

*Early in their exploring the new field of biofeedback, Elmer and Alyce Green developed a strategy of studying individuals with unusual abilities in psychophysiological self-regulation. This strategy provided a useful way of determining possibilities and limits in the new field. In the selection below, "Biofeedback and Yoga," from **The Five Minute Hour**, published by Geigy Pharmaceuticals, Ardsley, New York, in 1974, Elmer Green details how this specialized area of studies developed, and what was learned from investigations with an Indian yogi, Swami Rama. [Eds.]*

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## BIOFEEDBACK AND YOGA

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**W**hen we had a chance to "wire up" a Swami from Rishikesh, India, for our project on "voluntary control of internal states," we eagerly accepted the opportunity. What he might have to say about techniques for obliterating the pulse, turning off pain, stopping the heart, could be useful for understand both psychosomatic health and psychotherapy, because in addition to "turning off" various functions he presumably could turn them on again. Many people can disturb their hearts. Thousands of psychosomatic patients it every day. Presumably, they responded somatically to psychological stress in a normal way at first with normal activation of the nervous system, but as Wilhelm Reich pointed out long ago, if they allowed the response to become chronic, psychosomatic disease developed. If voluntary control means anything, it must include "turning off" well as "tuning on."

Daniel Ferguson, M.D., who brought Swami Rama to Topeka in early 1970, as Chief of Psychosomatic Services the Veterans Administration Hospital Fort Snelling, St. Paul, Minnesota. He told us that the Swami had obliterated his pulse without muscular effort during an examination by himself and two other physicians. Perhaps in the Psychophysiological Laboratory we could find out what actually was happening. Ferguson, a graduate of The Menninger School of Psychiatry, knew of our research on "voluntary control of internal states" and felt that since biofeedback and yoga were both methods of self-regulation, they might have something in common. Indeed, in four years of continued study we have found some striking similarities as well as differences.

The most obvious similarity is that both yoga and biofeedback training are systems of self-regulation, as opposed to programming through hypnosis, drugs, or through direct surgical modification of the patient. In yoga, even though the patient follows a system in order to learn self-regulation, he alone responsible for its application. The same degree of self-responsibility is found in biofeedback training. The machines do nothing but detect physiological processes and present the information to the patient (usually with meters or by tones), but it sometimes takes two or three weeks before a patient is convinced of the passive nature of biofeedback machines and realizes at a deep level that no one is helping except himself. The machines tell him something about himself, but that is all. They are mere reflectors of inside-the-skin events.

Surgery, hypnosis, and drugs can prevent disasters in acute cases, but for the average chronic health problem, both yoga and biofeedback have the advantage of activating self-determined goals of trainees, “trainees” rather than “patients,” because yoga and biofeedback attract people of all kinds, healthy and sick, old and young. Whether psychiatric patient or psychosomatic patient, healthy hippie, or “all American” college student, most people are naïve trainees when it comes to learning psychosomatic self-regulation.

**I**t is no secret that psychotherapy is highly diversified and ranges in practice from extreme authoritarian programming to almost complete self-programming, but most psychotherapists, regardless of their theoretical orientation, agree that successful recovery from psychophysiological malfunction, genetic or conditioned, somatic or psychological, really begins when the patient is motivated for change. But how to develop motivation is a big problem. Here biofeedback and yoga can be useful tools because both are excellent methods for enhancing, or potentiating, motivation. It is interesting that self-regulation, by definition, implies that the individual has assumed a significant measure of self-responsibility.

Concerning differences, yoga has the disadvantage for many Western patients of being exotic and involving cultural accoutrements that are often not appropriate for Westerners. Psychosomatic learning, when taught by teachers of yoga in the West, is often mixed with mystic or religious doctrines that unfortunately tend to confuse or glamorize the student rather than lead toward self-awareness and self-control. Swami Rama, though, it is interesting to note, focused on yoga as a “science” rather than a religion.

When I mentioned to him that even if he succeeded in certain demonstrations, many people would nevertheless not accept his explanation of how it was done, he answered, "Each person can have his own hypothesis; but he still has to account for the facts." A beautifully scientific statement from a supposed mystic! This idea lies at the core of the scientific method.

**T**he Swami's answer contrasted ironically with an opinion I got later from an esteemed friend, a "hardheaded" scientist. I asked if he would participate in testing one of the Swami's more "far-out" proposals, and he bluntly said no. When I asked why, he said that he did not want to be connected with such a foolish experiment. I pointed out that the Swami could only succeed or fail. If the Swami said he could demonstrate something we had nothing to lose by watching him succeed or fail, and if he succeeded we could inquire further. My colleague still refused and said there was no use in conducting the test. It was bound to fail, he said, "Because it breaks all I the laws of the universe."

When I asked if he knew all the laws of the universe, he replied heatedly that he still would not participate. It did not help when I complained that he was a strange scientist, ready to write the final report before we even conducted the experiment, that he sounded like the medieval Cardinal who would not look through Galileo's telescope because he already knew that the moons of Jupiter could not be there. I maintained that I was a neutral investigator (though hopeful), whereas he was a "true disbeliever," as unscientific in his way as a "true believer" could be in another way.

We did not run that particular test, but the Swami nevertheless did demonstrate some physiological controls of considerable significance for theory in psychosomatic medicine and psychotherapy.

1. He controlled vascular behavior in his right hand, without striate muscle tension, so that on command two spots two inches apart on his palm were made to differ in temperature within two minutes by approximately 10 degrees F. This, he said, "was harder to do" than stopping his heart.
2. Without any overt motion or EMG indication of tension, he stopped his heart from pumping blood by putting it into a state of atrial flutter for seventeen seconds, at which time muscle tension associated with suddenly establishing a "solar plexus lock" drove the EKG pen off the edge of the strip chart record.

3. He produced theta EEG rhythm at will in occipital locations. This he called “stilling the conscious and bringing forward the unconscious,” a state he described as being “noisy” and unpleasant. When I asked him exactly what he meant by that, he said, “All the things I wanted to do and didn’t do, all the things other people wanted me to do that I didn’t do, and all of the things I should have done but didn’t do, came up and began screaming at me at the same time. It is not pleasant. Usually I keep it turned off, but sometimes it’s good to see what is in there.”

**I**n regard to theta rhythm, it is interesting that college students whom we trained to increase the percentage of theta in occipital regions, also reported a sudden awareness of imagery that seemed to spring from the unconscious, but their experiences were generally integrative rather than unpleasant. The Swami’s theta experience implied to us that practicing the disciplines of yoga in his guru’s cave monastery had involved a considerable amount of repression as well as sublimation, though he particularly stressed the latter. Both of these ways of handling “psychic energy” are probably less pronounced in American college students than in Swamis.

4. The Swami maintained a measure of consciousness during what appeared to be a rapidly varying and variable sleep state (stages 2 to 4) by reporting what was said in the laboratory during the session. He called this state “yogic sleep,” and said it was better than normal sleep. Many people, he said, let the brain sleep while the mind stays awake, with the result that they are still tired after eight hours in bed. If the “brain and mind” can be made quiescent at the same time, he explained, a couple hours of sleep is enough. It was noteworthy that he had not produced any significant amount of occipital delta rhythm during his previous fifteen days of lab sessions and, in fact, had produced a marked amount of theta for the first time just the preceding day.

Before the yogic sleep session began, I said it would be quite unusual if he could remember what happened in the lab during the session because he would have to be asleep to produce delta rhythm. In addition, I continued, he could not in any event know the psychological state with which delta waves might be associated, because he had never produced any noticeable amount. He insisted, however, that he knew that he could produce delta, because we had said that delta was a “deeper” state than theta. The next deeper state of consciousness, therefore, would have to show delta!

Before the Swami entered the experimental room, he asked how many minutes we wanted him to stay in the state of yogic sleep. He was indirectly suggesting that he had a continuous awareness of time, could tell how much time passed even when asleep. I said twenty-five minutes would be adequate. He lay down on the couch with his head on a pillow and we covered him with a blanket. Alyce, my wife and associate in biofeedback research, remained in the experimental room, while Dale Walters, our colleague, and I went to the control room. We calibrated the polygraph channels and the EEG machine, and then I called over the intercom for the demonstration to begin.

**W**ithin five minutes the Swami was snoring gently and a sleep-like pattern with scattered delta rhythm began to appear in the EEG record. Every five minutes Alyce, in a soft voice, said a sentence such as, "Today the sun is shining, but tomorrow it may rain." After twenty-five minutes the Swami spontaneously awakened.

In answer to my question about what had happened during the session, the Swami said, "Doors slammed twice upstairs, and someone went click-click-click with their heels on the floor above, and Mrs. Green said...", and here he repeated three and one-half of the four sentences. The last phrase of the fourth sentence was not given word for word, but the gist was correct. Dale and I were impressed. We could not remember exactly what Alyce had said even though we were supposed to be awake. On the other hand, we reminded each other, we were expected to pay attention to the physiological record, not to Alyce. We were not expected to remember anything, the tape recorder was supposed to do that.

When I asked the Swami later how he "did it," he said, "I told my mind to be quiet and to record everything that went on. If it had reacted at all I wouldn't have been able to stay in that state. When the time was up, I looked to see what was recorded." He was saying that he could operate his mind like a tape recorder and could put it in either "record" or "playback" mode.

All of Swami Rama's demonstrations were of interest to us, but the most significant to our research on states of consciousness was his ability to produce various brain wave patterns by "putting himself into" various states of consciousness. Except for delta, the variety of brain wave rhythms produced at will by the Swami were also produced at will by college students who a few months later

were subjects in our biofeedback research on brainwaves and imagery. Although brain rhythms correlated nicely with hypothesized psychological states in both cases, there was an interesting difference between the Swami and the students. He learned control of states of consciousness first, and then in the lab produced specific brain rhythms related to them. The students, on the other hand, first learned to increase the percentage of specific brain rhythms, and then became aware of associated states of consciousness. The most important similarity between the Swami's reports and those of the college research subjects was that in both cases conscious theta production was associated with awareness of normally unconscious material.

The strong implication is, of course, that if we can in fact learn to select a psychological state with the aid of brainwave training, then perhaps we can more easily learn to maintain emotional and mental stability. If we can replace specific physiological states with others of our choice, and find that emotional states are also being selected, then possibly the way is open for an attack on mental illness from a new direction.

**C**onsistent with the idea that mind affects body, and that body affects mind, and possibly related to the fact that emotional upsets often trigger seizures in epileptics, researchers from four laboratories reported at the February, 1974, meeting of the Biofeedback Research Society that a number of epileptic patients had learned, through EEG feedback, to select brainwave patterns that militated against the appearance of epilepsy (which might be thought of as an "electrical storm" in the brain). Their results imply that epilepsy may sometimes be voluntarily controlled without the use of drugs. The important problem raised in all such examples of brainwave control is, "Since brainwaves have no known 'sensory' correlates, what is it that is being self-controlled, an emotional state?"

It is clear that a dilemma has been generated by, or has resulted from, biofeedback research. Which comes first, psychological control or physiological control? In the chicken-or-egg problem, the answer is that neither comes first, they both come together. This is probably true of psychosomatic correlations, too. The interesting philosophical problem is not which comes first, but is, of course, "How can we choose to learn anything?" By implementing "choice," biofeedback appears to involve a deconditioning that frees people to a degree from control by previous states, however implanted or imprinted, genetically or culturally.

In one sense, learning to consciously regulate normally unconscious involuntary functions (mixing psychological and neuroanatomical terms) is very much like learning to drive a car. By means of feedback, and never without feedback, we learn to steer, control speed, and all the other things that come together in a good driver, and in a good self-regulator of autonomic processes. Even yogis need feedback, but without instruments their task is not easy.

The upshot for physical and mental health is that both internists and psychiatrists have at their disposal a new tool, biofeedback, that seems to “work,” partly because the patient realizes that the problem is in his body as well as in his “head.” Most patients quickly become involved as game players in learning to operate the feedback devices, and in this way motivation levels go up.

**Y**ogic methods for gaining control of physiological and psychological processes are workable for those who have the temperament and the time for it, but for those who may not be interested in yoga, biofeedback promises to yield significant results. This possibility is not being overlooked in India and talking with medical people about the similarities and differences between yoga and biofeedback training occupied much of our time in a recent three-month research trip to India.

Many Indian physicians felt that yogis had definitely demonstrated bona fide control of “involuntary” functions, but that previous to the development of biofeedback methodology, a scientific way was lacking for easy application of self-regulation methods. Biofeedback has the advantage of being consistent with modern scientific bias and seems to provide a rapid dogma-free technique for learning self-regulation. If it is especially desirable, for certain reasons, to emphasize the scientific aspects of biofeedback, it can be stated that “Biofeedback closes the cybernetic loop in which normally unconscious limbic, hypothalamic, and pituitary processes are consciously ‘directed’ through guidance supplied by physiological transducers, amplifiers, and meters.” Dogma, if any, lies in the implicit assumption that the patient has a capacity to help himself, that the mind-body system is open, not closed, and can be directed by volition. One thing that is certain about volition is that it is of indeterminate origin.

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