In Memoriam: Tom Budzynski, Friend and Colleague

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Tom Budzynski’s background and professional life are described. Born in Grand Rapids, Michigan, Tom earned his electrical engineering degree at the University of Detroit, then worked for the aerospace industry in Southern California for several years, a period that included work on the Blackbird spy plane. Later, while a graduate student at the University of Colorado, he developed the first practical surface electromyogram feedback device, receiving his PhD in experimental psychology in 1969. In his biofeedback studies, he worked extensively with stress-related disorders, pioneering many widely used techniques. In his later years, he carried out research and clinical studies using electroencephalogram brain wave feedback. We recognize Tom both as a major innovator in biofeedback and as a great friend.

Introduction

This article will take the form of narratives about Thomas Budzynski, his life, and his contributions to biofeedback by three friends and colleagues. First, Johann Stoyva will present his tribute, then Kirk Peffer, and then John Picchiottino.

A Tribute from Johann Stoyva

To begin with, I will (shamelessly) take credit for introducing Tom Budzynski to the idea of biofeedback. Admittedly, this statement needs a slight qualification, because what happened was completely unintentional on my part, although the episode does illustrate the role of accident in the diffusion of ideas. Let me explain.

First, the backdrop. I had just given a talk on electroencephalographic (EEG) studies of sleep and dreaming to a psychology graduate seminar at the University of Colorado in Boulder (probably in the spring of 1966). Afterward, Tom—then a novice graduate student—asked if I wouldn’t mind lending him Gay Luce’s book on sleep research. This was a slim, soft-cover volume summarizing recent rapid eye movement and electroencephalography (REM/EEG) studies of sleep and dreaming, most of which had been supported the National Institute of Mental Health.

Luce’s book included a description of Joe Kamiya’s studies of alpha EEG feedback, research begun in the late 1950s while Joe was still at the University of Chicago. I had resolutely ignored this pioneering work, despite having worked in Joe’s sleep lab, first in Chicago, then later in San Francisco. But Tom—as a former aerospace electrical engineer, and someone very much tuned in to the potential of feedback control systems—immediately sensed the possibilities opened up by Joe’s work in applying information feedback to the control of human physiological activity.

In fairly short order (probably the fall of 1967), Tom built an alpha EEG feedback device. This unit was great fun to experiment with, and I frequently had the privilege of serving as the test animal. In my case, as for many, the alpha state was experientially associated with an “emptying of conscious,” combined with an absence of mental effort. Alpha seemed to blossom between one’s thoughts.

Research on alpha feedback and consciousness dovetailed with the reigning passions of the “hippie” counterculture, a flourishing, if somewhat noisy, movement that peaked in the late 1960s and early 1970s. At the time, there was a great deal of excitement about altered states of consciousness and how to reach them—whether these were naturally induced as in meditation, hypnosis, or dreams or drug-induced as with mescaline or LSD. Electronic feedback of brain rhythms held out the possibility that with biofeedback training, individuals could learn voluntarily to produce many different mental states, some of them perhaps novel to human experience! Possibly, as well, the mental states mastered by Eastern meditators only after years of arduous practice could be reached fairly quickly by means of EEG feedback. There was even talk of “instant Zen” or “Skinnerian Zen.”

In turning from engineering to psychology, Tom had become quite interested in behavior therapy and particularly in Joseph Wolpe’s anxiety desensitization technique. So he began to experiment with using alpha feedback in the systematic desensitization process, both as a means of inducing a mentally relaxed state and as an indicator of tension buildup during the imaging of anxiety scenes. Tom
employed alpha EEG feedback in successfully desensitizing several patients with phobias. But the method had some problems. Some individuals displayed little or no alpha EEG. Some showed high amounts most of the time and exhibited little change between anxiety-evoking imagery, pleasant imagery, or no imagery. In these cases, alpha EEG wasn’t a particularly accurate indicator of a relaxed condition.

These and other problems with alpha EEG led to the question: Why not use muscle tension, in the form of surface electromyogram (SEMG) feedback, for relaxation training? All humans possess skeletal muscle activity and have it all the time, though at varying levels of tension. Moreover, there were important historical precedents suggesting the clinical utility of muscle relaxation. One major older source was Edmund Jacobson’s progressive muscle relaxation technique. There was also Joseph Wolpe’s desensitization procedure in which an abbreviated form of progressive relaxation was employed to counter anxiety.

Although SEMG feedback was simple enough in principle, it turned out to be ticklish electronically. For one thing, SEMG signals in the near-relaxed muscle are very tiny—close to the noise levels of then-current preamplifiers and thus not easy to tease out clearly. Also, the range of signals in muscle is very large: 10 to 10,000 Hertz versus 8 to 12 Hertz in alpha rhythms. Tom solved these and related problems after about a year of concentrated work, carried out in close collaboration with John (Pitch) Picchiottino, a long-time friend from the aerospace industry in Southern California. Pitch, an electrical engineer, inventor, and entrepreneur, subsequently became president of Bio-Feedback Systems, Inc., of Boulder, Colorado.

Like alpha feedback, SEMG feedback was great fun to experiment with, and a number of interesting observations emerged: (a) the SEMG unit generated minute-by-minute quantification of SEMG levels, thus providing continuous data on SEMG patterns during desensitization; (b) not infrequently, anxious patients reported themselves as being relaxed even when they were not—as judged by SEMG criteria; (c) frontalis SEMG proved to be a very sensitive indicator of anxiety increases during the desensitization process (during visualization of anxiety scenes, frontalis SEMG began to rise 5 to 15 seconds before the patient’s overt report of anxiety); and (d) SEMG feedback training, especially of the facial muscles, produced central nervous system changes. Relaxed subjects showed a reduced capacity to discriminate paired flashes of light. Specifically, in the relaxed condition, the time interval between paired flashes of light needed to be longer for subjects to see the flashes as two rather than one, an indicator of lowered cortical arousal (Budzynski, 1969). (These, and related observations, were published in Budzynski & Stoyva, 1973.)

A useful study we launched in the early 1970s had to do with tension headache. Here again, accident—or semi-accident—played a role. A visiting psychiatrist, commenting on SEMG feedback, remarked, “Why don’t you guys try this stuff on tension headache”? Actually, we didn’t know anything about tension headache or that it was a recognized diagnostic category and not simply an invention of the advertising industry.

Because our results with a pilot study of five patients were quite encouraging, we decided to launch a controlled-outcome investigation. This study, which included a pseudo-feedback group and a no-treatment group in addition to the SEMG-feedback group, confirmed the pilot study results. Again, there was a strong treatment effect. Treatment patients showed strong decreases in both headache activity and medication usage, whereas headache decreases in the control groups were modest and episodic (see Budzynski, 1989; Budzynski, Stoyva, Adler, & Mullaney, 1973). The observed effect was robust and has subsequently been confirmed in three meta-analyses (summarized in Penzien, Rains, & Andrasik, 2002). In the Penzien et al. article, which focused mainly on various behavioral treatments of tension-type headache, the most robust effect occurred with SEMG feedback and relaxation in combination (about a 55% improvement). In contrast, the three available controlled studies using amitriptyline—the standard pharmacological treatment of the time—showed only a 33% average reduction in headache activity, a decrease lying at the low end of the effect range achieved by behavioral therapies (Penzien et al., 2002, p. 169).

The tension headache study, we like to think, was valuable for the biofeedback area since it was the first controlled investigation demonstrating a treatment effect for a recognized—and common—stress-related disorder. As Tom liked to remind us, this favorable report had emerged against a backdrop of skepticism. For many psychologists and physicians, biofeedback remained a gray area at best. Just a bit of New Age flim-flam. Nothing had been proven; at least nothing that was clinically useful.

Viewed in retrospect, the tension headache studies did a lot to encourage further work on the clinical uses of SEMG feedback. These and similar reports suggested the possibility that SEMG feedback might have various clinical applications. As noted by Yates (1980), the well-known
Australian behavior therapist, it was following the publication of these studies that “the slow build-up of research and clinical application in the area of biofeedback became a torrent of activity” (p. 10).

SEMГ feedback, and its use in promoting muscle relaxation, generated a ripple of excitement and sense of intriguing possibilities. For one thing, it connected with several impressive older practices and disciplines, all of which focused around the core idea of self-regulation. There was Edmund Jacobson’s progressive muscle relaxation, already mentioned. More recently arrived on the scene was Joseph Wolpe’s desensitization method, in which muscle relaxation was used to counter and defuse anxiety reactions. Then there was autogenic training, well known in Europe but virtually unknown in America. Developed primarily by the German physician Johannes Schultz, it involved a combination of relaxation techniques, auto suggestion, and meditative-type exercises. This body of techniques had been applied to a wide spectrum of stress-linked disorders, thus suggesting problems for which biofeedback could be useful. Also originating in Europe were the Spiritual Exercises of St. Ignatius, which, though fascinating psychologically, remained little known outside the Jesuit order. And of course, there were the Eastern meditative disciplines, procedures that had developed within a variety of religious traditions. Also exciting was the emerging idea that a thorough relaxation response might possess a broad-gauge effectiveness in countering excessive stress reactions and consequently might be useful in treating a variety of stress-linked conditions. Perhaps biofeedback could expedite the learned modification of physiological responses and their associated states of consciousness already pioneered in these older traditions.

Tom, perhaps in connection with his engineering background, always maintained a keen interest in the practical applications of biofeedback. In the early 1980s, he and Kirk Peffer, also a former electrical engineer who became a psychologist, started the first—or one of the very first—private clinical biofeedback practices in the country. The Biofeedback Institute of Denver. Most of their apparatus was produced by Bio-Feedback Systems of Boulder, the main producer of biofeedback equipment at that time.

The majority of patients were seen for one of the following diagnoses: chronic tension headache, anxiety disorders, common and classic migraine, psychophysiological-type insomnia, Raynaud’s syndrome, cardiac rehabilitation, irritable bowel syndrome, and a variety of other stress-related conditions. The program emphasized stress/coping in three general systems: cognitive, physiological, and overt behavioral. Details of the treatment program are described in Budzynski, Stoyva, and Peffer (1980).

The late 1970s and the 1980s became a time of spreading the word about biofeedback. Our lab organized workshops in many different cities around the country. These were strenuous endeavors, but great fun, and we met a lot of interesting people. Our first venture in this direction—and probably my favorite location—took place in Snowmass, Colorado (close to Aspen). It was a 5-day program held in August 1974, just around the time Richard Nixon was poised to “abdicate.” One curious thing about the workshops was that a certain amount of spinoff occurred. I guess you could call it a chain reaction. Not too long after attending, some of the participants would in fact be announcing their own workshops!

Quite apart from the workshops, but due at least in part to contact with our lab, a number of talented people became interested in biofeedback. Among them were John (Jac) Carlson, Niels Birbaumer, Carol Schneider, Francine Butler, Alex Weinstock, and others, all of whom went on to make their own distinctive contributions to the area.

Finally, I remember Tom as a good-humored and even-tempered person and as someone who remained cool under pressure. He was always curious about the quirks and oddities of human nature and always tolerant of assorted departures from the usual and the ordinary. He was a great person to be with, both on and off the job. In retrospect, I can say that my life would have been very different had it not been for that initial (accidental) encounter with Tom.

**A Tribute from Kirk Peffer**

Tom possessed a real flair for developing innovative and practical procedures. Although these particular innovations have not yet run the gauntlet of full-dress comparative studies, they have often proved useful for some patients. One technique he worked on was the concept of psychophysiological profiling. Depending on the individual’s unique physiological response pattern—especially when stressed—biofeedback training could be tailored accordingly. Thanks to electronic monitoring, the therapist could determine whether an adverse physiological pattern had been altered or not. Had there been change at more than simply the level of verbal report?

Another strategy was the pervasive anxiety technique, a variant of systematic desensitization. Here, patients first learn to master a good relaxation response. Then they are instructed “to think about various thoughts—including anxiety thoughts—but at the same time to maintain good relaxation.” If SEMГ levels increase beyond a certain level,
the feedback tone comes back on. The patient then breaks
lock with the scene and resumes working on getting back to
a relaxed SEMG level. Once the patient has regained a
satisfactory relaxation level, the feedback tone is gradually
turned off, and visualization resumes. As in systematic
desensitization, the goal is to be able to think about
disturbing material but to do so in a relaxed fashion. (Note
the similarity to certain procedures from the meditative
disciplines, particularly mindfulness meditation.)

Tom also designed the Twilight Learner, a device that
turned on a prerecorded audio change statement, or
statements, only when the individual displayed a specific
brain wave pattern (i.e., typically when the EEG indicated a
“twilight” state of consciousness). The underlying idea was
that perhaps change statements presented during twilight
states would bypass the usual filtering and rejecting
mechanisms present in the patient’s normal, waking
consciousness. Many patients found this procedure useful.
Again, the Twilight Learner illustrates the value of pooling
knowledge and skills. The idea was first conceptualized by
Tom; then functionally mapped out by Tom and Pitch
(John Picchiottino); electronically implemented by Tom,
Pitch, and myself; and then produced by Bio-Feedback
Systems in Boulder as their Model TL-1™.

The start of my friendship with Tom had a definite chance
element to it. I had been working as a graduate research
assistant at the University of Colorado Health Sciences
Center, mainly on a project that had to do with impulsive
violence. Part of this job involved interviews with serious
offenders at the state penitentiary, some of whom were on
Death Row, and some—as I found out later—who were
responsible for multiple murders. Happily, the interviews
took place in the comparative security of the associate
warden’s office. Anyway, this project was ending.

One fortunate day, Johann Stoyva and I ran into each
other on the quadrangle just outside the Colorado Psychi-
atric Hospital (then still called the Colorado Psychopathic
Hospital). During our conversation, he offered me a job as a
graduate research assistant in his biofeedback lab at the
University of Colorado Health Sciences Center. So I had the
good fortune of working with Tom and Johann on several
significant projects over the years. Thanks to their projects, I
had steady work through most of my doctoral studies.

When Tom developed the first private biofeedback clinic
in the United States, he was generous enough to offer me a
position in the clinic while I completed my doctorate at the
University of Colorado in Boulder. Despite the many
efforts Tom was involved with, he always had time to
supervise me, so that I could meet part of the requirements
to be licensed in Colorado. There is no way I could repay
the kindness bestowed on me by Tom during our many
years working together. An extra bonus of working in
biofeedback was the lifetime friendships I’ve enjoyed over
the years with Johann Stoyva, John Picchiottino, and Tom
Buzynski, until Tom’s untimely death.

A Tribute from John Picchiottino

Tom and I first met by chance when we were both signing
in at the personnel offices of Hughes Aircraft in Culver
City, California. That encounter was June 1958. It led to a
53-year friendship and fellow “adventurer-ship.”

I was signing in for the Master of Science Fellowship
Program as an electrical engineering student and was
immediately put to work on the GAR 9 Missile Project.
Tom’s position was as design engineer for interceptor
electronics (on fighter aircraft) working on aerospace inertial
navigation systems. Both of us had received draft deferments
by reason of working in a critical industry (for national
defense). Later, Tom worked for Honeywell on the super
hush-hush SR-71, a high-altitude Cold War spy plane, also
known as the Blackbird. Security there was extremely tight.
Even now, the details of this project remain murky. But I do
remember hearing that when employees were being bused to
the work site, the bus’s windows were sealed over tightly.
Nobody could see in, and nobody could see out.

After Tom had moved to Colorado for graduate school,
the two of us collaborated extensively in developing the
original SEMG feedback device. Then, in 1971, we formed a
company to produce these units: Bio-Feedback Systems
(BFS) of Boulder. Tom was vice-president, and I was
president. Later, in May 1976, BFS became the first
biofeedback company to register with the Food and Drug
Administration as a medical device manufacturer. In the
1980s, Tom started some other commercial ventures as
well. One was Mindbyte, which produces various self-help
tapes. Its Web site is Mindbyteproducts.com.

Over about the past decade, Tom returned to his original
interest in EEG brain wave feedback. Here, again, his
enthusiasm for novelty and experimenting with various
new procedures is clear to see. Some of this work involved
using EEG feedback for patients suffering from mild to
moderate closed-head injury. This flair for innovation is
clearly reflected in the book he coedited with his wife,
Helen, and with James Evans and Andrew Arbarbanel
(2008), Introduction to Quantitative EEG and Neurofeed-
back: Advanced Theory and Applications.

Tom was born in 1933 and died of a heart attack on
February 14, 2011. Born and raised in Grand Rapids,
Michigan, he took his electrical engineering degree at the
University of Detroit, then worked for the aerospace
industry in Southern California. In 1969, with Johann Stoyva as his advisor, he received his doctorate in psychology at the University of Colorado in Boulder. From 1974 to 1975, he served as president of the Biofeedback Society of America. Further details about his life and career are available on his Wikipedia entry. We will all miss Tom: he enriched our lives and left us with many good memories.

References


