

Classic Paper

BIOFEEDBACK METHODOLOGY IN PSYCHOPHYSIOLOGIC SELF-REGULATION

Alyce M. Green

ABSTRACT

The principles of successful training in biofeedback-aided psychophysiological self-regulation training are laid out and illustrated with two medical cases, one of cancer and the other of hypertension. *Properly taught, biofeedback training is visualization training*, in contradistinction to operant conditioning or traditional therapies, and its beneficial effects include self-mastery, better self-image, and resolution not only of body problems, but mental and emotional difficulties as well.

KEYWORDS: Biofeedback, self regulation, visualization, self mastery

SO THIS LEAGUE OF MINDE AND BODIE HAS THESE TWO PARTS, HOW THE ONE WORKETH UPON THE OTHER. FOR THE CONSIDERATION IS DOUBLE, EITHER HOW, AND HOW FARRE, THE HUMOURS AND THE AFFECTS OF THE BODIE, DO ALTER OR WORKE UPON THE MINDE; OR AGAIN, HOW AND HOW FARRE THE PASSIONS OR APPREHENSIONS OF THE MINDE, DO ALTER OR WORKE UPON THE BODIE. . .

—Francis Bacon (1561-1626)

Biofeedback is playing an important role in accelerating development toward an encompassing healing system, often referred to as Holistic Health Care or Holistic Medicine. These therapies incorporate a variety of techniques and procedures to achieve the healing, or maintain the well-being, of the *whole* person, the unity of body, emotions, mind, and spirit. Biofeedback is one such technique, Biofeedback Training is one such procedure.¹

What is *biofeedback*? Simply put, it is the feedback of biological information to a person. It is the continuous monitoring, amplifying, and displaying (usually by a needle on a meter, or by a light or tone) of an ongoing internal physiological process, such as muscle tension, temperature, heart behavior, or brain rhythm. Biofeedback *training* is using that information in learning to voluntarily control the process being monitored.

The establishing of voluntary control over autonomic (involuntary) nervous system functions, through biofeedback training, rests on what we have called the “psychophysiological principle,” which postulates that *every* change in a physiological state is accompanied by an appropriate change in the psychological state, conscious or unconscious, and conversely, *every* change in the psychological state, conscious or unconscious, is accompanied by an appropriate change in the physiological state.² *This principle, when coupled with volition, allows for the self regulation of a number of autonomic processes, and theoretically at least, the influencing of every function of the body.*

Self regulation of autonomic processes is accomplished (as we teach in our work) through learning to relax and quiet the body, the emotions, and the mind, then imagining and visualizing what you want to have happen, “feel” it happening, and then letting it happen, allowing the body to carry out the visualization. The aim in biofeedback training is to train various processes of the mind and body to operate in such a way that finally a very brief visual-

ization of self-direction will accomplish the intended change and the biofeedback instrument no longer will be needed.

We, in the Voluntary Controls Program of the Menninger Foundation, in Topeka, Kansas, began research in mind-body relationships in 1964, demonstrating with instrumentation that *voluntary* control of so-called *involuntary* processes is possible. While we were engaged in this research, Menninger psychiatrists asked, from time to time, if we might be able to help one or another of their patients. When we agreed to try, patients were referred for symptoms such as muscle tension, anxiety, bleeding stomach ulcers, tachycardia, high blood pressure. In 1975 we established the Menninger Biofeedback and Psychophysiology Center, in which to do our clinical work, and to which physicians refer patients for treatment of psychosomatic disorders. We call our clinical procedures “psychophysiological therapy”—mind/body therapy—and we call ourselves “psychophysiological therapists.”

Biofeedback is a major tool in our work, and biofeedback training is the primary procedure among a number of methods that we use. We sometimes speak of biofeedback training as “awareness training,” awareness of our physiological selves and body sensations—awareness of our emotions—awareness of our thoughts. Such awareness is necessary for achieving voluntary control of “involuntary” processes. Through use of biofeedback in this way, people learn new skills, skills of self regulation, skills of self-healing. Like a mirror, biofeedback guides their learning and indicates their achievement.

During the first session when the patient comes for biofeedback-aided psychophysiological therapy, the rationale for cortical-limbic-hypothalamic control (control of the brain and nervous system and the glandular hierarchy) is carefully explained in terms suitable for that particular client or patient. The how and why of biofeedback’s effectiveness, how our thoughts and emotions affect the nervous system and glands, must be clearly understood. We emphasize that this is a *natural* process, happening all the time, with either helpful or harmful effects on health. We emphasize that *healing* is also a natural process, that is is natural for the body to heal and to be well.

In summary, we emphasize the fact that our minds play an important part in creating and maintaining health when what was formerly “unconscious” is brought into conscious awareness through biofeedback.

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When the patient understands the rationale and the process of biofeedback training, we discuss goals. This includes what is to be achieved by voluntary control of temperature, muscle tension, and brainwave rhythms in the amelioration of the specific problem for which she or he was referred. Additional goals often include gaining the ability to deal more successfully with *interpersonal problems* (at home or at work), gaining *self confidence* and *assertiveness*, and developing a better sense of *self worth*. Clear goals stimulate motivation, an essential element in learning self regulation skills.

Next, we discuss *visualization*—the power of visualization. That which we intensely imagine, vividly visualize, tends to come into being in our bodies and in our lives. In fact, visualizing what is to be accomplished plays an important part in all self-regulation techniques. When the mind is successfully trained, the body changes.

Lastly, we emphasize *the power of choice*, that we can choose to hold one emotion rather than another; that we can choose to hold one thought rather than another. This is the power that sets us apart from other creatures, the power that gives us human dignity.

Charles Renouvier, a French philosopher, defined free will as “the sustaining of a thought because I choose to when I might have other thought.” This is discussed in psychologist William James’ diary entry of 30, April, 1870:

I think that yesterday was a crisis in my life. I finished the first part of Renouvier’s “Essais” and see no reason why his definition of Free Will—the sustaining of a thought because I choose to when I might have other thought—need be the definition of an illusion. My first act of free will shall be to believe in free will. . . . Hitherto, when I have felt like taking a free initiative, like daring to act originally, without carefully waiting for contemplation of the external world to determine all for me, suicide seemed the most manly form to put my daring into; now, I will go a step further with my will, not only act with it but believe as well; believe in my individual reality and creative power. . . I will posit life (the real, the good) in the self-governing resistance of the ego to the world.”³ (*underline added.*)

Accepting and acting upon that definition of free will was instrumental in changing William James from a sickly, depressed, and despairing young man,

contemplating suicide, into a productive writer, teacher, and philosopher. He later wrote, “The greatest discovery of my generation is that human being, by changing the inner attitudes of their minds, can change the outer aspects of their lives.” Unfortunately, this “great discovery” disappeared for several decades, overpowered by the behavioristic and conditioning paradigms, and is only now coming into acceptance and use.

By our choice we move toward dis-ease or well-being. Long-held anxiety, anger, fear, frustration or despair, leads to psychosomatic illnesses, stress-related illnesses. To be of good cheer, to love and to laugh, leads to psychosomatic health.

* * *

Interestingly, many illnesses today are classified as stress-related disorders. The *stress response* is the mind and body’s response to some “stressor,” some disturbing or challenging internal or external situation or demand. Physical and psychological stress, through the cortico-limbic system, activates the sympathetic nervous system—that section of the autonomic nervous system that prepares us for emergency. It prepares us for “fight or flight” just as it prepared our primitive ancestors when a bear entered their cave at night. But today, “fight or flight” may not be the right response, especially if the *bears* are on Wall Street. In humans, with their highly developed nervous systems, emotional problems are the most important stressors—and throwing stones, using a club, or fleeing the cave isn’t an appropriate response.

Not all stress is bad, of course. In fact, life without stress life would be dull, dull, dull. Joy can be stressful. All change is stressful. When we play a competitive game of golf or tennis, it is stressful, but it is fun. And when it is over we relax (theoretically and the sympathetic “turn on” turns off. A performer on stage in an opera, a play, or in an important medical or business meeting, is “keyed up” for a good performance, but afterwards it may take hours for body and mind to quiet down. But the fact that the body and mind *can* re-adjust—that the “turn on” *can* “turn off,” is important for health.

Unfortunately, most of our stresses are more long lasting than a game or a performance. The job situation may be unpleasant, or uncertain, unsatisfying, or boring—or there may be no job available. Making a good marriage and raising a family are demanding occupations, and readjustments when the marriage fails, or after the family is raised, may be difficult.

If we respond to any of these stresses with **chronic** “turn on,” the accompanying body changes also tend to become chronic. “Stress-related” psychosomatic disorders are the result—cardiovascular problems, headaches, disorders of the respiratory system, disorders of the gastrointestinal system. Stress also increases pain, increases and prolongs bleeding from a wound. It complicates and delays recovery from every disease and disorder, ranging from flu, to a tonsillectomy, to a broken bone. Research also shows that stress inhibits immune system functioning, our body’s natural “defense system,” and makes us more open to diseases of many kinds, including cancer. A rapidly-growing discipline, psychoneuroimmunology, promises to shed light on this latter problem.

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When we use biofeedback training in the treatment of a stress-related disorder, we sometimes say to a patient, “It isn’t life that kills us—it’s our *response* to it, so we must learn to choose health-producing and health-sustaining responses. That’s what biofeedback-aided therapy is all about.”

Whatever the presenting problem, we always begin biofeedback training by teaching the patient to increase his or her hand temperature (which means increasing blood flow to the hands) by the use of self-suggestion phrases, visualization, and temperature feedback. This is an eye-opening demonstration of *self mastery* for most people. We explain that the blood vessels of the hands are innervated only by the *sympathetic* section of the autonomic nervous system, that an increase in hand warmth signifies relaxation in this system, in effect a turn off of the sympathetic “fight or flight” response.

Having learned to use the temperature training in the clinic, the patient takes the instrument home for twice-daily practice. And after each practice session, the patient fills out a questionnaire describing *physical feelings, emotions, thoughts and fantasies* which occurred during the session. Like biofeedback itself, this also is an “awareness increasing” procedure. The answers to the questionnaire add to the understanding of problems and progress by both patient and therapist. Relevant psychological insights often surface here, that relate to chronic health-damaging stress responses.

Temperature control, first learned in the hands, can be used to bring warmth and increased blood flow to other body areas. For instance, to help heal a sore throat, an arthritic knee or back, or to increase *blood flow in the legs*, an important ingredient in successful treatment of hypertension.

The patient then comes to the Biofeedback Center for once-weekly electromyographic (EMG) training, training in muscle tension control, and to learn the other procedures and techniques used in psychophysiological therapy. Most frequently we place the EMG electrodes on the forehead at the beginning of training for relaxation of the forehead. Effects, however, usually include the jaw and neck, and often generalize to the whole body.

Other biofeedback modalities may then be introduced, depending on the needs of the patient. For instance, feedback of brain rhythm for insomnia or pain control, or heart rate feedback for tachycardia and arrhythmia, or galvanic skin response feedback (GSR) for awareness and control of emotional responses.

In addition to biofeedback, we teach (1) diaphragmatic breathing for stress release and general well-being, (2) specific breathing exercises for quieting the mind, (3) guided and unguided imagery, and (4) internal dialogue with the body. These are used daily by the patient *during home practice*.

Also, we recommend physical exercises which are appropriate to the patient, active ones like walking, running, swimming, and bending and stretching exercises as in yoga (*reminding the patient that the body is one machine that wears out by not being used*). We also give information and suggestions for improved nutrition.

All of the above are techniques of self regulation. And please note, they combine psychological and physiological procedures. Practice of voluntary control of muscle tension for general relaxation and temperature control for autonomic relaxation, *as preliminary learning*, not only teaches the patient ways of managing stress, but begins to re-establish healthy homeostatic balance, preparing the body for self healing. As one learns to quiet the body, quiet the emotions, and quiet the mind, the body switches to *receiving mode*, rather than *playback mode*. It is then ready to receive a visualization, or an internal dialogue, and act upon it. As training proceeds, patients are able, under the guidance of their regular medical advisor, to reduce or eliminate the use of drugs.

From the very beginning, *the transfer of what is learned to the life situation* is emphasized. For example, temperature training is done at home, as are the deep breathing and other exercises. But also, we may say to a patient, "If a

stop light turns red as you approach it, don't clutch the wheel and cuss out the light. Instead say, 'Ah, an opportunity to practice self regulation.' Relax your hands, take a deep breath—and, if you have time,—feel all the tension flow out of your body. You'll be in better shape for driving on when the light says 'go' and you will have done your body a favor." We suggest finding reminders—"cartoons or jokes that make you laugh—a picture that says 'untense'—a poem, a smiling face that makes you feel like smiling back, to put under the glass on your desk, or on your refrigerator door."

As training proceeds *we ask patients to develop their own phrases, visualizations, imagery, and other techniques for self regulation—thus freeing themselves from dependence on the phrases and visualizations we have given them.* And, when through increased self awareness they develop "direct perception of inside-the-skin events," they are finally freed from both the biofeedback instruments and finally, freedom from the therapist. They then *know* that the responsibility, and the achievement, are theirs.

As mentioned above, beyond the amelioration or healing of a specific physical disorder, successful psychophysiology therapy results in an improved self-image, and this influences everything we are, and do. A good self image enhances self direction and self mastery. It often is accompanied by a new sense of values and a deepening spiritual awareness. And, there is a change in life style. This last is essential if what has been gained is to be maintained. Dr. Meyer Friedman, co-author of *Type 'A' Behavior and Your Heart*, says that unless the life-style that contributed to the development of the illness is changed, nothing else that one may do will be of much help in maintaining health.⁴

Along the same vein, a publication by the National Institutes of Health says "The guiding principles to action against cancer and other diseases of our time are life-style changes and body awareness." Very Interesting! Biofeedback training as we use it, is training in awareness of body, emotions and mind. And afterwards, patients often say to their biofeedback therapists, "You have changed my life." But the response is, of course, "No, YOU have changed your life."

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More striking, some patients move strongly toward a transpersonal (spiritual) orientation. The following is the story of Laura (not her real name), a patient who developed inoperable lung cancer. I had treated her several years before. Together, at that time, we had successfully healed a serious bleeding ulcer. But now she was undergoing heavy chemotherapy and radiation treatment for cancer, and the prognosis was negative. Approaching sixty years, she lived alone and had few friends. Her only child, a son, had left home in anger, years earlier, because of her alcoholism. She was extremely cruel and abusive when drinking. Though she had conquered the alcoholism, he still would not forgive her, would not allow her to see the grandchildren. As a result, and now with cancer, she was not sure that she wanted to put forth the effort to live.

An intelligent and artistic person, Laura easily adapted to our cancer-control visualization procedures. As she progressed in her training, her feelings and thoughts began to change. For instance, she suddenly remembered that she had always wanted to shape things out of clay. So she ordered a potter's wheel. Also, she had done some painting before this illness, and she ordered a new set of paints.

One day in a *theta brainwave state* of deep relaxation and spontaneous hypnagogic imagery, she said she was seeing “the face of that seductive young man, that shadowy figure wearing a black cape, whom I call death.” He was standing at the end of a stone passageway beckoning her to come, as he had beckoned many times before when she was an alcoholic. She had responded more than once in those days by attempting suicide. Now, however, she told him she would not respond. She mentioned her interest in painting and pottery.

He continued to smile cynically.

“You know only about death,” she said. “There are many things I want to do—and oh, so many things I want to read—way into my old age.”

There was a moment of silence, then, Laura exclaimed “He’s gone. . . . When I said ‘way into my old age,’ he threw down his cape and left!” For her, this symbolized her intention to live, and the figure never again appeared in her imagery.

Laura had a wonderful gift of fantasy. She had seen “Star Wars” and been enchanted with the robot 3PO. Consequently, she visualized her own robot, patterned after 3PO, and called him Robie. He was the clever and faithful leader of an army of R2D2 robots (white blood cells) that went to battle in her body at any time of night or day to destroy cancer cells.

She was courageous and diligent in her practice of all aspects of the immune-system training, and x-rays after two months showed that the cancer was significantly reduced in size.

Three weeks later in her self-awareness notes, she wrote, “The immune system is right on target. For each x-ray the growth decreases and I know it will be gone in a month.” *And so it was.* One of her doctors wrote to me, saying “It was truly amazing to watch such a large and vicious tumor simply melt away, without a trace, in the course of a few short weeks.”

Unfortunately, however, her intensive chemotherapy and radiation treatments were continued without letup, and Laura grew thinner, and more tired, too tired to do the many things she had planned. Since she found it difficult to eat, we searched for foods that would stimulate her appetite, but with little success. This was of concern because we both knew that her immunological system was being weakened.

Laura continued to have significant imagery, however. For instance, she saw an old battlefield of the Civil War that symbolized the long battle with her internalized mother. But “now there was peace. . . the war was over.” She had images of the potter’s wheel, “looking down at a spinning ball of clay on the wheel, telling yourself I had the power in my being to center it and make it grow into a bowl.” Then, she added, “I seem to be internalizing my desires toward clay. Hopefully I will find the right position for centering.”

Another time, “I had the strange sensation of being very small and at the vortex of the clay pot I was throwing on the wheel. Just a tiny me.” And again, “. . . being in the vortex of a turning pot on the wheel. it was as if I were looking down and within.”

She also had recurring images of Greece. It seemed “so familiar,” though she had never been there. She wondered, aloud, if she had lived in that country in a former life.

Often in spontaneous imagery she would be sitting on a high rock, looking down into a green valley, “a sheltered and beautiful place of peace and color. I was going down to live there. It was good, and clean and ordered. I hope I can go down the somewhat rocky road into this peaceful valley.” And about six weeks later, “I saw myself beginning the journey down the mountain path into my green valley. *There is much luggage I have left at the pass.* I am carrying only what I need.”

As the weeks went by, Laura’s physical condition worsened and she grew afraid. She had handled chemotherapy and radiation with neither nausea nor fear, in the beginning, but now she felt they were destroying her. Dr. Carl Simonton had said, “Some cancer treatments are so potent, in fact, that patients fear the side effects. . . as much as the treatment itself.”⁵ I asked one of Laura’s physicians if her fears were justified, if the treatment could possibly destroy her, and he said yes. I could not reveal this conversation to Laura, but suggested that she confer with her physicians, attend carefully to what they said, and then make her own decision about traditional treatment, for it was her body and her life that were at stake. After doing that, weighing the possibilities, she refused further chemotherapy and radiation treatment.

Laura grew more cheerful and positive after she had stopped chemotherapy and radiation, and her appetite revived slightly. But she did not gain weight. Her physician then put her back in the hospital to “gain ten pounds.” It did not happen. Eventually she grew depressed by the hospital milieu, and was allowed to go home. We had visualization therapy sessions in her home for two weeks, but she seemed very frail. And when I returned from a conference, she was again in the hospital. It had been decided that she should have another body scan. Her lungs were still clear it was found, but there was a small cancer in her liver.

The upshot was that questions about life and death, previously discussed in relation to lung cancer, had to be discussed again. Laura could not decide at first whether, in her depleted condition, she wanted to “go to battle.” (It would be difficult to describe how emaciated she was.) Finally her answer was not to battle, that she and Robie just could not get activated again, that she felt she was ready to be released from her tired body. She knew that whatever her choice, we would continue to work with her, helping in any way we could to make her more comfortable. She asked that I help her to die with dignity.

Laura remained in the hospital. She was not heavily medicated, and although she slept a great deal, she was lucid when she wanted to be. Her son was called and came to see her and they wept together and made their peace. Her attorney came and her will was made. She was proud that in spite of pain and lack of energy, she was able to do these things with dignity and clarity. Our last visualization together was spent contemplating the Light, and moving toward the Light. In another day she died as she wished, with peace and dignity.

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As indicated above, psychophysiological therapy may merge into transpersonal therapy. This is especially so when the possibility of imminent death must be considered. There is a tendency then to penetrate beneath the trivialities of ordinary life. Values change. What becomes important, in the words of another patient with cancer, is “the love of family and friends, and time to spend with them, and the beauties of nature, and time to enjoy them.” When the deeply quiet state is achieved in therapy, “answers from the unconscious” tend to enhance peace, and love and compassion, for oneself as well as for others.

Patients can be helped to realize that *just as it is possible to direct the course of living more intentionally, so it is possible to direct the course of dying more intentionally.* To have the ability to call on elements of self mastery, pain control and peace of mind in terminal illness, would be valuable for every human. Death of the body is an experience we all will share, and dying with dignity is a part of living with dignity.

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A very different but interesting case is that of the hypertensive patient who took the longest time of all our clients to become free of drugs and able to maintain normal blood pressure at the same time. He is now an American medical doctor, a psychiatrist, but as a teenager he was in Hitler's Third Reich. At age 15 his parents put him on a boat bound for the United States. He managed well in the United States, completing college and medical school. But his parents died in the holocaust.

One of the most important factors in his bout with hypertension was that he was “Type A,” and liked it.⁴ He liked his “norepinephrine highs,” but he

disliked the side effects of the hypertension drugs he had to take. He described himself as always doing two or three things at a time. For example, talking on the telephone while writing the medical notes on his last patient. A man always in a hurry, he said, who drove his car too fast—the same man who said, after he had been in therapy for some weeks, that he “looked for the red stop lights” to give himself a chance to slow down.

He had been on hypertension medication continuously for ten years at the time he entered our program, but he had been on these drugs sporadically since medical school. By the twelfth week of self-regulation training, he decided he would ask his cardiologist to reduce his medication a little. *Just thinking about it made his blood pressure rise.* He lowered it again in a few days and the doctor again reduced his medication. This pattern was repeated several times—and each time it made him nervous. “I am a doctor,” he said. “I’m used to *prescribing* drugs, not giving up on drugs.”

Nevertheless, it was his desire to be free of medication that brought him to psychophysiological therapy. After having practiced self-regulation procedures diligently for a few months, he began jogging. At first, only around the block, but increasing the distance slowly until he was doing three miles a day. He also adopted a more healthful salt-free diet, reducing his weight by forty pounds. And he slowed down.

During his fifty-second week of psychophysiological therapy he went for a medical check up and his doctor said, “You don’t have hypertension any more. Go home and take yourself off that last bit of medication (1/16 of the original amount) and come back in a year for your regular checkup.”

When we terminated therapy he said to me, “I think at last I really know what this is all about. I have become child-like again, not childish, mind you, but child-like. I notice things again. I didn’t even know our neighbors had beautiful gardens—I never took time to look. Each week I make a trip out of town to do counseling. I never knew what was on the way. I just drove there and did my business. Now I drive more slowly and I notice things. You know, I had forgotten that Kansas has birds—I had forgotten that birds sing in Kansas.”

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CORRESPONDENCE. Patricia A. Norris, Ph.D. [Alyce Green's daughter] • Life Sciences Institute of Mind Body Health • 2955 SW Wanamaker Drive, Ste. B. • Topeka, KS 66614.

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REFERENCES AND NOTES

1. Elmer E. Green & Alyce M. Green, *Beyond Biofeedback* (A "Merloyd Lawrence Book," Delacorte Press, Boston, MA, 1977. Reprinted with new Preface by Knoll Publishing Co., Inc., Ft. Wayne, IN, 1989).
2. Elmer Green, Alyce Green & E. Dale Walters, Self Regulation of Internal States, Progress of Cybernetics, *Proceedings of the International Congress of Cybernetics* (Gordon and Breach, London, 1970).
3. Gardner Murphy & R. Ballou, *William James on Psychological Research* (Viking Press, New York, NY, 1960).
4. Meyer Friedman & R. Rosenman, *Type A Behavior and Your Heart* (Knopf Publishing, New York, NY, 1974).
5. O. Simonton, S. Simonton & J. Creighton, *Getting Well Again* (J. P. Tarcher, Los Angeles, CA, 1978).

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