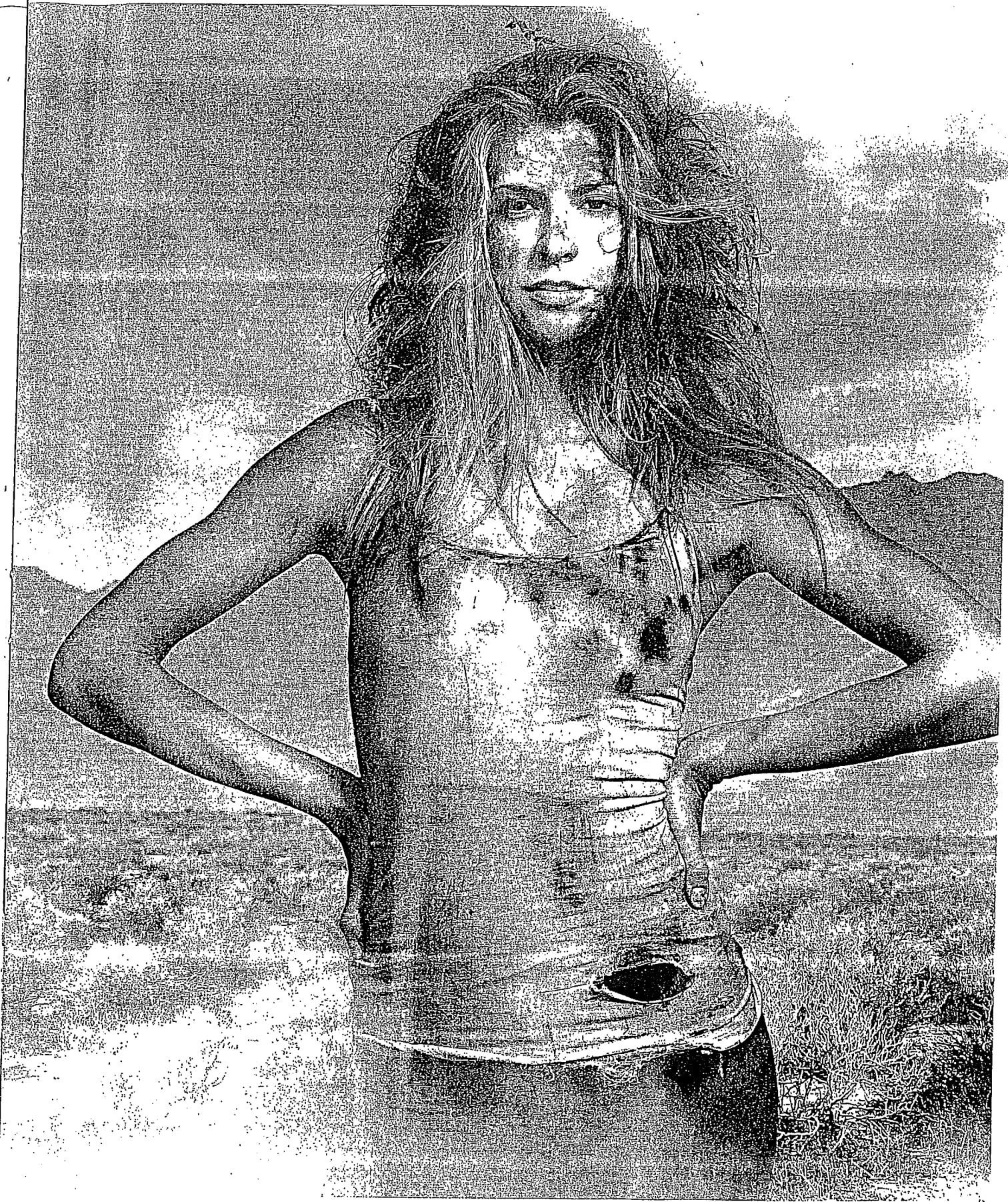


READY FOR ANYTHING

Scientists have compiled evidence-based tactics for building resilience. Among them: rethink adversity, forge close friendships and tackle novel challenges

*By Steven M. Southwick and
Dennis S. Charney*

PHOTOILLUSTRATION BY AARON GOODMAN



Wartime injuries need not be devastating. Many veterans learn and grow from their traumatic experiences.

A

s a college student at Brown University, Jerry White spent his junior year abroad studying in Israel. On a sunny day during the Passover holiday in April 1984, White and two friends set out for a camping trip in the Golan Heights. "I was walking out ahead of my friends with a song in my heart. I like being the leader, the one out in front," he recalls. "Then, boom! A huge explosion." He had stepped on a land mine. As blood poured from his leg, White screamed, "I have no foot! I have no foot!"



White's friends wrapped his stump with a shirt, tied a makeshift tourniquet around the injured leg and carried him through what they now knew was a minefield. For the next four months White lived in two Israeli hospitals where he felt helpless, sad and alone. "People were trying to introduce themselves, but they were all missing arms, legs, eyes, or they were burn victims. I felt sick and afraid," he says.

Eventually White returned home, completed college and worked as a substitute teacher before becoming an activist working on behalf of fellow victims. In 1995 he, along with his friend and colleague Ken Rutherford, who had lost both legs to a land

mine in Somalia, founded the Landmine Survivors Network (renamed Survivor Corps). This group played a leading role in the International Campaign to Ban Landmines, which was awarded the Nobel Peace Prize in 1997.

White's transformation from frightened victim to passionate survivor demonstrates resilience, the "process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress," according to the American Psychological Association. A resilient person may bend but does not break when confronted with adversity, enabling him or her to bounce back relatively quickly.

Biologically, resilience is the ability to modulate and constructively harness the stress response—a capacity essential to both physical and mental health. Unchecked, chronic stress can impair the immune system and contribute to illnesses such as gastric ulcers, asthma, depression, diabetes and heart disease. Stress can also spawn unhealthy behaviors such as smoking and excessive alcohol use.

Success appears to hinge on resilience. Setbacks are part of any endeavor, and those who react to them productively will make the most progress. In a 2002 *Harvard Business Review* article, Dean M. Becker, a founder of the resilience-training firm Adaptiv Learning Systems, is quoted as saying, "More than education, more than experience, more than training, a person's level of resilience will determine who succeeds and who fails. That's true in the cancer ward, it's true in the Olympics, and it's true in the boardroom."

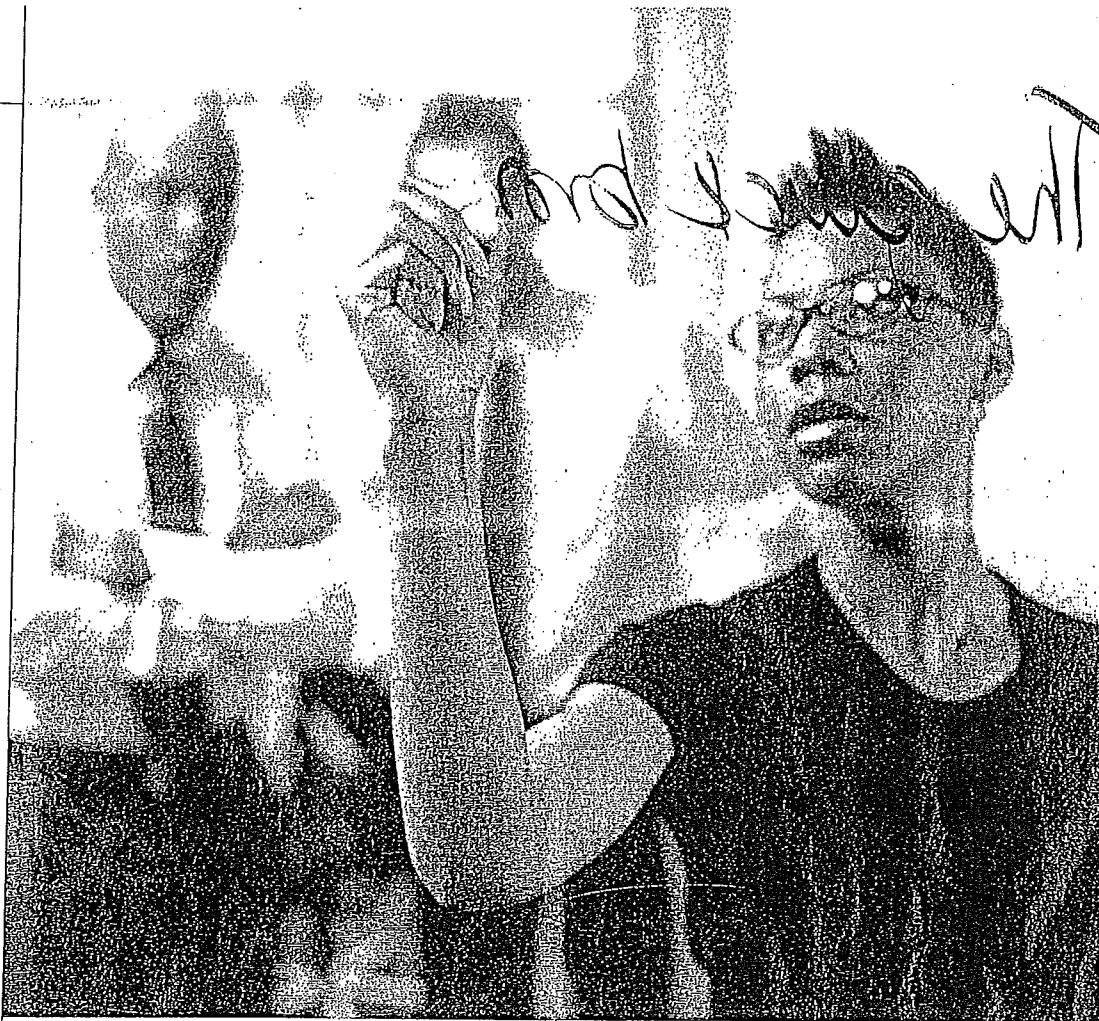
Whether a person hangs tough or gives up in hard times depends on influences at multiple levels, from molecules to neighborhoods. Resilience is determined by both inborn traits and environmental factors that affect the capacity to adapt to stress. Although some of these environmental influences, such as poverty, are difficult to alter, a person can increase his or her level of resilience by developing mental and physical habits that foster positive adaptation to stress and trauma.

FAST FACTS
Armed against Adversity

1» Resilience is the ability to modulate and constructively harness the stress response—a capacity essential to both physical and mental health.

2» Success can hinge on resilience. Setbacks are part of any endeavor, and those who react to them productively will make the most progress.

3» A person can boost his or her resilience. Strategies include reinterpreting negative events, enhancing positive emotions, becoming physically fit, accepting challenges, maintaining a close social network and imitating resilient role models.



Resilience is critical to success. The ability to keep working toward a goal in the face of difficulty separates the CEOs from the ne'er-do-wells.

Standing Up to Stress

Browse through the magazine section of any bookstore or drugstore, and you will find an assortment of books and articles on how to reduce stress: "7 Rules for a Stress Free Life," "Leave Your Stress Behind," "How You Can Reduce Your Stress and Your Dress Size," and so on. The basic message is that stress is bad—but it is not always. Some stress is actually good. Without stress, we would weaken. Difficulty that can be mastered, on the other hand, facilitates growth, self-esteem, self-efficacy and resilience. A resilient person is thus not someone who avoids stress, but someone who learns how to tame and master it.

A body of data, including studies of identical twins, suggests that certain personal characteristics that foster resilience may be at least partly inherited. These traits include a temperament that leads a child to confidently take on novel tasks and interact

with unfamiliar people, as well as a good-natured, sociable personality and an ability to accept yourself, including your faults. Researchers are now uncovering some of the basic biology of resilience that facilitates our adaptive responses to stress [see box on page 38].

Beyond biology, several environmental variables affect resilience, among them family support, the stability and quality of schools, and the services in and safety of a neighborhood. For example, a loner who is unemployed will have more trouble dealing with stress and trauma than a financially secure individual in a supportive family. Weak leadership in a community and insufficient first-responder and financial resources can also compromise responses to adversity.

Some of these situational factors, along with specific character traits, may be hard to change. Nevertheless, people can learn to think and act in

A resilient individual is not someone who avoids stress but someone who learns how to tame and master it.

ways that greatly enhance resilience. Virtually anyone can become more resilient through disciplined, consistent practice. The more we activate specific brain areas through our behavior, the more neural connections form in those areas, enabling the neurons involved to transmit their messages more efficiently.

In our book *Resilience: The Science of Mastering Life's Greatest Challenges*, we identify 10 avenues for building resilience. Some of these strategies reduce stress. Others help you grow from the experience. Strategies to increase resilience include learning how to regulate your emotions, adopting a positive but realistic outlook, becoming physical

and often adaptive, but if left unchecked, they can seriously compromise our ability to think clearly and to make rational decisions in challenging situations.

Researchers have devised numerous strategies for regulating emotions and enhancing resilience. Two approaches that have received increasing scientific support in recent years are cognitive reappraisal and mindfulness meditation. Using reappraisal, individuals reinterpret the meaning of an adverse event so that they see it as less negative. Doing so tends to attenuate physiological and emotional reactions to the event. For example, psychologist Kevin Ochsner and his colleagues at Columbia Uni-

These former prisoners of war found meaningful ways in which they had grown stronger, wiser and more resilient.

ly fit, accepting challenges, maintaining a close and supportive social network, and observing and imitating resilient role models. We discuss each of these approaches below.

Emotional Rescue

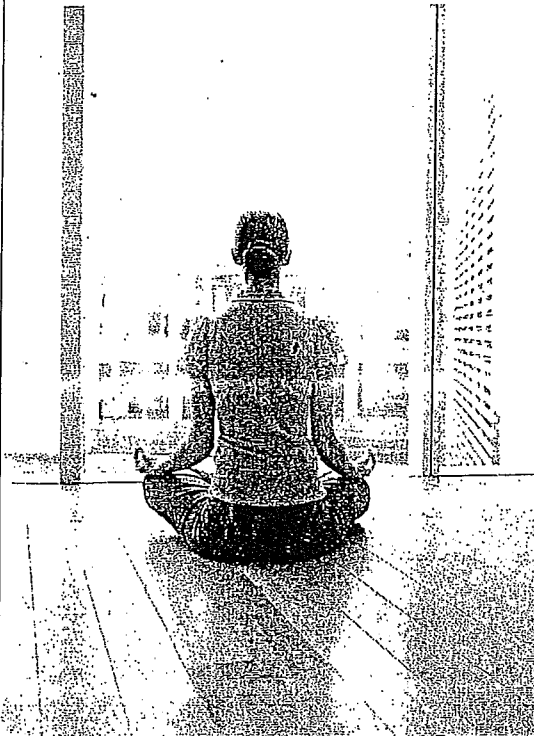
The ability to regulate emotions such as sadness, anger and fear is critical for effectively coping with stress and trauma. Negative emotions are nat-

versity have shown that when people intentionally reinterpret a situation such as a rejection for a job or the loss of a friend as being less negative, they report a decrease in unpleasant emotions. Ochsner's team also found that this improvement in mood is accompanied by changes in the brain—in particular, an increase in activity in the prefrontal cortex, a center for planning, directing and inhibiting behavior, and a decrease in activity of the amygdala, a hub for feelings such as fear.

For years researchers have studied how people regulate their emotions. Individuals who frequently use cognitive reappraisal as a way to alter their emotional reactions to stress and trauma tend to report greater psychological well-being than those who do not look for neutral or positive ways to interpret their circumstances. For example, in a 2008 study we, along with psychiatrist Adriana Feder and other colleagues at the Mount Sinai School of Medicine, interviewed 30 former Vietnam prisoners of war about how they evaluated their wartime experiences. We found that most of these veterans, many of whom had been brutally tortured, had actively reappraised their imprisonment and found meaningful ways in which they had grown stronger, wiser and more resilient as a result of it. They also reported that they were now better able to see possibilities for the future, relate to others and appreciate life.

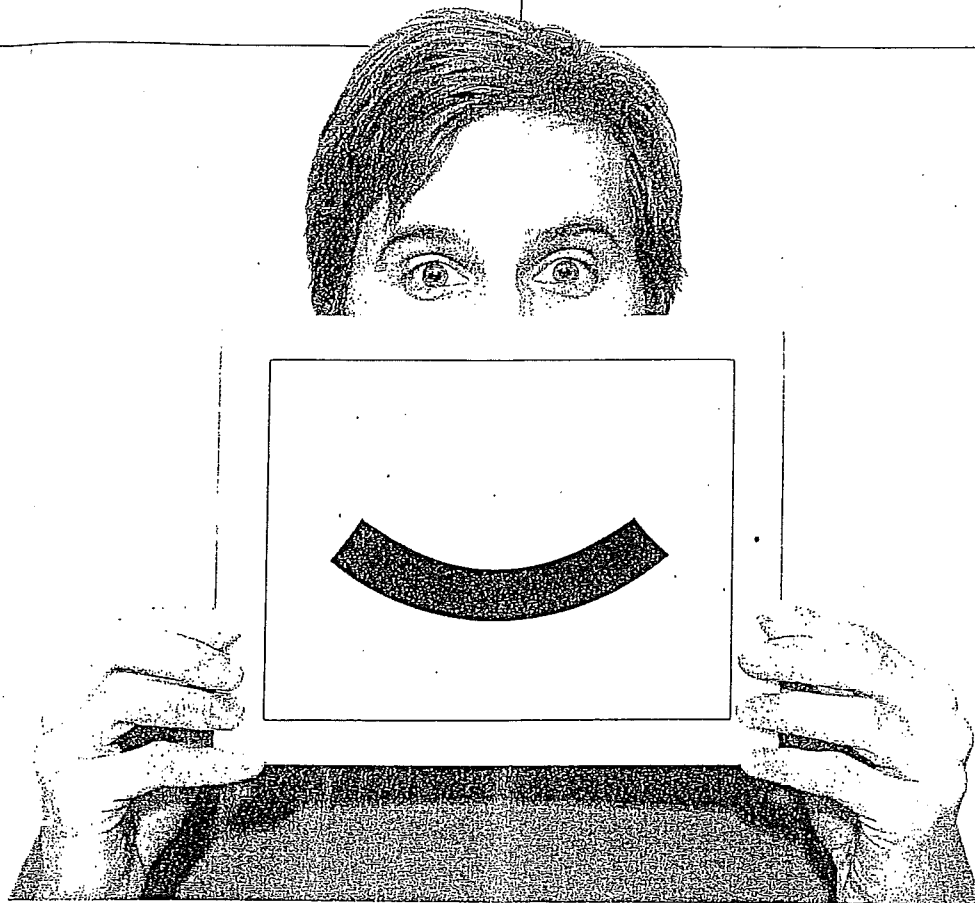
Training in cognitive reappraisal is a component of various therapies designed to enhance well-being, strengthen resilience and reduce distress. For example, cognitive-behavior therapies, which are effective for treating mood and anxiety disorders,

Engaging in mindfulness meditation is an effective way of controlling stress.



or





Using a coping strategy called cognitive reappraisal, a person revises his or her interpretation of a difficult experience to make it less negative.

teach individuals to observe their own thoughts and behaviors, to challenge their negative assessments of stressful situations and of themselves, and to replace these with more realistic and positive points of view. When faced with a highly stressful or negative episode, you may find it helpful to ask yourself, "Is there a less destructive way to look at this situation?" "Am I catastrophizing or exaggerating its potential negative impact?" and "Is there something that I can learn from this experience, or is it possible to grow stronger as a result?"

Another strategy for controlling stressful emotions is to engage in mindfulness meditation. This exercise teaches practitioners how to consciously live in the present moment, rather than dwelling in the past or fretting about the future. The participant becomes an observer who learns to watch, but not judge, as the mind tends to automatically follow familiar conditioned patterns of thinking that often add to distress and maladaptive coping. Mindfulness meditation has been associated with improved ability to focus, more flexible thinking, greater psychological well-being, and better ability to cope with depression, anxiety and stress [see "Being in the Now," by Amishi P. Jha; *SCIENTIFIC AMERICAN MIND*, March/April 2013].

Brain-scanning experiments have revealed that

both mindfulness meditation and training in cognitive reappraisal can increase activation of the left prefrontal cortex, a pattern that is associated with greater emotional control, a boost in positive emotions, and faster recovery from feelings such as anger, disgust and fear. Attending a workshop on mindfulness meditation is one good way to start learning how to modulate the stress response and successfully weather life's many challenges.

A Glass Half Full

In addition to attenuating negative emotions, a dedicated effort to bolster positive emotions can enhance a person's ability to bounce back from difficulty. Optimism and positive emotions are strongly associated with good mental and physical health, even longevity. In a remarkable study published in

(The Authors)

STEVEN M. SOUTHWICK is Glenn H. Greenberg Professor of Psychiatry, PTSD and Resilience at the Yale University School of Medicine and the Yale Child Study Center. DENNIS S. CHARNEY is Anne and Joel Ehrenkranz Dean and Professor of Psychiatry, Neuroscience, and Pharmacology and Systems Therapeutics at the Icahn School of Medicine at Mount Sinai. They are authors of *Resilience: The Science of Mastering Life's Greatest Challenges* (Cambridge University Press, 2012).

GETTY IMAGES

2001 developmental psychologist Deborah D. Danner of the University of Kentucky and her colleagues examined autobiographical sketches composed by 180 nuns from School Sisters of Notre Dame in Milwaukee before they took their vows of commitment to the Church and God. They found that the degree of positive emotion expressed in the sketches, which had been written decades earlier, predicted longevity. Only 34 percent of nuns whose sketches were classified in the lowest quarter of cheerfulness were still alive at age 85 compared with 90 percent who had been classified in the most upbeat quarter.

The health benefits of positive emotions probably stem from a better ability to regulate the stress

response. Psychologist Barbara L. Frederickson of the University of North Carolina at Chapel Hill and her colleagues have found that negative emotions tend to increase physiological arousal, narrow our focus of attention and restrict our behaviors to those essential for survival. Positive emotions, on the other hand, have been found to reduce arousal and broaden our focus, leading to more creative and flexible responses to stress and trauma.

Resilience is associated with realistic optimism, not the rose-colored form. Because the latter often involves ignoring negative information, people who adopt an overly buoyant outlook tend to underestimate stressful and risky situations. On the other

The Biology of Bouncing Back

Researchers have traced resilience, the capacity to recover from adversity, to a network of brain regions and chemicals. Beginning early in life, an individual's genes and the interaction of those genes with the environment shape brain circuits that underlie the psychological strengths and behaviors of resilient people.

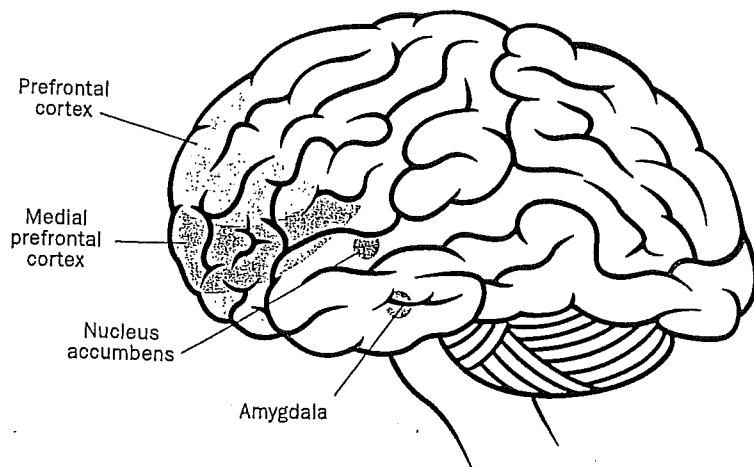
Critical to building resilience is the capacity to face fears, experience positive emotions, search for adaptive ways to reframe stressful events and benefit from relationships. Thus, resilience relies on neural circuits governing fear, reward, and social and emotional regulation. These circuits overlap at certain brain structures. For example, the amygdala not only regulates fear but also has a major role in reward, through the processing of positive emotions. The nucleus accumbens, the hub of reward, also influences social behaviors such as sociability and pair bonding. The medial prefrontal cortex has a role in all three circuits, helping to regulate social interactions and emotions and relaying that information to other regions to inform higher-level decisions. As a result of the overlap and connections among these circuits, how a person faces fear is correlated with his or her ability to remain upbeat under stress and generate rewarding social experiences in tough times.

The neural circuits of fear, reward and social behaviors are powered by a variety of neurochemicals and hormones. One of these, neuropeptide Y, is a short protein found in the amygdala and other regions that mediate anxiety and fear. Among people under severe stress, such as someone undergoing challenging military training, higher neuropeptide Y levels are connected to better performance. High levels of the stress hormone cortisol, however,

are associated with depression. Norepinephrine, another stress hormone, helps us react appropriately to danger by readying us to fight or flee the scene. Unrestrained repeated increases in norepinephrine may create chronic anxiety, however. Dopamine and serotonin, meanwhile, help us stay positive under difficult conditions.

Resilience may also be related to activation of the left prefrontal cortex. When active, this region at the surface of the brain just behind the forehead sends inhibitory signals to the amygdala, quieting anxiety and fear-based emotions and leaving the frontal brain region free to plan and set goals. In this way, a person is better able to persevere, maintain a positive self-image, remain hopeful in stressful times, and plan and act without being overwhelmed by fear or other emotions. Understanding the biological underpinnings of resilience could help researchers and clinicians design psychological and pharmacological interventions that make people better able to overcome adversity.

—S.M.S. and D.S.C.



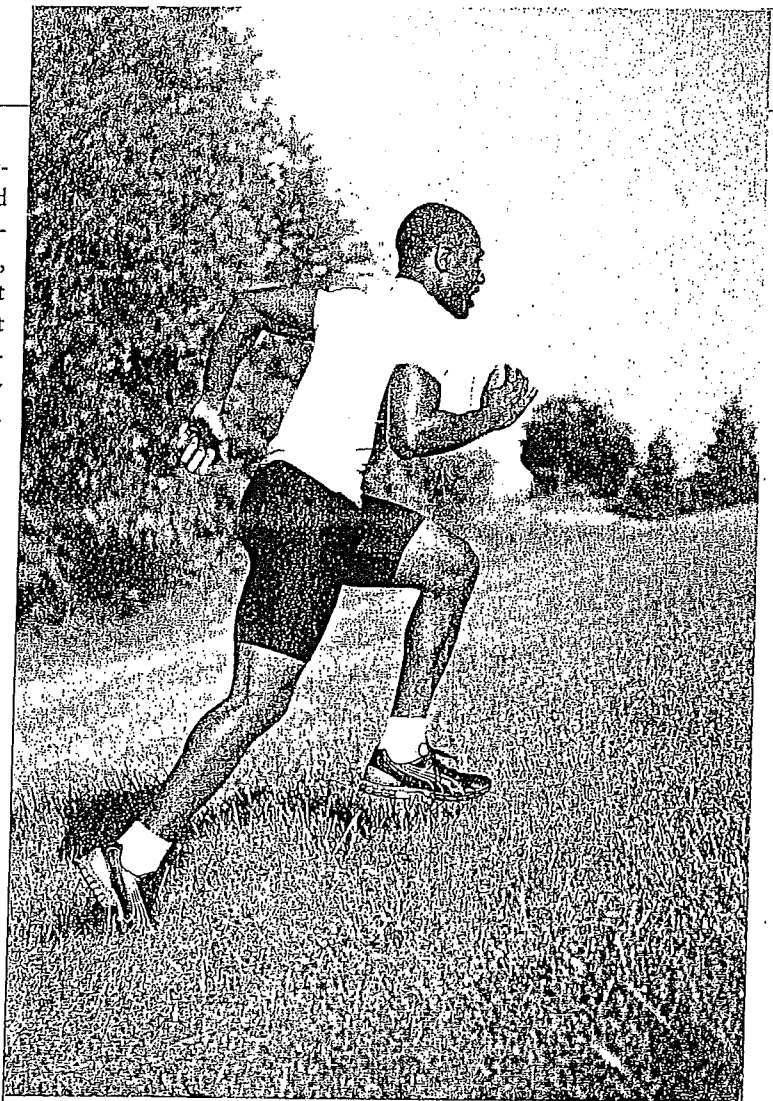
hand, realistic optimists filter out unnecessary negative information but pay close attention to bad news that is relevant to dealing with adversity. Using a technique called cognitive-bias modification, you can, with repetitive training, learn to tune out negative words and occurrences and develop a habit of interpreting ambiguous situations in a more positive manner [see "The Essence of Optimism," by Elaine Fox; *SCIENTIFIC AMERICAN MIND*, January/February 2013].

Working Out Your Troubles

Physical activity can enhance resilience, too, by protecting people (and animals) against the negative effects of stress. During the past decade neuroscientist Benjamin N. Greenwood and his colleagues at the University of Colorado at Boulder have published a series of studies in rats showing that six weeks of voluntary wheel-running exercise can ward off anxiety and depressionlike behaviors, such as exaggerated fear, reduced social exploration and increased intake of morphine, that typically result from exposure to a variety of intense stressors.

In humans, aerobic exercise also has been shown to reduce symptoms of depression and anxiety. It improves attention, planning, decision making and memory, all of which are important for effectively managing stress. Exercise appears to promote resilience through a number of neurobiological mechanisms. For example, it boosts levels of endorphins as well as neurotransmitters such as dopamine and serotonin that may reduce symptoms of depression and elevate mood. It also suppresses the release of the stress hormone cortisol.

In addition, workouts seem to activate genes for proteins, such as brain-derived neurotrophic factor (BDNF), that promote the growth and repair of neurons, which prolonged stress can damage. In a study published in 2011 psychologist Arthur F. Kramer and his colleagues at the University of Illinois at Urbana-Champaign found that moderate-intensity aerobic exercise (three days a week for one year) increased the size of the hippocampus, a brain region involved in both memory and stress regulation, by 2 percent. This growth was associated with increases in BDNF and improved memory, suggesting that exercise can protect neurons in this area and may thus help people recover from difficult circumstances.

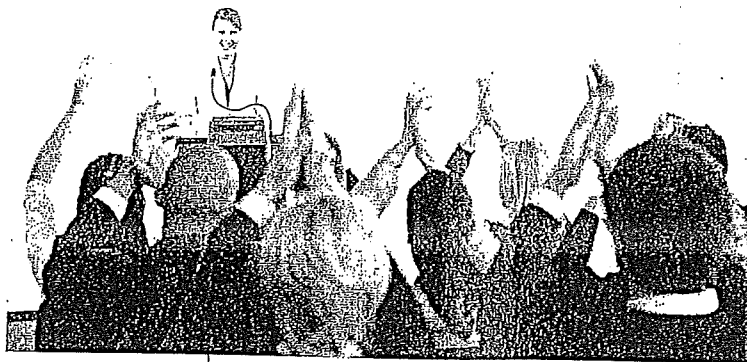


For general health, the Department of Health and Human Services has recommended at least one hour and 15 minutes a week of intense aerobic workouts such as swimming or running or twice as much moderately intense exercise—mowing the lawn, say, or walking fast—along with two days of muscle strengthening. (Those who work out more tend to reap greater health benefits, although very intense or prolonged athletic endeavors can actually be detrimental to physical and mental health.)

To enhance resilience, however, we recommend that you consult with your physician and then develop a schedule in which you gradually increase the intensity of your cardiovascular and strength training. Every workout should be challenging but manageable. In this way, in addition to getting the biological benefits of exercise itself, you are also care-

Exercise can strengthen attention, decision making and memory, empowering people to better shoulder stress.

Workouts activate genes for proteins that promote the growth and repair of neurons, which stress can damage.



Taking on moderately stressful challenges, such as giving a lecture in front of a small group, can boost resilience.

fully calibrating your exposure to stress in a way that is known to increase resilience.

This general strategy is called stress inoculation. It is based on the notion that if a person deliberately takes on increasingly difficult challenges he or she will gradually learn to handle higher levels of stress. The inoculation principle of graded exposure can apply to a broad range of activities designed to increase physical, emotional and cognitive resilience. For example, practitioners of mindfulness can increase their ability to concentrate by gradually lengthening their periods of meditation. A person who is afraid to give speeches might sign up for a public speaking workshop and afterward accept speaking engagements in front of small, nonthreatening audiences, then gradually agree to stand up in front of larger and more challenging crowds.

Such experiences should be outside your comfort zone but not so intense as to be unmanageable

can obtain constructive feedback from instructors and colleagues.

As you gradually acclimate to greater levels of stress, you will need to recover and relax more. Psychologist James Loehr, who has written several books on resilience training, points out that insufficient recovery relative to the high volume of stress can be quite damaging and that one of the most important life skills may be knowing when high recovery needs to balance high stress.

Friends in Need

A particularly effective way to enhance resilience is to strengthen one's relationships because doing so can dampen your biological response to stress and bolster your courage in tense situations. High levels of social support have been associated with better psychological outcomes after many types of trauma, including childhood sexual abuse and combat. For example, in a 1998 study psychologist Lynda A. King of Boston University and her colleagues found that high levels of social support after returning from war were associated with significantly lower levels of post-traumatic stress disorder among a sample of 1,632 male and female Vietnam veterans. High social support has also been linked with better overall physical and psychological health in college students, new mothers, parents of children with serious medical illnesses, widows and unemployed workers.

Backing from others is powerful because it increases an individual's self-confidence, provides a safety net if we should fall, and bolsters our belief that we can overcome obstacles. As a result, we tend to more actively solve problems rather than passive-

High levels of social support have been associated with better psychological outcomes after many types of trauma

or potentially harmful. You should also plan to progressively increase the intensity or difficulty of these endeavors. As noted in the *U.S. Army Combat Stress Control Handbook*, "To achieve greater tolerance or acclimatization to a physical stressor, a progressively greater exposure is required. The exposure should be sufficient to produce more than the routine stress reflexes.... In other words you must stress the system." Moreover, make training as realistic as possible. Pilots, firefighters, police and soldiers all enhance their physical, cognitive and emotional skills in realistic settings where they

ly avoiding challenges. After all, bonding with others does provide greater security; a group that works closely together is stronger than an individual. On a biological level, social ties stimulate the release of the hormone oxytocin. Oxytocin is known to reduce anxiety and fear in part by limiting the cortisol response to stress. (It also promotes affiliative behaviors and emotions, such as trust, that encourage continued socializing.)

Interestingly, social support may have an even stronger effect on coping with adversity in Latin American and other cultures that place great value

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Friendships can lift you up, provide security and prevent a precipitous fall.

on interdependence, extended kinship systems and collectivism. It plays a comparatively lesser role in more individualistic cultures such as ours, although relationships in all societies are vital.

To boost resilience through your relationships, first evaluate your social network. Make a list or map of the people you feel connected to. With whom do you interact daily? Who would help you without hesitation? To whom do you turn for advice? Who really understands you? And who can count on you for help?

If you find you need to bolster or simply maintain a supportive network, reach out to family, friends and colleagues. Join organizations that share your interests and concerns. Find ways to help others. As an adult, it is also important to teach children the skills needed to become socially competent, such as knowing how to listen to, empathize with and give support to others.

More Than Flattery

In your social circles, look for people who recover quickly from hardship whom you could learn from. Members of your own family, colleagues, teachers, coaches, or even historical figures or fictional characters could also serve as resilient role models.

Psychologist Albert Bandura, the highly influential emeritus professor at Stanford University, believed that modeling was most effective when the observer analyzed what he or she wished to imitate by dissecting it into segments and creating rules that could guide future action. For example, when a friend of one of us (Southwick) lost her job, I noticed that she immediately called fellow employees, former employers and friends to solicit their help in searching for a new position. When she fell ill with pneumonia, she

moved in with her sister until she recovered. And when her mother died, she called her family and closest friends and asked them to spend time with her. Rather than going it alone in times of stress, she reached out for support from those who care about her, a pattern that can guide my own behavior.

White, the land-mine survivor, is an outstanding model of resilience. Through years of soul-searching (read: cognitive reappraisal), he began to see the loss of his foot as more opportunity than horrendous misfortune. Together with a group of like-minded individuals, he embarked on a quest to rid the world of land mines. Through thoughtful reassessment, social support and a problem-solving approach, White transformed his tragedy into a mission of hope. M

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