

# The Cancer Project

# The Roles of Exercise

# and Stress Management

PHYSICIANS COMMITTEE FOR RESPONSIBLE MEDICINE

5100 WISCONSIN AVE., N.W., SUITE 404 • WASHINGTON, DC 20016  
PHONE (202) 686-2210 • FAX (202) 686-2216 • PCRM@PCRM.ORG • WWW.PCRM.ORG

**H**ealthy foods, physical activity, and reducing stress are increasingly recognized as vital ingredients of cancer prevention and survival. While genetics play a role in predisposing some people to cancer, other factors play a much greater role. In fact, much of what appears to “run in the family” results from shared exposure to environmental factors, such as cancer-promoting chemicals or dietary patterns.<sup>1</sup> Many factors, including diet, physical activity, viral and bacterial infections, radiation, and exposure to carcinogens all influence one’s risk of developing cancer.<sup>2</sup>

In the past two decades, a wealth of research has revealed that emotional factors and a lack of exercise can alter the body’s resistance to cancer. Changing exercise patterns and emotional states could therefore play a powerful role in preventing or surviving the disease—a role no less important than making appropriate dietary changes. This booklet will tell you how to protect your body through stress management and exercise.

## Immunity against Cancer

**C**ancer begins with a major change in a normal, living cell. The transformation from a normal cell to a cancer cell is triggered by damage to the DNA, for example, by radiation or a carcinogenic chemical. The cells generally undergo cellular division more rapidly than the cells from which they originate. When a cancer cell divides, it forms two new cancer cells. The process continues until a mass of cells is created, called a tumor. The dangerous nature of cancer stems from the abnormal cells’ ability to invade other tissues and travel through the blood and lymphatic vessels to other areas of the body, a process called metastasis.

Each of us is constantly exposed to carcinogens in our food, air, and water, resulting in the production of cancer cells within the body. Ordinarily, however, our immune system recognizes and destroys these cells before they have a chance to multiply. (The same thing happens to the vast majority of viruses and bacteria entering our bodies.) Given this fact, simply having abnormal cells develop is not the only

factor in determining the course of cancer. The primary threat of cancer may result instead from the body’s inability to eliminate the abnormal cells.

The immune system provides the body with a way to seek out and destroy cancer cells. Among the main anti-cancer components of this system are specialized white blood cells, known as T-lymphocytes or T-cells, which travel throughout the body to detect unusual cells. Some lymphocytes can produce various anti-cancer chemicals, such as tumor necrosis factor, interleukin, and interferon. These are the body’s equivalent of chemotherapy, except they don’t harm healthy cells as chemotherapy does.

The body’s most immediate and powerful protection against cancer, however, results from the action of natural killer cells (NK cells), a specialized form of lymphocyte. NK cells descend directly on a microscopic tumor and begin devouring and disintegrating the tissue. As a consequence, many tumors never make it beyond the early stages.

## Stress and Immunity

**S**tress affects us physically and psychologically. In the case of a perceived threat, the body undergoes a build-up of internal tension characterized by increased heart rate, blood pressure, and muscular tension, to prepare for swift and powerful action. In primitive times, these bodily changes probably helped us adapt to dangerous situations, such as sudden storms or attacks. In many cases, however, these aspects of the stress response are inappropriate in the context of modern society. You don’t need tight muscles and a rapid heart rate, for example, in trying to resolve a business dispute or a conflict at home.

Under stressful circumstances, the brain signals the adrenal glands to produce corticosteroids, hormones which weaken the immune response. Corticosteroids exert such a powerful immune-suppressive effect that synthetic steroids (e.g., cortisone) are widely used as drugs to suppress immunity in allergic conditions and the rejection of

transplanted organs. Cancerous processes are accelerated in the presence of large amounts of corticosteroids<sup>3,4</sup> as well as other stress-related hormones.<sup>5,6</sup>

Among the stress-related emotional factors now thought to play a role in reducing cancer resistance are depression, grief, repressed anger, hopelessness, helplessness, and a high degree of passivity or social conformity.<sup>7-12</sup> Certain cancers have also been associated with distressing life events. For example, the risk of developing breast cancer is significantly higher if the woman has experienced the loss of a spouse or close friend.<sup>13,14</sup> A recent review notes that, in fact, major stressful life events can contribute to cancer morbidity.<sup>15</sup>

Losing a loved one is among the most intense emotional losses ever faced in life. In a landmark study, R.W. Bathrop, M.D., and his colleagues at the University of New South Wales in Sydney, Australia, studied the effects of bereavement by following the lives of surviving spouses and charting changes in immune function during mourning.<sup>16</sup> A battery of immune and hormonal measures were taken in 26 subjects. At eight weeks, T-cell functions were significantly lower in the bereaved spouses than in age- and sex-matched controls. Other researchers later found a similar profile of depressed T-cell activity in men whose wives had died of breast cancer<sup>17</sup> and in women who had lost their jobs.<sup>18</sup>

Stressful experiences can strongly influence the risk of contracting a type of skin cancer called melanoma. Researchers at Yale University examined the effect of major life events on the clinical presentation of melanoma in 56 patients relative to a control group of 56 general surgical patients.<sup>19</sup> Among the melanoma patients, there had been significantly more divorces or marital separations, bankruptcies, and unemployment in the five years prior to diagnosis. There was also a higher occurrence of death of a spouse or family member.

Several studies have shown that NK cell activity is depressed in individuals under stress.<sup>20-23</sup> In light of these findings, Sandra Levy, Ph.D., and her coworkers at the Pittsburgh Cancer Institute contend that NK cell activity is an important predictor of prognosis in breast cancer<sup>24</sup> and have accounted for a significant portion of the NK cell suppression on the basis of stress factors.<sup>25</sup> In response to stress or pain, the brain may release large amounts of endorphins, the brain's own morphine-like chemicals, which block pain sensation. In turn, excess endorphin release decreases the tumor-fighting ability of NK cells.<sup>26</sup> When the effects of the endorphins are blocked, NK activity is restored. Morphine alone will also suppress NK cell activity.<sup>27</sup>

Findings from large, prospective community studies indicate that a lack of social support is associated with increased cancer incidence and mortality rates.<sup>28-32</sup> Knowing that there are others around to whom you can turn in tough times affords a sense of emotional stability, a context for dealing more effectively with feelings and the problems of life.

No scientific evidence has yet found that stress and emotions can directly cause cancer. The most plausible link is an indirect effect via the immune system. When immunity is weakened by stress, particularly in the presence of biological stressors such as a fatty diet or environmental pollution,

then cancer can thrive and grow.

## The Anti-Cancer Personality Is Hopeful and Expressive

Our responses to stress—or any life change—are very individualized. What appears threatening to one person may seem harmless to another. How a person copes may be partly a function of age and experience.<sup>33</sup> A recent study of melanoma patients found that those with the most “major life stress” in their backgrounds actually showed a greater will to confront and fight their cancer and less avoidance of the disease’s frightening aspects.<sup>34</sup> Those patients with less experience with major stresses tended to harbor a defeatist attitude and expected a poor prognosis.

When people feel that a major life upheaval is overwhelming or hopeless, their subsequent risk of cancer increases.<sup>35-39</sup> In one study, survival was affected, not by the amount of stress each woman had faced, but by the degree of hopelessness a woman felt in the face of stress.<sup>40</sup>

Theories connecting personality to cancer date back at least to second-century Greek physician Galen, who noted a higher incidence of cancer in “melancholy” women as opposed to “sanguine” women.<sup>41</sup> These observations may have merit even today. A 1988 study of 36 women with recurrent breast cancer found that positive attitudes were associated with longer periods of being free of symptoms.<sup>42</sup> In a well-designed study of 2,020 men, followed for a period of 17 years, those who scored highest on depression tests had twice the rate of deaths due to cancer.<sup>43</sup> The high cancer rate among the more depressed men in this study could not be explained on the basis of their drinking and smoking habits.

The main feature of the “risky” way to cope with cancer is denial or poor expression of one’s feelings. For example, in a 1979 study comparing long-term survivors of breast cancer with those who did not survive, scientists at Johns Hopkins University found that long-term survivors expressed much higher levels of anxiety, hostility, alienation, and other negative moods and were perceived as having negative attitudes toward their illness.<sup>44</sup> In other words, they shared their feelings openly rather than trying to hide their fears and pretend that nothing was bothering them.

Based on her psychological surveys of thousands of cancer patients, Lydia Temoshok of the University of California has identified a group of “nice” cancer patients who exhibit what she calls the Type C personality.<sup>45</sup> They are passive, unassertive, and eager to please, and refuse to let anger, fear, or other strong negative feelings leak out. Even in the face of life-threatening disease, Type C individuals will appear composed. Not only do they suppress strong feelings, they also tend to avoid any conflict which could bring about emotional upset.

Psychologists say Type C’s tend to stoically accept or passively respond to stressful situations. Suppression of emotions appears to be linked to higher risk of cancer, especially breast cancer and malignant melanoma.<sup>46-54</sup> The suppression process may result in the secretion of large amounts of those natural opiates, the endorphins, which suppress the activity of NK cells and thereby allow tumor

growth to proceed unchecked.<sup>55</sup> In a 30-year study, medical students characterized as “loners” who suppressed their emotions beneath a bland exterior were 16 times more likely to develop cancer than a group who gave vent to emotions and, at times, took active measures to relieve anger or frustration.<sup>56</sup> Type C’s may also have a worse prognosis when they are diagnosed with cancer. Unassertive, compliant women tend to have shorter survival times for metastatic breast cancer than women who can express anger and hostility.<sup>57</sup> On the other hand, women who show a “fighting spirit”—a combative attitude toward their disease—appear to have a longer cancer-free interval and overall longer survival compared to those who tend toward emotional passivity and helplessness.<sup>58</sup>

The Type C personality appears to be the result of repeated negative experiences with cold, rejecting parents.<sup>59,60</sup> Other Type C characteristics include: a tendency to try to adjust to unsatisfying relationships in order to feel secure,<sup>61</sup> helplessness, apathy, depression,<sup>62</sup> compulsive eating habits, frequent fatigue, a perfectionist approach to work,<sup>63</sup> and a tendency to consciously suppress emotions.<sup>64</sup> This last aspect, conscious suppression, may be a strategy of social interaction which results from having repeatedly experienced punishment or disparagement after expressing one’s feelings in a social context.

The observation of compulsive eating adds another dimension to the Type C theory. It may be that poor diets and nutritional imbalances have left them more susceptible to cancer.<sup>65</sup> It is not personality per se, but excessive smoking, drinking, and poor eating habits that account for earlier mortality among bachelors, according to a study at the University of California, San Francisco.<sup>66</sup> Researchers found that single men aged 55 to 64 had about twice the premature-death risk of married men the same age.

## Strengthening the Anti-Cancer Mind

Studies of various relaxation techniques suggest that the mind can enhance our immunity against cancer. In his book, *Psychological and Behavioral Treatments for Disorders Associated with the Immune System* (Institute for the Advancement of Health, 1986), Steven Locke, M.D., director of the Psychoimmunology Research Project at Harvard Medical School, describes more than 200 studies on the treatment of cancer by “mind/body” methods. Among the methods most often used by cancer patients are those which reduce anxiety, such as meditation relaxation techniques. A reduction in the anxiety, depression, and helplessness that often accompany the disease can make it easier to make decisions about treatment.

Sharing one’s fears and frustrations with a psychotherapist or members of a cancer support group can provide invaluable emotional stability and relief. Being around healthy and positive people is also important. Healthy children, with their playful, spontaneous nature, are particularly good companions in times of sickness.

Based on his extensive work with cancer patients, Bernie

Siegel, M.D., notes that cancer survivors who enjoy a high quality of life tend to express their anger and other negative emotions freely, thereby avoiding a build-up of such emotions. He encourages friends and family members of cancer patients to help create positive expectations in the healing process.<sup>67</sup>

## Meditation

Just as rest supports the immune system in times of stress, meditation may be one of the more effective ways of relaxing the body and strengthening its anti-cancer defenses.

During the 1970s and early 1980s, Australian physician Ainslie Meares published numerous case reports of cancer regressions after meditation and in the absence of conventional treatment.<sup>68-74</sup> Based on his treatment of 73 advanced cancer patients over more than 20 sessions of intensive meditation, Meares noted reduced anxiety, confusion, depression, discomfort, and pain in about half of his patients. In addition to mood improvements, the meditation was accompanied by a reduction in the patient’s levels of circulating corticosteroids,<sup>75</sup> stress hormones which depress immunity. At least 10 percent of the patients with advanced cancer had tumor regressions after the meditation.<sup>76</sup>

Meditation usually takes place in a sitting position with the eyes closed. A common technique, often described as directed concentration, is to impartially attend to all thoughts and feelings. The idea is not to suppress, analyze, or judge these aspects of the psyche—even those that seem negative or disturbing. One simply notices the thoughts and feelings, then gently lets them go by returning to a particular focus (the breath, a candle, an image, a word, or sound). The purpose of the focus is to “anchor” the mind when it becomes too busy or distracted by thoughts, feelings, and sensations. In focusing on the breath, for example, one simply observes each inhalation and exhalation without trying to control them in any way. The restless chatter of the mind tends to diminish as one learns to attend to the focus.

Practicing this type of meditation for 15 or 20 minutes at a time (usually twice a day) results in a kind of dynamic awareness in which the mind is alertly attentive, yet also tranquil. This “meditative mood” tends to carry over into daily experience, affording more clarity and flexibility in daily decisions and actions. The mind becomes better able to concentrate amid distractions and more inclined to relax spontaneously in high-pressure situations. In many cases, one begins to enjoy the simpler pleasures in life, and attitude improves dramatically.

Meditation can also be applied directly to activities such as walking, knitting, or cooking. In each case, the individual gives total attention to the activity and, with practice, the meditative mood becomes second nature. As Joan Borysenko, Ph.D., former director of Boston’s Mind/Body Clinic, writes in *Minding the Body, Mending the Mind*, “The final goal of meditation is to be constantly conscious of experience so that relaxation and peace of mind become the norm rather than the exception.”<sup>77</sup>

Whether or not meditation is capable of preventing or treating cancer remains to be proven. There seems little

doubt, however, that meditation can be a helpful adjunct to any cancer treatment program, mainly by helping the meditator feel more at peace and more in control of cancer's stressful aspects.

## Imagery and Relaxation Training

**R**elaxation training involves a variety of techniques designed to induce relaxation in the muscles, which then produces a sense of calm.

Imagery, a component of many stress management programs, refers to the creation and interpretation of mental images.

At the Simonton Cancer Center in Pacific Palisades, California, cancer patients use relaxation and mental imagery daily to motivate themselves to make positive changes in their lives and to recover their health. Much of this work is discussed in the Simontons' bestselling 1978 book *Getting Well Again*. After an initial period of relaxation, the cancer patient is instructed to visualize the tumor as a soft, weak, disorganized mass of cells. Conventional treatment, either chemotherapy or radiation, is then visualized as strongly effective, capable of shrinking the tumors and destroying stray cancer cells. The patient is urged to visualize defending herself or himself against cancer through an aggressive immune system in which white blood cells act as a powerful army easily overwhelming the pesky malignant cells. Dead and dying tumor cells are visualized as being flushed out of the body until all cancer cells are gone. Finally, the patient is instructed to imagine herself or himself as healthy, vital, and fulfilled.<sup>78</sup>

Although reports of relatively high cancer survival rates at the Simonton Center are still debated, it is worth noting that many of the patients following this program report reductions in fear, tension, and anxiety, as well as a renewed sense of confidence and optimism.<sup>79</sup> In theory, such effects could promote enhanced immune system functioning.

Along these lines, one provocative study involved a group of elderly subjects trained in a technique of systematic relaxation and guided imagery.<sup>80</sup> By the end of one month, the group showed a significant increase in NK cell activity compared to a control group and a group that merely had "social contact" visits from a college student. The relaxation group also showed significant decreases in tension and anxiety. Whether or not this boost in the body's anti-cancer defenses affords any real protection against cancer remains to be seen.

Other studies suggest that relaxation training can improve one's ability to cope with the unpleasant effects of cancer and may also augment the body's ability to fight the disease.<sup>81-85</sup> For children with cancer, hypnosis (which can include variations of guided imagery) may be more effective in reducing the severity of chemotherapy's side-effects than relaxation training.<sup>86</sup> Owing to their active imaginations, children receiving painful treatment for cancer experience significantly less fear and anxiety with the use of guided imagery.<sup>87</sup> Whether or not survival rates actually increase, these reports indicate that the quality of life of cancer patients definitely improves with the regular use of imagery and

relaxation techniques.

## Exercise against Cancer

**T**he evidence that exercise may play an effective role against cancer is accumulating fast. Regular exercise has been associated with a decrease in the risk of colorectal, breast, and lung cancers.<sup>88</sup> In a large-scale study of 17,148 Harvard alumni, men who burned as few as 500 calories a week in exercise—the equivalent of about an hour's worth of brisk walking or less than 10 minutes of walking a day—had death rates 15 to 20 percent lower than men who were almost completely sedentary.<sup>89</sup> Men who burned 2,000 calories a week (about four hours of brisk walking per week) had about 35 percent lower cancer mortality. The researchers concluded that the more exercise you get (up to a point), the lower your risk of premature death from cancer or heart disease. The Harvard study found that the risk of colon cancer, the second leading cause of cancer-related death in the U.S., was dramatically reduced by exercise.<sup>90,91</sup>

Prostate cancer is the most common cancer affecting men today. In the Harvard study, alumni who expended greater than 4,000 calories per week (equivalent to about eight hours of brisk walking) were at a reduced risk of developing prostate cancer compared to their inactive counterparts.

For women, a history of moderate, recreational exercise is associated with a reduced risk of breast, uterine, cervical, and ovarian cancers,<sup>92</sup> although not all studies have shown this effect.<sup>93</sup> Findings from a 1993 study suggest that women engaged in moderate or high levels of physical activity may have a reduced risk of endometrial cancer; women engaged in the lowest level of physical activity had four times greater risk of cancer.<sup>94</sup>

There are many mechanisms by which exercise and physical activity contribute to decreased cancer risk. It has been postulated that individuals who regularly engage in physical activity also practice healthful eating habits including eating less meat and other fatty foods, abstaining from tobacco use, and moderating alcohol consumption,<sup>95,96</sup> in addition to helping control energy balance through caloric intake and expenditure.<sup>97</sup> In addition, exercise and physical activity have a number of positive physiological effects on the body.

Two explanations for the reduction in cancer among those who exercise are: (1) an increase in gastrointestinal transit speed, which results in lower amounts of carcinogens in food being absorbed or exposed to the intestinal wall; and (2) a decrease in the level of circulating estrogen levels, which in turn reduces the risk of certain cancers, particularly breast cancer and cancers of the female reproductive system.<sup>98</sup>

Exercise may also have a direct effect on the immune system. David Nieman and coworkers at Loma Linda University in California found that brisk walking (45 minutes, five times a week, for 15 weeks) boosts the body's resistance to disease by boosting NK cell activity. This was reflected in the fact that, compared to a non-walking, sedentary group, people in the walking group contracted the same number of colds and flus, but the number of days they suffered cold and

flu symptoms was cut in half.

A recent review by the author also noted that bouts of exercise performed at a moderate intensity and duration could enhance the immune system and result in a decrease in risk of upper respiratory infections.<sup>99</sup> While moderate exercise appears to positively impact the immune system, more vigorous or exhausting exercise can actually impair it.<sup>100</sup>

However, Nieman's research team also reported that trained marathon runners experienced a decline in NK cell activity for 21 hours after they completed a 3-hour run. The regimen of high-intensity, long-duration exercise increased the body's production of adrenaline and cortisol, stress-related hormones which tend to depress the immune system. Similarly, Nieman noted that heavy exercise of increased intensity or duration could impair one's immune function and increase risk of infection, notably that of the upper respiratory system.<sup>99</sup> With exercise, then, more is not always better. Studies of "all cause mortality" indicate that moderate aerobic exercise offers health benefits superior to high-intensity workouts.

A few words of caution should be added here. First, exercising every day will not necessarily cancel out the health-negating effects of emotional stress or a poor diet. All aspects of lifestyle should be considered as integral to the total picture of health. Second, fatigue is quite common among cancer patients (especially among those receiving chemotherapy and radiation treatments) and may become exacerbated as a result of exercise.<sup>100</sup> Any decision to include exercise in the course of cancer therapy should take this into consideration. It is strongly advised that you check with your physician before beginning any exercise program, particularly if you are over 40 years of age, are overweight, or have any preexisting medical condition.

## A Moderate Exercise Program

**W**alking is probably the best moderate form of exercise for maintaining health and fitness. The faster your walking pace, the better. Do not, however, attempt to jump into a high-intensity walking program if you have not been exercising on a regular basis. Let your pace increase gradually.

Find an area where you can walk at a steady pace in calm surroundings, such as a park, a beach, or a quiet road.

Use a comfortable pair of sneakers or walking shoes. For maximum ease of movement, the walking shoe should be light, preferably weighing less than 11 ounces. A good walking shoe should have a low heel height of no more than ½ to ¾ of an inch and a sole thick enough to cushion the foot on gravel roads, yet with plenty of flexibility in the forefoot. Running shoes should be avoided as they are designed to absorb the shock of running (and supposedly reduce injuries), and are therefore usually too rigid. They also have excessively high heels which interfere with the natural motion of the foot.

If this is the first time you are walking on a regular basis, just go for a walk at a comfortable pace slightly above a stroll. Set a goal of 20 to 30 minutes of walking at this comfortable pace each day. (Note: If you are over 45 and this is your first strong

step toward fitness, check with a physician first.)

How fast you progress is entirely up to you. Don't overdo it, though, because putting too much effort into the activity might decrease the enjoyment you would ordinarily derive from it.

## Use Your Body

**P**hysical activity is great for your heart, your waistline, and your sense of well-being. Unfortunately, many people associate exercise with misery: jogging down a smoggy roadway at 6:00 a.m. or peddling on a stationary bike for as long as boredom will allow. Let's face it. These forms of exercise are not natural. Jogging is the physical equivalent of an instant diet shake—an unnatural compensation for an unhealthy lifestyle. People jog because they have forgotten more enjoyable ways of getting their bodies moving. Of course, some people do enjoy jogging, running, weight-lifting, or structured aerobics. If that includes you, then there is nothing wrong with those exercises, so long as you stay within the limits of safety. But the recommendation for most people is different.

Our bodies are designed for physical activity: walking, dancing, biking, participating in games, and playing with children. These activities can get your heart moving and can burn a lot of calories. But we do them for fun, not to burn calories. Honeymooning couples do not, in the midst of afterglow, check their pulses and calculate calorie expenditure. The key is to remember what it was like to move your body—to enjoy a walk in the woods, a game of volleyball or touch football, a night on the dance floor.

For starters, try something very simple. Just walk a half-hour per day or one hour three times per week. This is easy and gives you plenty of exercise. And, by all means, smell the roses along the way. Pick a place to walk that is enjoyable for you, with interesting sights, sounds, and smells.

If you prefer, pick any other activity. To give you an idea of how quickly your body can part with calories, here are some activities people enjoy and the number of calories they burn per hour for a 150-pound adult:

Activity	Calories Burned per Hour
Bicycling	400
Canoeing	180
Cooking	180
Dancing, ballroom	240
Gardening	480
Golf	345
Jumping rope	570
Ping-Pong	285
Playing piano	165
Racquetball	615
Swimming	525
Tennis—doubles	270
Tennis—singles	435
Volleyball	330
Walking, brisk	360

Fun is the key. And bring a friend along.

A word of caution: Do not push yourself too hard. If you are over 40 or have any history of illness, medication use, or joint problems, talk over your plans with your doctor before you begin.

## Managing Stress

**R**educing stress helps cut your risk of heart problems, strengthens your immune system, and reduces anxiety. If you are relaxed, you are more likely to stick to a healthful lifestyle and less likely to depend on sedatives of daily martinis that many people use to deal with stress.

First, get plenty of sleep. You know the amount of sleep you need to feel well. And if you can spare the time, a short nap before dinner is a great stress reducer. At work, take a break every now and then to move around, take a deep breath, stretch, and have a big yawn.

Here are three simple exercises that melt away stress. These techniques work by turning off external stimuli and relaxing your muscles. When your body is relaxed, your mind tends to let go of tension, too. Twice a day, try any one of these for several minutes. They also help if you are having trouble falling asleep.

For each exercise, sit in a comfortable chair or lie on your back in a quiet room. Unplug the phone and use a “Do Not Disturb” sign. If you should happen to doze off, don’t worry. That is a sign that your body wants more rest.

## Relaxation Breathing

**F**or about 30 seconds, simply relax with your eyes closed, thinking about nothing at all. Then start to pay attention to your breathing. Let your breathing slow down naturally, like a person sleeping. Feel the cool air come in through your nose with each inhalation, and feel your breath leave as you exhale. Imagine that tension is leaving your body with each exhalation.

Now imagine that, as you breathe in, the air comes into your nostrils and caresses your face like a gentle breeze. As you breathe out, the exhalation carries away the tension from your face. As you breathe slowly in and out, tension gradually leaves your body and you become more and more relaxed.

Now imagine that, as you breathe in, the gentle air enters your nose and spreads relaxation up over the top of your head. As you exhale, imagine the tension leaving this area and passing out of your body. Then imagine the next breath carrying relaxation over your face, your scalp, and both sides of your head. As you exhale, let the tension flow out easily.

If other thoughts come to mind, simply return to paying attention to your breathing. Your breathing is slow and easy, with no effort at all. Let your body relax.

Now let your breath carry relaxation to your neck. As you exhale, tension passes out of your neck and out of your body with the exhaled air. Then feel a breath carry relaxation to your shoulders. As you exhale, tension leaves your

shoulders and passes out of your body.

Now, one breath at a time, focus your attention on each part of your body from the top down: your upper arms, forearms, hands, chest, stomach, hips, thighs, knees, calves, ankles, and feet. Imagine each breath of air carrying relaxation into each part of your body. As you breathe out, tension passes out through your nostrils.

This relaxing exercise will take several minutes, and you can do it at whatever pace is comfortable for you. When you have finished, allow yourself to sit quietly for two minutes or more.

## Muscle Relaxation Sequence

**A**s in the previous exercise, focus on one body part at a time from the head down. This time, tighten and release the muscles in each body part, one at a time. This allows the muscles to achieve a deep state of relaxation.

Start by sitting quietly for about 30 seconds. Allow your breathing to slow down naturally. Now gently raise your eyebrows for a second, and then relax. You may briefly feel tension in the front and back of your head, followed by relaxation. Breathe slowly in and out. Now gently tighten the muscles of your face into a slight grimace for about one second, then let them totally relax. Take a normal breath in and out, and feel your face relaxing. Then gently clench your jaw and release it. This tightens and then relaxes the muscles of the cheeks and above the ears.

Tighten the muscles of your neck and release them. After a moment, raise your shoulders and drop them. Let each body part relax in sequence. Take your time, and allow your body to completely relax after each tightening. Tighten and release the muscles of your upper arm and then your forearm. Ball your hand into a fist for a moment and then release it. Feel the tension leave each body part. Continue slow and relaxed breathing.

Then briefly tighten and release, in succession, the muscles of your chest, your abdomen, your thighs, calves, and feet. When you are finished, notice whether tension remains in any part of your body. If it does, imagine that body part gradually releasing tension as you breathe slowly in and out.

Enjoy the feeling of relaxation for a few minutes before getting up.

## Listening to Breathing

**T**his exercise can be used anywhere, whether you are on a stage waiting to give a speech or tossing and turning in a hotel bed unable to wind down from the stresses of the day. It uses imaginary sounds with no meaning to focus your attention away from the events of the day.

Sit quietly or lie on your back. Listen to your breathing, and let your breathing slow down. Imagine that as you breathe in, the inhalation makes a sound like the word *so*. As you exhale, imagine that your breathing sounds like the word *hum*. You need not make these sounds; just imagine them as you inhale and exhale.

Let your breathing slow down a little more, and slowly imagine the word *so* with each inhalation. Slowly and silently say *hum* to yourself as you slowly exhale. Repeat this for several minutes. If you find your mind drifting to something else, gently come back to listening to your breathing. You can also use this technique for just a few seconds, if you like, as a quick stress reducer.

## References

- Mulvihill JJ. Clinical ecogenetics: cancer in families. *N Engl J Med* 1985;312(24):1569.
- Cummings JH, Bingham SA. Diet and the prevention of cancer. *BMJ* 1998;317:1636-40.
- Schleifer SJ, Keller SE, Stein M. Central nervous system mechanisms and immunity: implications for tumor response. In: Levy SM. Behavior and Cancer. San Francisco, CA: Jossey-Bass, 1985.
- Borysenko M, Borysenko J. Stress, behavior and immunity. *Gen Hosp Psychiatry* 1985;4:59-67.
- Pettingale KW. Towards a psychobiological model of cancer: biological considerations. *Soc Sci Med* 1985;20:179-87.
- Lippman ME. Psychosocial factors and the hormonal regulation of tumor growth. In: Levy SM. Behavior and Cancer. San Francisco, CA: Jossey-Bass, 1985.
- Fox BH. Premorbid psychological factors as related to cancer incidence. *J Beh Med* 1978;1:45-133.
- Fox BH. Epidemiologic aspects of stress, aging, cancer, and the immune system. *Ann NY Acad Sci* 1988;521:16.
- Fox BH. Psychosocial factors and the immune system in human cancer. In: Ader R. Psychoneuroimmunology. New York, NY: Academic Press, 1981.
- Borysenko JZ. Behavioral-physiological factors in the development and management of cancer. *Gen Hosp Psychiatry* 1982;4:69-74.
- Ader R. Psychoneuroimmunology. New York, NY: Academic Press, 1981. Cited in: Grossarth-Maticek R. Interpersonal repression as a predictor of cancer. *Soc Sci Med* 1982;16:493-8.
- Goodkin K, Antoni MH, Blaney PH. Stress and hopelessness in the promotion of cervical intraepithelial neoplasia in invasive squamous cell carcinoma of the cervix. *J Psychosomatic Res* 1986;30(1):67-76.
- Forsen A. Psychosocial stress as a risk for breast cancer. *Psychotherapy and Psychosomatics* 1991;55:176-85.
- Cooper CL, Cooper R, Faragher EB. Incidence and perception of psychosocial stress: the relationship with breast cancer. *Psychological Med* 1989;19:415-22.
- Spiegel D, Sephton SE, Terr AI, Stites DP. Effects of psychosocial treatment in prolonging cancer survival may be mediated by neuroimmune pathways. *Ann NY Acad Sci* 1998;840:674-83.
- Bartrop RW, Luckhurst F, Lazarus L, et al. Depressed lymphocyte function after bereavement. *Lancet* 1977;1:884.
- Schleifer SJ, Keller SF, Camerinop M, et al. Suppression of lymphocyte stimulation following bereavement. *JAMA* 1983;250:374.
- Arnetz BB, Wasserman J, Petrini B, et al. Immune function in unemployed women. *Psychosomatic Med* 1987;49:3.
- Havlik RJ, Vukasin AP, Ariyan S. The impact of stress on the clinical presentation of melanoma. *Plast Reconstr Surg* 1992;90:57-61.
- Shavit Y, Lewis J, Terman G, et al. Opioid peptides mediate the suppressive effect of stress in natural killer cell cytotoxicity. *Science* 1984;223:188-90.
- Levy S, Herberman R, Lippman M, d'Angelo T. Correlation of stress factors with sustained depression of natural killer cell activity and predicted prognosis in patients with breast cancer. *J Clin Onc* 1987;5:348-53.
- Calabrese JR, Kling MA, Gold PW. Alterations in immunocompetence during stress, bereavement, and depression: focus on neuroendocrine regulation. *Am J Psychiatry* 1987;144:1123-34.
- Irwin M, Daniels M, Bloom ET, et al. Life events, depressive symptoms and immune function. *Am J Psychiatry* 1987;144:437.
- Levy S, Herberman R, Lippman M, d'Angelo T. 1987. Op cit.
- Levy SM, Herberman RB, Whiteside T, et al. Perceived social support and tumor estrogen/progesterone receptor status as predictors of natural killer cell activity in breast cancer patients. *Psychosomatic Med* 1990;52:73.
- Ornstein R, Sobel D. The healing brain. *Psychology Today* 1987;21(3):48-52. Also see: Ornstein R, Sobel D. The Healing Brain. New York, NY: Simon & Schuster, 1987, pp. 78-9.
- Ornstein R, Sobel D. 1987. Ibid.
- Berkman L, Syme L. Social network, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *Am J Epidem* 1979;2:186-204.
- Welin L, Svardsudd K, Ander-Peciva S, et al. Prospective study of social influences on mortality: the study of men born in 1913 and 1923. *Lancet* 1985;34:915-8.
- House J, Robbins C, Metzner H. The association of social relationships and activities with mortality: prospective evidence from the Tecumseh community health study. *Am J Epidem* 1982;116:123-40.
- Blazer D. Social support and mortality in an elderly community population. *Am J Epidem* 1982;115:684-94.
- Cassel J. The contribution of the social environment to host resistance. *Am J Epidem* 1976;104:107-23.
- Funch DP, Marshall J. The role of stress, social support and age in survival from breast cancer. *J Psychosomatic Res* 1983;27(1):77-83.
- Gibertini M, Reintgen D, Baile WF. Psychosocial aspects of melanoma. *Ann Plastic Surg* 1992;28:17-21.
- Goodkin K, Antoni MH, Blaney PH. Stress and hopelessness in the promotion of cervical intraepithelial neoplasia in invasive squamous cell carcinoma of the cervix. *J Psychosomatic Res* 1986;30:67-76.
- Schmale AH, Iker H. The effect of hopelessness in the development of cancer. I. Identification of uterine cervical cancer in women with atypical cytology. *Psychosomatic Med* 1966;28:714-21.
- Cooper CL, Cooper R, Faragher EB. 1989. Op cit.
- Jensen MR. Psychobiological factors predicting the course of breast cancer. *J Personality* 1987;55:317-42.
- Ramirez AJ, Craig TKI, Watson JP, et al. Stress and relapse of breast cancer. *Br Med J* 1989;298:291-3.
- Schmale AH, Iker H. 1966. Op cit.
- Mettler CC, Mettler FA. History of Medicine. Philadelphia, PA: Blakiston, 1947.
- Levy SM, Lee J, Bagley C, et al. Survival hazards analysis in first recurrent breast cancer patients: seven-year follow-up. *Psychosomatic Med* 1988;50:520-8.
- Shekelle RB, Raynor WJ, Ostefoeld AM, et al. Psychological depression and 17-year risk of death from cancer. *Psychosomatic Med* 1981;43:117-25.
- Derogatis L, Abeloff M, Melsaratos N. Psychological coping mechanisms and survival time in metastatic breast cancer. *JAMA* 1979;242:1504-8.
- Temoshok L. Personality, coping style, emotion and cancer: towards an integrative model. *Cancer Surveys* 1987;6:545-67.
- Dattore P, Shontz F, Coyne L. Premorbid personality differentiation of cancer and non-cancer groups. *J Counseling Clinical Psychology* 1980;48:388-94.
- Schonfield J. Psychological and life-experience differences between Israeli women with benign and cancerous breast lesions. *J Psychosomatic Res* 1975;19:229.
- Cooper CL. The social-psychological precursors to cancer. *J Human Stress* 1984;10:4-11.
- Derogatis L, Abeloff M, Melsaratos N. Op cit. 1979
- Visintainer MA, Casey R. Adjustment and outcome in melanoma patients. Presented at meeting of the American Psychological Association, Toronto, 1984. Cited by Levy S, Herberman R, Lippman M, d'Angelo T. 1987. Op cit.
- Jensen M. Psychobiological factors in the prognosis and treatment of neoplastic disorders. Doctoral dissertation, Department of

- Psychology, Yale University, 1984.
52. Rogentine G, Van Kammen D, Fox B, et al. Psychological factors in the prognosis of malignant melanoma: a prospective study. *Psychosomatic Med* 1979;41:647-55.
  53. Greer S, Morris T, Pettingale K. Psychological response to breast cancer: effects on outcome. *Lancet* 1979;2:785-7.
  54. Pettingale K, Morris T, Greer S, et al. Mental attitudes to cancer: an additional prognosis factor. *Lancet* 1985;1:750.
  55. Ornstein R, Sobel D. 1987. Op cit.
  56. Schafer JW, Graves PL, Swank RT, Pearson TA. Clustering of personality traits in youth and the subsequent development of cancer among physicians. *J Beh Med* 1987;10:441-7. Cited in: Bower B. The character of cancer. *Science News* 1987;131:120-1.
  57. Abeloff MD, Derogatis LR. Psychologic aspects of the management of primary and metastatic breast cancer. *Prog Clin Biol Res* 1977;12:505-16.
  58. Greer S, Morris T, Pettingale K. 1979. Op cit.
  59. Grossarth-Maticek R, Siegrist J, Vetter H. 1982. Op cit.
  60. Thomas CB, Duszynski KR, Shaffer JW. Family attitudes reported in youth as potential predictors of cancer. *Psychosomatic Med* 1979;41:287-482.
  61. Grossarth-Maticek R, Siegrist J, Vetter H. 1982. Op cit.
  62. Grossarth-Maticek R, Siegrist J, Vetter H. 1982. Ibid.
  63. Thomas CB, McCabe OL. Precursors of premature disease and death: habits of nervous tension. *Johns Hopkins Med J* 1980;47:137-45.
  64. Greer S, Morris T. Psychological attributes of women who develop breast cancer: a controlled study. *J Psychosomatic Res* 1975;19:147-53.
  65. Bower B. The character of cancer. *Science News* 1987;131:120-1.
  66. Biomedicine Report. New twist to marriage and mortality. *Science News* 1990;138:267.
  67. Siegel B. *Peace, Love, & Healing*. New York, NY: Harper & Row, 1989, p. 12.
  68. LeShan L. *Cancer as a Turning Point*. New York, NY: E.P. Dutton, 1989.
  69. Meares A. Regression of cancer of the rectum after intensive meditation. *Med J Australia* 1979;2:539-40.
  70. Meares A. Remission of massive metastasis from undifferentiated carcinoma of the lung associated with intensive meditation. *J Am Soc Psychosomatic Dent Med* 1980;27:40-1.
  71. Meares A. Regression of recurrence of carcinoma of the breast at mastectomy site associated with intensive meditation. *Australian Fam Phys* 1981;10:218-9.
  72. Meares A. Meditation: a psychological approach to cancer treatment. *Practitioner* 1979;222:119.
  73. Meares A. Regression of osteogenic sarcoma metastases associated with intensive meditation. *Med J Australia* 1978;2:433.
  74. Meares A. A form of intensive meditation associated with the regression of cancer. *Am J Clin Hypnosis* 1982;25:114-21.
  75. Meares A. Stress, meditation and the regression of cancer. *Practitioner* 1982;226:1607-9.
  76. Meares A. What can the cancer patient expect from intensive meditation? *Australian Fam Phys* 1980;9:322-5.
  77. Borysenko J. *Minding the Body, Mending the Mind*. Reading, MA: Addison-Wesley Publishing Co., Inc., 1988, p. 47.
  78. Matthews-Simonton S, Simonton OC, Creighton JL. *Getting Well Again*. New York, NY: Bantam, 1978.
  79. Matthews-Simonton S, Simonton, OC, Creighton JL. 1978. Ibid.
  80. Kiecolt-Glaser J, Glaser R, Williger D, et al. Psychosocial enhancement of immunocompetence in a geriatric population. *Health Psychology* 1985;4:99-113.
  81. Burish TG, Jenkins RA. Effectiveness of biofeedback and relaxation training in reducing the side effects of cancer chemotherapy. *Health Psychology* 1992;11:17-23.
  82. Scarf M. Images that heal. *Psychology Today* 1980;9:33-6.
  83. Newton-Bernauer W. The use of hypnosis in the treatment of cancer patients. *Am J Clin Hypnosis* 1982;25:104-13.
  84. Shapiro A. Psychotherapy as adjunct treatment for cancer patients. *Am J Clin Hypnosis* 1982;25:150-5.
  85. Gerl PB. Hypnotherapy in the psychologic treatment of cancer. *Hypnotherapie Kognition* 1984;1:56-68.
  86. Zeltzer LK, Dolgin MJ, LeBaron S, LeBaron C. A randomized, controlled study of behavioral intervention for chemotherapy distress in children with cancer. *Pediatrics* 1991;88:34-42.
  87. Broome ME, Lillis PP, McGahee TW, Bates T. The use of distraction and imagery with children during painful procedures. *Onc Nurs Forum* 1992;19:499-502.
  88. Blair SN, Kohl HW, Paffenbarger RS, et al. Physical fitness and all-cause mortality. *JAMA* 1989;262:2395.
  89. Lee IM, Paffenbarger RS, Hsieh C. Physical activity and risk of developing colorectal cancer among college alumni. *J Natl Canc Inst* 1991;83:1324-9.
  90. Shephard RJ. Exercise in the prevention and treatment of cancer: an update. *Sports Med* 1993;15:258-80.
  91. Shephard RJ. 1993. Ibid.
  92. Sternfeld B. Cancer and the protective effect of physical activity: the epidemiological evidence. *Med Sci Sports Exercise* 1992;24:1195-209.
  93. Levi R, La Vecchia C, Negri E, Franceschi S. Selected physical activities and the risk of endometrial cancer. *Br J Cancer* 1993;67:846-51.
  94. McTiernan A, Ulrich C, Slate S, Potter J. Physical activity and cancer etiology: associations and mechanisms. *Cancer Causes Control* 1998;9(5):487-509.
  95. Gerber M, Corpet D. Energy balance and cancers. *Eur J Cancer Prev* 1999;26(5):293-315.
  96. Shephard RJ, Shek PN. Associations between physical activity and susceptibility to cancer: possible mechanisms. *Sports Med* 1998;26(5):293-315.
  97. Shephard RJ. 1993. Op cit.
  98. Nieman DC. Exercise and immunology: practical applications. *Int J Sports Med* 1997;18(suppl)1:S91-100.
  99. Shephard RJ, Shek PN. Potential impact of physical activity and sport on the immune system—a brief review. *Br J Sports Med* 1994;28(4):247-55.
  100. St. Pierre BA, Kasper CE, Lindsey AM. Fatigue mechanisms in patients with cancer: effects of tumor necrosis factor and exercise on skeletal muscle. *Onc Nurs Forum* 1992;19:419-25.
- \*The section “Use Your Body” was reprinted from Barnard N. *Food for Life*. New York, NY: Harmony, 1993.**