

THE RELAXATION RESPONSE

BY HERBERT BENSON, M.D.

EARLY IN MY CAREER AS A CARDIOLOGIST, I WAS INTRIGUED BY THE observation that patients had higher blood pressure during times of stress. That connection, in fact, was part of popular folklore: The notion that "you'll raise your blood pressure if you get upset" was common among physicians and lay people alike.

But while most people believed that stressful circumstances can elevate blood pressure, little was known about the nature of this link or how best to counteract it. If your doctor found that your blood pressure was elevated, you were likely to be treated with medication. That meant that people who had high blood pressure only during periods of stress might be needlessly taking drugs and subjecting themselves to possible adverse side effects and extra expense.

Fascinated by this link between mind and body and inspired by the possibility of simplifying the treatment for stress-induced high blood pressure, I decided to focus on this area after I finished my cardiology training at Harvard's Thorndike Memorial Laboratory. Working in the medical school's department of physiology, I undertook a series of studies between 1967 and 1969 in which I used biofeedback techniques to train monkeys to control their own blood pressure.

The approach was a simple application of biofeedback principles (described in Chapter 18), but it was surprisingly effective. My colleagues and I

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monitored each animal's blood pressure, and whenever it began to go up, we flashed a white light for the animal to see. When the animal's blood pressure dropped, we flashed a blue light. Through the use of appropriate rewards, we were able to train the animals to change their blood pressure in either direction.

As the results of our work became known, some young people who were students of meditation approached me. "Why are you working with animals?" they asked. "Why don't you study humans? We think we can lower our blood pressure through transcendental meditation."

I thanked them for their interest, but I didn't want to get involved with anything as far from the mainstream as meditation was at that time. They were quite persistent, however, coming back day after day. Ultimately, they convinced me that it would be worthwhile to study meditation and its possible effect on blood pressure, and I designed an experiment to test their claim. My colleagues and I also decided to take a wide range of measurements to see if other physiological factors might change with meditation as well.

At about the same time, psychologist Robert Keith Wallace and physiologist Archie F. Wilson had started similar experiments in California on practitioners of transcendental meditation. By chance, our experimental designs were virtually identical. Later, Wallace decided to join us in Boston, and we were able to combine and expand our data on the bodily changes that occur during meditation.

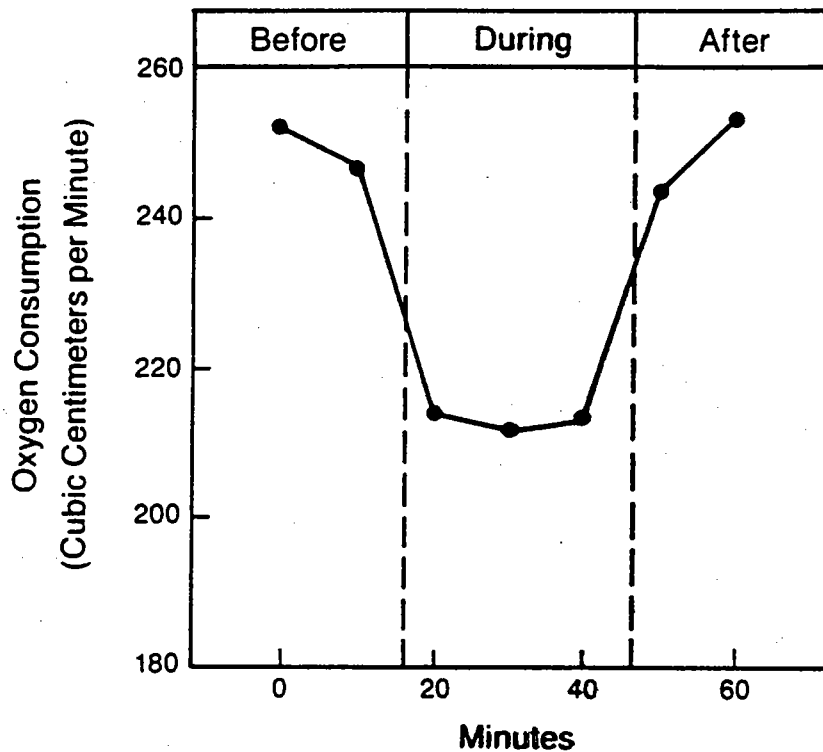
In 1968, we took the meditators who had volunteered to be studied and fitted them with measurement devices—even placing catheters in their veins and arteries—to record changes in a number of physiological functions, from breath rate to brain waves. The volunteers sat quietly for some time, getting used to all the instrumentation.

After an hour or so, when the subjects were in a quiet, resting state, we took measurements for 20 minutes and then asked them to meditate. There was no change in their posture, no change in their activity; they simply changed the content of their thoughts. During this meditation period, which also lasted 20 minutes, the measurements continued.

Finally, the volunteers were asked to return to their normal way of thinking. Again, there were no visible changes in posture or other activity. Their minds simply shifted from a meditative focus back to everyday thoughts, as our measurements continued for a final 20 minutes. Thus, the experiment included a premeditation period, a meditation period, and a postmeditation period.

The results of our experiments were striking, with dramatic physiological changes as people shifted from everyday thinking into meditation. Several aspects of metabolism—the basic “maintenance functions” that keep the body operating—dropped significantly during meditation, even though they had already been operating at a low level as our volunteers rested quietly before meditating. Compared to the simple resting state, the volunteers consumed 17 percent less oxygen while meditating and produced less carbon dioxide as well. Breathing slowed down from a normal rate of 14 or 15 breaths per minute to approximately 10 or 11 breaths per minute. And there was a decrease in the total amount of air moving in and out of the lungs—a measure called *minute ventilation*.

We also noted a precipitous drop in the amount of a chemical called



HOW METABOLISM CHANGES WITH THE RELAXATION RESPONSE

The body's metabolic rate, an overall measure of biochemical activity, is reflected in the amount of oxygen consumed. As this graph shows, oxygen consumption drops significantly in meditators when they switch from simply resting ("Before") to meditating ("During"), and rises when they stop meditating ("After").

lactate in the bloodstream. High levels of lactate have been associated in psychiatric studies with anxiety and disquietude; low levels, with peace and tranquility. We found some of the lowest levels ever recorded in human beings.

Finally, brain wave patterns during meditation were slower than those found in everyday thinking. There were more low-frequency alpha, theta, and delta waves in the meditative period—waves associated with rest and relaxation—and fewer of the high-frequency beta waves associated with normal waking activity.

Interestingly, one thing we did *not* observe in these experiments was a drop in blood pressure. But these meditators had low blood pressure to begin with. And as we will see later, the physiological state associated with meditation—which we were on the verge of discovering—does not lower blood pressure in everybody, although it can certainly do so for many people.

Our findings launched us on a 25-year journey that continues to absorb our attention today. It has led to the elucidation of one of the body's most remarkable means of regulating its own physiological machinery—a stress-reducing phenomenon we call the *relaxation response*.

In the fall of 1988, my colleagues and I founded a research, teaching, and training facility called the Mind/Body Medical Institute at the New England Deaconess Hospital and the Harvard Medical School. It was the first institute of its kind, devoted to the study of this response and other self-help measures—including exercise, nutrition, and cognitive therapies—and their potential role in the prevention and treatment of disease. In addition to research, we disseminate information to the lay public about these approaches and teach health-care professionals how to use them in practice. At the New England Deaconess Hospital, we now offer groups for people with a range of medical conditions, including high blood pressure and heart disease, cancer, and chronic pain, as well as offering professional training (see Resources).

We and others have found that the relaxation response can help in the treatment of many medical problems; in some cases, it can eliminate them entirely. It's important to remember that most diseases have many different possible causes and contributing factors, and the relaxation response targets only one: stress. But this is no small feat, because stress alone can precipitate a wide range of unhealthy conditions, as described in many places elsewhere in this book.

To the extent that any disorder is caused or made worse by stress, the relaxation response is useful. It is never a substitute for regular medical care.

However, it is a scientifically proven treatment that is totally compatible with other approaches of modern medicine.

A UNIQUE STATE OF RELAXATION

When we performed our first experiments in the late 1960s, there were just two conditions known to decrease metabolism below the resting state: sleep and hibernation. Early on, we asked whether the changes of the relaxation response could indicate that human beings had a hitherto unrecognized capacity to hibernate.

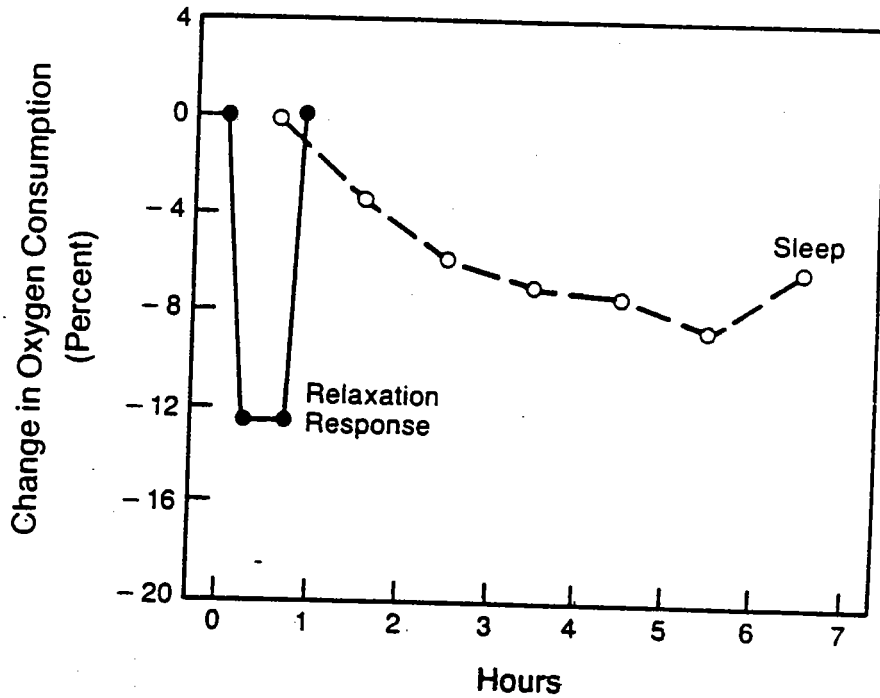
One accurate way to differentiate hibernation from sleep is by measuring rectal temperature. Rectal temperature decreases up to more than 60 degrees in a hibernating animal—40 times the temperature drop seen in a sleeping animal. But rectal temperature measurements taken during meditation revealed that there was virtually no temperature change, showing that meditation was not a hibernatory state.

But neither were meditators in a state of sleep. During sleep, decreases in metabolism occur over a period of one to five hours; during meditation, they occurred within three to five minutes. In addition, the brain wave patterns of sleep differ from those seen in meditation.

Almost immediately, a hypothesis came to me that would explain this apparent conundrum. I was performing the experiments in the very same laboratories that were used by physiologist Walter B. Cannon early in this century, and I was very well versed in his work and that of his contemporaries. Our hypothesis was based on an understanding of the so-called *fight-or-flight*, or *emergency response*, which Cannon had described (see Chapter 2).

Cannon discovered that injecting an extract from the adrenal glands into experimental animals could trigger a set of physiological changes, including increases in blood pressure, heart rate, and breath rate, and a three- to four-fold increase in the amount of blood flowing to the muscles. The adrenal extract contained what was later called *adrenaline* (epinephrine) and *noradrenaline* (norepinephrine). Cannon reasoned that this set of changes was an animal's way of preparing to either fight or flee—hence the name *fight-or-flight response*.

I also remembered the work of the Swiss physiologist Walter R. Hess, a Nobel Prize winner. Hess's findings coupled with Cannon's gave us a key to understanding the relaxation response.



HOW THE RELAXATION RESPONSE DIFFERS FROM SLEEP

While both sleep and the relaxation response bring a decrease in oxygen consumption, the change occurs much more rapidly with the relaxation response. Although the relaxation response period shown in this graph was only 20 minutes, oxygen consumption remains low for as long as a person elicits the relaxation response.

In the 1930s and 1940s, Hess found that by stimulating certain areas of the brain in laboratory animals, he could bring about a response opposite to the fight-or-flight response, which he called, in translation, "a protective mechanism against overstress." This response was characterized by a state of tranquility, relaxed muscles, and decreased blood pressure and breathing rate.

We hypothesized that Hess's *protective mechanism* might be related to the changes that we had found during meditation. If this were true and we had discovered a basic physiological response in human beings, it seemed likely that approaches other than transcendental meditation would prove capable of bringing it forth.

MEDITATION AND PRAYER: UNIVERSAL PATTERNS

It seems that there are two basic components to transcendental meditation: First, the silent repetition of a sound, called a *mantra*, to minimize distracting thoughts; and second, the passive disregard of thoughts that do intrude, followed by a return to the repetition. (See "How to Elicit the Relaxation Response.")

Using this formula, we spent several years reviewing the secular and religious literatures of the world to see whether these basic steps had been described previously. We looked not only at traditions that used a sound like a *mantra*, but also at those that used the prolonged repetition of a word, prayer, phrase, or muscular activity as a point of focus for the attention. And in virtually every culture we examined that had a written history, the basic steps were present.

For example, in Judaism, at the time of the Second Temple—roughly from the fourth and fifth centuries B.C. to the first century A.D.—followers of a philosophy called *Merkabism* would squat in a fetal-like posture and focus on their breathing. They would repeat the name of a magic seal on each exhalation and disregard other thoughts when they came to mind.

In Christianity, repetitive prayers dating back almost to the time of Christ evolved by word of mouth, appearing first among the Desert Fathers, who were ascetics living in northern Egypt in the second, third, and fourth centuries A.D. One of these prayers was ultimately codified in the 14th century on Mount Athos in Greece, where the technique is still practiced in Byzantine monasteries. The instructions were to pay attention to your breathing and on each exhalation repeat silently the prayer, "Lord Jesus Christ, have mercy on me." Should other thoughts come to mind, the instructions were to passively disregard them and return to the repetitive prayer. This prayer has survived to this day in many branches of Christianity and is currently called the *Jesus Prayer* or the *Prayer of the Heart*.

Very similar practices are found within Islam, Buddhism, Shintoism, Taoism, and Confucianism, with the only difference being in the words to be repeated. In Islam, where the process is called *Dhikr*, the repetitive focus is often a phrase from the Koran or the word *Allah*. In a ceremony of Shintoism, the focus is on counting in association with breathing. And in one prayer of Tibetan Buddhism, the phrase *Om Mani Padme Hum* (*Hail, Jewel of the Lotus*) is repeated.

HOW TO ELICIT THE RELAXATION RESPONSE

Some general advice on regular practice of the relaxation response:

- Try to find 10 to 20 minutes in your daily routine; before breakfast is a good time.
- Sit comfortably.
- For the period you will practice, try to arrange your life so you won't have distractions. Put the phone on the answering machine, and ask someone else to watch the kids.
- Time yourself by glancing periodically at a clock or watch (but don't set an alarm). Commit yourself to a specific length of practice, and try to stick to it.

There are several approaches to eliciting the relaxation response. Here is one standard set of instructions used at the Mind/Body Medical Institute:

Step 1. Pick a focus word or short phrase that's firmly rooted in your personal belief system. For example, a nonreligious individual might choose a neutral word like *one* or *peace* or *love*. A Christian person desiring to use a prayer could pick the opening words of Psalm 23, *The Lord is my shepherd*; a Jewish person could choose *Shalom*.

Step 2. Sit quietly in a comfortable position.

Step 3. Close your eyes.

Step 4. Relax your muscles.

Step 5. Breathe slowly and naturally, repeating your focus word or phrase silently as you exhale.

Step 6. Throughout, assume a passive attitude. Don't worry about how well you're doing. When other thoughts come to mind, simply say to yourself, "Oh, well," and gently return to the repetition.

Step 7. Continue for 10 to 20 minutes. You may open your eyes to check the time, but do not use an alarm. When you finish, sit quietly for a minute or so, at first with your eyes closed and later with your eyes open. Then do not stand for one or two minutes.

Step 8. Practice the technique once or twice a day.

Inspired by these findings, we expanded our experiments. We wanted to be sure that the physiological changes we had described could be evoked by any practice that included the basic two-step process, not only by transcendental meditation. We used the same instrumentation as we had in the initial meditation experiment. But rather than practicing transcendental meditation, individuals simply repeated the number *one* on each exhalation and passively disregarded any intrusive thoughts. As we predicted, we found changes that were indistinguishable from those of our earlier findings with transcendental meditation.

We also thought about the fact that many of the examples we had uncovered in our research had their roots in religious practice. For some people, we thought, a religious motivation might enhance their commitment to practicing these techniques.

To be sure that modern religious practices could evoke the relaxation response, we brought into our laboratory people who regularly prayed. We found that repetitive prayer—in Judaism, a *davening*-type prayer; in Catholicism, a rosary-type prayer; and in Protestantism, a “centering” prayer—produced the same physiological changes that we had originally noted in transcendental meditation. We now recommend that our religious patients consider using such a prayer when they elicit the relaxation response and that nonreligious patients use any sound, word, or phrase with which they are comfortable.

OTHER MEANS OF ELICITING THE RELAXATION RESPONSE

A wide array of techniques can elicit the relaxation response. At the Mind/Body Medical Institute and the Division of Behavioral Medicine, we offer a variety of techniques from which individuals make their choice. The techniques may be religiously based or have a secular focus. When people choose a technique that conforms to their own preferences, it is much more likely that they will adhere to the practice.

The relaxation response comprises an assortment of physiological changes: a decrease below resting levels in oxygen consumption, heart rate, breathing rate, and muscle tension—plus a decrease in blood pressure in some people—and a shift from normal waking brain wave patterns to a pattern in which slower brain waves predominate. As our research has contin-

ued, we have found that many of these same changes can be triggered by methods somewhat different from transcendental meditation and prayer. (See the table, "Physiological Changes with Different Techniques.")

One of these techniques is yoga, an ancient form of "active meditation" from the Hindu and Buddhist traditions. In *hatha yoga*, the form most commonly practiced in the United States, there is no central mental focus, no repetition of a mantra or prayer. Instead, practitioners concentrate on their breathing and on assuming a series of physical postures, moving between them slowly and with concentration. The practice is actually a form of *mindfulness meditation*, described in Chapter 15, which differs from approaches like transcendental meditation in some significant ways. Nevertheless, yoga has also been shown to evoke the physiological changes of the relaxation response.

We have also found that several Western secular techniques designed for stress management can elicit the changes seen in the relaxation response. Among them:

AUTOGENIC TRAINING

This technique, developed in Germany by the physician Johannes H. Schultz, was designed to bring forth the tranquil reaction that Hess described as counteracting the fight-or-flight response in animals. The standard exercises of autogenic training include focusing on feelings of heaviness and cultivating a sense of warmth in the limbs, combined with a passive focus on breathing. You are told that your attitude toward the exercises should be one of *passive concentration*—not intense or compulsive, but rather of a "let it happen" nature. (See "Autogenic Training: Basic Instructions.")

PROGRESSIVE MUSCLE RELAXATION

This technique was first described in the 1920s by the American physiologist Edmund Jacobson. To start, you lie down in a quiet room. A passive attitude, again, is essential. You are taught to recognize even the slightest muscle contractions so that you can release them and achieve a deep degree of muscular relaxation. (See "Progressive Muscle Relaxation: Basic Instructions.")

HYPNOSIS

To induce this state, which is characterized by increased suggestibility, a hypnotist begins with instructions to make you calm and relaxed while you re-

Technique	Oxygen consumption	Respiratory rate	Heart rate	Alpha waves	Blood pressure	Muscle tension
Transcendental meditation	Decreases	Decreases	Decreases	Increase	Decreases*	(Not measured)
Zen and yoga	Decreases	Decreases	Decreases	Increase	Decreases*	(Not measured)
Autogenic training	(Not measured)	Decreases	Decreases	Increase	Inconclusive results	Decreases
Progressive relaxation	(Not measured)	(Not measured)	(Not measured)	(Not measured)	Inconclusive results	Decreases
Hypnosis with suggested deep relaxation	Decreases	Decreases	Decreases	(Not measured)	Inconclusive results	(Not measured)

*In patients with elevated blood pressure

PHYSIOLOGICAL CHANGES WITH DIFFERENT TECHNIQUES

Several techniques have now been shown to elicit a constellation of related changes, all part of what we have called the relaxation response. While not every change has been measured with every technique, the overall results suggest that these methods trigger the same natural physiological pattern.

cline or rest comfortably in a sitting position. These instructions are given before the hypnotic suggestions are presented. Indeed, as these instructions are followed, heart rate, breathing rate, and blood pressure all decrease and the brain waves become slower—physiological changes similar to those of the relaxation response. (See Chapter 16.)

THE RELAXATION RESPONSE AND HYPERTENSION

The use of the relaxation response in medicine is based on the recognition that stress can cause or exacerbate many different conditions, as described in other chapters of this book. But even for conditions where the relaxation response has clear clinical potential, its usefulness may vary greatly from person to person.

AUTOGENIC TRAINING: BASIC INSTRUCTIONS

This method uses simple phrases to cue your body to elicit the relaxation response. These phrases should theoretically elicit specific physiological responses; for example, the phrase, "My arms are heavy and warm," is meant to increase blood flow to the arms.

Get comfortable and have someone slowly read you these instructions, or make a tape recording to use until you get the hang of it:

Close your eyes and focus on the sensations of breathing. Imagine your breath rolling in and out like ocean waves. Think quietly to yourself, "My breath is calm and effortless . . . calm and effortless. . . ." Repeat the phrase to yourself as you imagine waves of relaxation flowing through your body: through your chest and shoulders, into your arms and back, into your hips and legs. Feel a sense of tranquility moving through your entire body. Continue for several minutes. . . .

Now focus on your arms and hands. Think to yourself, "My arms are heavy and warm. Warmth is flowing gently through my arms into my wrists, hands, and fingers. My arms and hands are heavy and warm." Stay with these thoughts and the feelings in your arms and hands for several minutes. . . .

Now bring your focus to your legs for a few minutes. Imagine warmth and heaviness flowing from your arms down into your legs. Think to yourself: "My legs are becoming heavy and warm. Warmth is flowing through my feet . . . down into my toes. My legs and feet are heavy and warm."

Now scan your body for any points of tension, and if you find some, let them go limp, your muscles relaxed. Notice how heavy, warm, and limp your body has become. Think to yourself: "All my muscles are letting go. I'm getting more and more relaxed."

Finally, take a deep breath, feeling the air fill your lungs and down into your abdomen. As you breathe out, think, "I am calm . . . I am calm. . . ." Do this for a few moments, feeling the peacefulness throughout your body.

Then, as your practice session ends, count to three, taking a deep breath and exhaling with each number. Open your eyes and get up slowly. Stretch before going back to everyday activities.

The case of hypertension (the medical term for high blood pressure) is a good example. For some people with hypertension, stress is the main cause and the relaxation response may solve the problem entirely. For others, stress is not a factor at all and medication may be the best approach to the problem. Hypertension has many possible causes, and the relaxation response should only be expected to help in cases when stress is at least a significant component.

We and others have accumulated considerable evidence that the relaxation response can indeed lower blood pressure in many people with hypertension. But the issue has become confusing, because some researchers have failed to find that relaxation has this effect. In one large-scale study published in 1992 in the *Journal of the American Medical Association*, patients who practiced "stress management" techniques failed to achieve lower blood pressures than those who did not practice the techniques. The study was quoted in the media as evidence that relaxation is not effective in treating hypertension.

Although it will take further work to sort out the results of that study, I believe they do not contradict or undermine previous findings. As we subsequently published in the same journal, this 1992 study made no effort to determine whether stress was affecting the subjects' blood pressure in the first place. In fact, subjects in this study did not have true hypertension at all, but blood pressure in the high-normal range. The researchers also did not record the precise type of stress management techniques these people chose to use, nor did they keep track of how regularly the subjects practiced those techniques.

On average, our studies and others show that the relaxation response can lower blood pressure by about 5 to 10 millimeters of mercury in people with hypertension. The relative effect of the relaxation response will vary, depending on the degree to which an individual's high blood pressure is caused by stress. For example, an individual may have severely elevated blood pressure that requires treatment with antihypertensive medications. If stress is one of the contributing factors, the regular practice of the relaxation response would lower blood pressure to the extent that stress is elevating it. Although medications would still be required, the amount of medication necessary would be reduced and the likelihood of undesirable side effects from the medications would be lessened. At the present time, the only way I know to test the effectiveness of the relaxation response is to start practicing it and track the results.

PROGRESSIVE MUSCLE RELAXATION: BASIC INSTRUCTIONS

In progressive muscle relaxation, you methodically sweep through your body, tensing and then relaxing each major muscle group. This attunes you to the difference in feeling when your muscles are tensed or relaxed and is another way to elicit the relaxation response.

This technique can be done in any large chair that supports your head and neck, but is best done lying on your back on a firm but soft surface, such as a thick carpet or workout mat. (A bed is too soft—you're more likely to glide off to sleep.) Lie on your back with your arms along your sides. Loosen any clothing that's uncomfortably tight, and take off your shoes.

You can have someone read you the instructions, or make a tape for yourself. These should be read at a slow, easygoing pace:

First, tense the muscles throughout your body, from head to toe. Tighten your feet and legs, tense your arms and hands, clench your jaw, and contract your stomach. Hold the tension while you sense the feelings of strain and tightness. Study the tension and notice the difference between how the muscle feels when it is tensed and when it is relaxed. Then take a deep breath, hold it, and exhale long and slowly as you relax all your muscles, letting go of the tension. Notice the sense of relief as you relax.

Now you're going to tense and relax individual groups of muscles, keeping the rest of your body as relaxed as you can. You'll hold the tension for a few seconds in each part of your body while you get a clear sense of what the tension feels like: then breathe deeply, hold the breath for a moment, and let go of the tension as you exhale.

Start by making your hands into tight fists. Feel the tension through your hands and arms. Relax and let go of the tension. Now press your arms down against the surface they're resting on. Feel the tension. Hold it . . . and let go. Let your arms and hands go limp.

Shrug your shoulders tight, up toward your head, feeling the tension through your neck and shoulders. Hold . . . then release, letting go. Drop your shoulders down, free of tension.

Now wrinkle your forehead, sensing the tightness. Hold . . . release, letting your forehead be smooth and relaxed. Shut your eyes as tight as you can. Hold . . . and let go. Now open your mouth as wide as you can. Hold it . . . and gently relax, letting your lips touch softly. Then clench your jaw, teeth tight together. Hold . . . and relax. Let the muscles of your face be soft and relaxed, at ease.

Take a few moments to sense the relaxation throughout your arms and shoulders, up through your face. Now take a deep breath, filling your lungs down through your abdomen. Hold your breath while you feel the tension through your chest. Then exhale and let your chest relax, your breath natural and easy. Suck in your stomach, holding the muscles tight . . . and relax. Arch your back . . . hold . . . and ease your back down gently, letting it relax. Feel the relaxation spreading through your whole upper body.

Now tense your hips and buttocks, pressing your legs and heels against the surface beneath you . . . hold . . . and relax. Curl your toes down, so they point away from your knees . . . hold . . . and let go of the tension, relaxing your legs and feet. Then bend your toes back up toward your knees . . . hold . . . and relax.

Now feel your whole body at rest, letting go of more tension with each breath . . . your face relaxed and soft . . . your arms and shoulders easy . . . stomach, chest, and back soft and relaxed . . . your legs and feet resting at ease . . . your whole body soft and relaxed.

Take time to enjoy this state of relaxation for several minutes, feeling the deep calm and peace. When you're ready to get up, move slowly, first sitting, and then gradually standing up.

Relaxation can be especially effective for people with "white-coat hypertension"—those whose blood pressure is high only when they are in the doctor's office or a similarly stressful setting. With national advertising campaigns characterizing high blood pressure as "a silent killer" and an "internal time bomb," the very act of having your blood pressure measured can stir self-fulfilling fears of being diagnosed with this potentially deadly condition.

itself. Recent studies suggest that 25 percent or more of patients diagnosed with high blood pressure actually have white-coat hypertension.

One patient of ours, a 55-year-old advertising executive, was told that he had slightly elevated blood pressure in a physical examination ten years ago. Worried about the potential for a stroke, he became quite anxious for days before every medical checkup—and then had very high blood pressure readings when he finally saw the doctor. Even when he took antihypertensive medication at higher and higher doses, there was little change in his physician's measurement of his blood pressure. Yet a monitor that tracked his blood pressure during normal daily activities showed his blood pressure was low the rest of the time. In fact, he often felt dizzy and weak during the day, suggesting that the medicine was lowering his blood pressure too much.

Suspecting that he might be suffering from white-coat hypertension, we taught this patient to use the relaxation response to control his anxiety in the physician's office. His feelings of fear gradually subsided, until he ultimately became comfortable in the doctor's office. From then on, his blood pressure was consistently normal. After roughly a year of practice, he was able to stop his medication completely, and he has not required blood pressure treatment for five years.

Although this patient's condition was a model of white-coat hypertension, the value of the relaxation response is not limited to such cases; it can be useful in the treatment of many kinds of hypertension. For example, the relaxation response can help people using other nondrug treatments for hypertension, such as dietary salt restriction, exercise, and weight loss. All of these approaches require behavioral changes that can be difficult and anxiety provoking, and using the relaxation response can make them less stressful and easier to follow.

OTHER MEDICAL APPLICATIONS

Over the past several years, many research groups have performed scientific studies to test the value of the relaxation response in the treatment of a wide range of medical conditions. At the New England Deaconess Hospital, we have taught the relaxation response to people with muscle tension pains (which can include some headaches), infertility, insomnia, psychological problems, cardiac arrhythmias, premenstrual syndrome, and several common symptoms related to cancer and AIDS. For these conditions, there is good evidence that the relaxation response can undo some or all of the damage

caused by stress and have a significant clinical impact. We are also using the relaxation response experimentally for people with psoriasis, asthma, and hyperactivity.

The following are some of the conditions we treat most frequently at the New England Deaconess Hospital—those for which there is the most evidence that the relaxation response can be helpful.

PAIN

Stress and anxiety decrease the threshold for pain, making people more sensitive to the initial pain sensations and making some kinds of pain seem especially intense. This can set up a vicious circle: When pain strikes, the sufferer begins to worry about how bad it will get, and that anxiety makes the perception of pain worse (see Chapter 6).

The relaxation response, which can break this pattern, has proven to be useful in the therapy of many kinds of pain. For example, it is extremely useful in alleviating stress-related muscle aches and headaches and can bring some people with these problems complete relief, sometimes within just a few weeks.

With more severe chronic pain, the relaxation response may not bring total relief, but it may allow people to tolerate the pain more easily. Studies by physician and pain specialist Margaret A. Caudill and her associates at the Mind/Body Medical Institute have shown that when the relaxation response is utilized with other behavioral therapies, patients decrease their physician visits by 36 percent on average, with those who had previously made the most doctor visits showing the greatest reduction.

INFERTILITY

Couples dealing with infertility often feel they have lost control over a central part of their lives and become depressed, anxious, and angry. Treatments for infertility are expensive and can cause emotional stress. And high levels of stress, in turn, can contribute to infertility by causing irregular ovulation, hormonal changes, fallopian tube dysfunction, and perhaps a decrease in sperm production.

The studies of psychologist Alice D. Domar and her colleagues at the Mind/Body Medical Institute have shown that a program based upon the relaxation response can significantly decrease the stress of the experience of infertility. Furthermore, she and her colleagues have found that couples undergoing this stress reduction program are more likely to become pregnant (see Chapter 12).

WHAT YOU CAN DO: RELAXATION AND BEYOND

INSOMNIA

About one in every six Americans has chronic insomnia. The problem can have both psychological and physiological components: Many people with insomnia have rapid brain wave patterns that are typical when a person is under stress. Recent studies at our institute by psychologist Gregg Jacobs and his colleagues have shown that insomnia patients ~~taught~~ the relaxation response, together with other behavioral techniques, ~~can~~ learn to fall asleep more easily. On average, these patients fell asleep four times more rapidly after treatment, and their brain wave patterns slowed as well. In both respects, these successfully treated patients resembled normal people who had never had insomnia.

The relaxation response may enable people with insomnia to give up sleeping pills—a transition that can be difficult, but that can also result in more restful sleep. One of our patients had been taking medication for sleep every night for more than three months, but she still required one to three hours to fall asleep and felt tired and irritable during the day. In preparing to try the relaxation response as an alternative, she first ~~gradually~~ stopped using all her sleeping pills; her insomnia worsened, and her sleep was quite poor for about two weeks. But within three weeks of being taught the relaxation response and other behavioral techniques, she was regularly able to fall asleep within 20 minutes. She also told us that she felt less irritable, more energetic, and much more “like her old self.”

ANXIETY, ANGER, HOSTILITY, AND DEPRESSION

Stress leads to psychological changes that can, in turn, affect the body. Anxiety can cause nausea, vomiting, diarrhea, and panic attacks, while hostility and anger have been shown to be risk factors for heart disease. Many studies have now shown that in people who regularly elicit the relaxation response, there is a decrease in anxiety, anger, and hostility, as well as depression.

SYMPTOMS FROM TREATMENT FOR CANCER AND AIDS

The relaxation response has proven a useful adjunct in the treatment of cancer and AIDS, especially as a means of quelling the symptoms many patients develop in anticipation of chemotherapy. Approximately one-third of cancer patients undergoing chemotherapy develop anticipatory nausea and vomiting, a conditioned response to the nausea-inducing drugs that may begin up to 24 hours before the drug is actually administered. The symptoms escalate with

repeated treatments, often becoming resistant to antinausea drugs and, in many cases, leading patients to refuse to continue chemotherapy.

Psychologist Ann Webster at the Mind/Body Medical Institute, like other investigators (see Chapter 5), has shown that anticipatory nausea and vomiting can be reduced significantly with behavioral techniques that incorporate the relaxation response. These include hypnosis; relaxation response training with guided imagery; biofeedback coupled with relaxation response training; and systematic desensitization, which uses the relaxation response to combat the anxiety patients have associated with chemotherapy.

One AIDS patient of ours had a long-standing asthma condition that worsened when he took a medication that was essential to his treatment. When he used an aerosol necessary to prevent pneumocystis pneumonia (an AIDS-related condition), he would have an asthma attack and suffer with asthma for many days, until he began to be afraid that he might die from the therapy.

This patient's intolerance to aerosols became even more critical when he stopped responding to his primary AIDS medication. In order to be eligible for an antiviral medication, he had to be able to take the aerosolized treatment as well. Through the use of an audiotape, he was trained to elicit the relaxation response. When he practiced the response immediately before receiving his aerosolized treatment, he found he could tolerate the medication without developing an asthma attack. Later, he was able to receive the antiviral treatment.

WHAT TO EXPECT FROM THE RELAXATION RESPONSE

If you want to try using the relaxation response to help treat a medical condition, first talk to your physician or other health-care provider. He or she should know what you plan to do because it may alter the amount of medication you require.

If you are wondering whether there might be any dangers in eliciting the relaxation response, the answer is that its side effects are essentially those of sitting quietly or praying twice a day. Although a very small minority of people find that practicing the relaxation response can be stress-inducing (see "When Relaxation Turns to Panic"), side effects for most people are essentially nonexistent.

As you elicit the relaxation response, you may notice that your rate of

WHEN RELAXATION TURNS TO PANIC

Occasionally, people who try relaxation methods for the first time find that they actually become *more* anxious. In our experience at the Mind/Body Medical Institute, this is extremely uncommon. In any case, it's usually easily corrected.

Some people feel fearful when they close their eyes. In this case, it is easy enough to practice the relaxation response with your eyes open, either gazing in a relaxed way at a picture or an object or getting up and practicing the walking or jogging technique described at the end of this chapter.

For others, focusing on breathing can make them overly conscious of the "effort" involved, causing a panicky feeling. Again, walking or jogging should provide a fine alternative.

breathing slows. You may even notice periods in which you feel as if you have stopped breathing for a short period of time. Furthermore, you may become aware of the fact that your heart rate has slowed. Your muscles will become relaxed, and you may become aware that a muscle ache or pain that you had at the beginning of the session is gone by the end. Other changes may include a slight welling of tears in your eyes or a sensation of warmth in your hands and feet. At the end of a period of sitting, most people report feeling peaceful and calm, yet also more alert and less fatigued than before.

Continued practice of the relaxation response can bring feelings of greater control over life. Instead of feeling like a "cork bobbing on the sea" (as one of our patients reported feeling before learning the relaxation response), regular practice leads to a sense that emotions—and the physiological reactions that go with them—can be brought under your control. One psychological benefit is a greater sense of self-assurance; the physical benefits are decreases in stress-related conditions and symptoms.

Do not expect these changes to occur immediately. Although a sense of peace and quiet occurs right after eliciting the relaxation response, long-term psychological and physiological changes may take several weeks or months.

Moreover, the changes do not appear all at once; on a day-to-day basis,

they are sometimes imperceptible. Indeed, like many people, you may first become aware of the improvement when another person comments on how you have changed. But as more time elapses—generally after a month or so of regular practice—if you look back at your initial feelings and symptoms and compare them with your current state, you will recognize the positive changes that have occurred.

FUTURE DIRECTIONS

As we have expanded our research into the relaxation response, we have found increasing evidence that the relaxation response can serve not only as a “solo” means of reducing stress, but also as an “amplifier” of sorts to maximize the effects of other mind/body approaches, such as visualization and imagery (see Chapter 17). We distinguish between the relaxation response “for its own sake” and the relaxation response as a means of enhancing other strategies by referring to these two approaches as Phase I and Phase II of the relaxation response.

Phase I includes the basic physiological changes that occur as a result of eliciting the relaxation response, including decreased activity of the sympathetic nervous system. In Phase II, which occurs *immediately after* eliciting the relaxation response, we have observed that the mind is more receptive to new information: The relaxation response quiets the mind and tones down the “static” of cascading thoughts.

In that quiet space of mind, the potency of other mind/body approaches appears to be enhanced. You probably have experienced some difficulty in focusing your attention when you are very anxious or distracted. So it makes sense that when your mind is quietest, you are better able to concentrate, solve problems, and, if presented with visual imagery, make the most of that imagery’s impact on the mind. Ongoing experimental work should tell us a lot about the therapeutic potential of this combined approach and its value as an adjunct to standard medical treatments.

We are also continuing to do research on other meditative traditions that suggest the potential of the relaxation response and related approaches may be even greater than we had realized. For example, we have been studying Tibetan Buddhist monks who are advanced practitioners of a form of meditation that has dramatic physiological effects. In an annual ritual, these monks shed almost all their clothes, wrap themselves in icy wet sheets on a near-

THE RELAXATION RESPONSE DURING EXERCISE

In 1978, we discovered that the relaxation response could also be elicited during exercise. We measured various physiological changes in volunteers as they pedaled on a stationary bicycle. Some were told simply to bicycle at a constant rate for 30 minutes, and, as expected, we found no changes in their metabolism during that time.

But some subjects, while riding their bicycles at exactly the same rate, were instructed to focus on a sound, a word, a phrase, or a prayer, and passively disregard other thoughts when they came to mind. Even though they worked just as hard as the other bicyclists, their metabolic rates—the speed at which they burned calories—decreased by 11 percent, a sign of the relaxation response.

More important for most people who do regular exercise is the psychological benefit of adding the relaxation response to a workout. Many joggers say that they experience a “high” after walking or running four to five miles (see Chapter 19). By using a relaxation response technique while you exercise, it is possible to experience this mild euphoria in the first or second mile.

The relaxation response can be elicited during walking or jogging by following these steps:

Step 1. Get into sufficiently good condition so that you can jog or walk without becoming excessively short of breath.

Step 2. Do your usual warm-up exercises before you jog or walk.

Step 3. As you exercise, keep your eyes fully open, but attend to your breathing. After you fall into a regular pattern of breathing, focus in particular on its in-and-out rhythm. As you breathe in, say to yourself, silently, “in”; when you exhale, say “out.” In effect, the words in and out become your mental devices or focus words, in the same way that you would use your personal focus words or phrases with other relaxation response methods.

If this in/out rhythm is uncomfortable for you (you might feel that your breathing is too fast or too slow), you may focus on something else. For example, you can become aware of your feet hitting the ground, silently repeating, “One, two, one, two” or “Left, right, left, right.”

There is, of course, nothing wrong with focusing on a faith-oriented word or phrase during exercise; in fact, it could make your exercise more satisfying. (One high-ranking U.S. Army chaplain, a Catholic, repeats the Jesus Prayer in rhythm to his footsteps as he runs each day.)

Step 4. Remember to maintain a passive attitude, simply disregarding disruptive thoughts. When they occur, think to yourself, "Oh, well," and return to your repetitive focus word or phrase.

Step 5. After you complete your exercise, return to your normal after-exercise routine.

Note: If you are over 40 or if you suffer from a physical ailment, ask your physician's advice before starting any exercise program.

freezing night, and proceed to enter a state of deep meditation in which they focus on specific mental images associated with generating heat. By doing this, they are able to raise their skin temperature to levels warm enough to dry the sheets—an observer can actually see the steam rising off them. Under these conditions of cold and wetness, physiological principles would predict that individuals would uncontrollably shiver and perhaps die.

In other monks, we have found that oxygen consumption and other metabolic functions decrease much lower than in people practicing conventional meditation. Whereas in conventional meditation oxygen consumption decreases 16 to 17 percent, these monks lower their oxygen consumption by up to 64 percent. The mechanisms responsible for these remarkable physiological alterations are not understood.

We are also doing further research to answer a key question: If the relaxation response is performed only once or twice a day for 10 to 20 minutes, how can its effects last long enough to influence a range of stress-related conditions? The late psychophysiological John Hoffman and his associates at Harvard Medical School demonstrated that in people who regularly elicit the relaxation response, the body is less responsive to the stress hormone noradrenaline, even during times of the day when they are not specifically practicing the response. This means that it takes more noradrenaline to bring

about an increase in heart rate and blood pressure in these people than it does in others.

Although the basis for this broad protective effect remains unclear, regular practice of the relaxation response does seem to block the ability of stress hormones to influence the brain and the body. In this respect, this function of the relaxation response resembles a class of drugs used to treat the symptoms of stress-related conditions: the alpha- and beta-blockers, which act by blocking the action of noradrenaline. The relaxation response may be a natural way of achieving the same kind of effect without the side effects of the drug.

Finally, we believe that the relaxation response can be used much more widely to help people, especially young people, to counter the stress in their lives. Many people seek relief from stress and anxiety through alcohol and drug abuse; others who cannot cope with the stress of modern life become violent or commit suicide. Because these problems often develop during adolescence, the Mind/Body Medical Institute is developing stress management curricula based on the relaxation response for use by high school students. It is our hope that these programs can help prevent violent or self-destructive behavior and give these young people coping skills that will serve them throughout their lives.

Modern medicine currently relies on two major therapeutic approaches: medications and procedures such as surgery. Until recently, little emphasis has been given to mind/body approaches, perhaps because of the traditional separation of mind and body that has characterized Western science since the time of Descartes. But as scientific evidence continues to establish the significance of mind/body interactions, a third major approach to medical treatment should evolve: one characterized by self-care through the mastery of mind/body interactions. The relaxation response should prove an important element of this very promising approach.

THE BOTTOM LINE

By practicing two basic steps—the repetition of a sound, word, phrase, prayer, or muscular activity; and a passive return to the repetition whenever distracting thoughts recur—you can trigger a series of physiological changes that offer protection against stress. These changes—which include lower heart rate, breathing rate, and, in some people, lower blood pressure—make up the natural relaxation response that is the opposite of the fight-or-flight

response to stress. While the relaxation response was discovered in studies of people practicing meditation, other forms of relaxation offer similar benefits.

The relaxation response has been proven beneficial in many stress-related conditions, often as a supplement to conventional medical treatment. In cases that are not stress related, it cannot be expected to treat illness effectively by itself. But it can be very useful in enhancing both mental and physical health, and it may find even broader applications in conjunction with visualization and imagery and other mind/body techniques.