

BIOFEEDBACK THERAPY: AN OVERVIEW

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Abstract

The popularity of biofeedback has increased to the point where serious investigation by counsellor trainees and practitioners into the therapeutic claims and treatment methodologies of biofeedback training is warranted. In this paper the major therapeutic claims of biofeedback training and the respective methodologies used, are outlined, along with some of the research difficulties that are encountered in biofeedback training.

Résumé

La popularité du biofeedback a augmenté à un tel point qu'une étude sérieuse de ses effets salutaires et de ses méthodes de traitement s'avère maintenant nécessaire. Une telle étude est menée par des conseillers et des étudiants en consultation. Cet article esquisse les principales méthodes employées de même que les résultats bénéfiques attribuées à l'entraînement dans l'emploi du biofeedback. On souligne également les difficultés que rencontre toute recherche dans l'entraînement à ce genre de thérapie.

The past five years has seen a substantial rise in popularity of a therapeutic movement known as biofeedback. Although a few articles had appeared by the mid 1960's that were related to biofeedback techniques (e.g. Miller, 1959; Miller and Dicara, 1967) it was not until 1970 that a sufficient number of relevant articles had been collected to warrant publishing the first Aldine Annual: *Biofeedback and Self-Control*. The amount of published research in the field of biofeedback continued to grow each year, and in 1974 one volume was insufficient to contain even the new (i.e. non-replication), and directly relevant research that had been published (DiCara, 1975).

In a similar fashion, there are an increasing number of theoretical and conceptual positions demonstrating interest in biofeedback. For some it offers the ultimate demonstration of the degree to which mind and body influence each other (Brown, 1974; Sullivan, 1975). For others, biofeedback research has suggested that traditional conceptualizations like the ANS/CNS dichotomy might not really be valid (Green, Green, and Walters, 1969; Hefferline, Keenan and Harford, 1959; Miller, 1959). Still others emphasize the great contribution that biofeedback can make to existing therapeutic techniques like systematic desensitization (Budzynski and Stoyva, 1973).

Many things have been subsumed under the rubric of biofeedback. Biofeedback is credited for successfully treating such ailments as: subvocalization while reading, self-deception and anxiety, migraine and tension headaches, hypertension (high blood pressure), insomnia, muscular tics, heart disease, hypersensitivity to pain, gastrointestinal problems, and asthma. A wide variety of biofeedback training devices are currently on the market ranging from \$50.00 portable galvanic skin response (GSR) indicators to \$10,000.00 integrators that are capable of monitoring a wide variety of physiological functions, such as brain wave pattern, muscle tension level, and skin temperature. However, some writers are quick to point out that biofeedback is no panacea (Melzack, 1975). Most of the research consists of essentially case study reports, with few studies incorporating control groups. Although this procedure may be justifiable for the preliminary investigation of a phenomenon (Miller & Dworkin, 1975), biofeedback research has advanced to the point where consideration should be given to systematically controlling for things like the placebo effect, and comparing and evaluating the effectiveness of biofeedback and alternative therapies (DiCara, 1975).

It would appear that the importance of biofeedback has increased to the point where it is worth-

while for counsellors to at least explore the parameters of this therapeutic technique. It is beyond the scope of this paper to present a detailed review of the therapeutic claims and practices of biofeedback training — to do so would be a mammoth undertaking. Instead, it is the intent of this author to provide a basic look at biofeedback; some general procedural considerations, types of equipment used and treatment conducted, and finally some cautions and a few conclusions.

General Description

Definition

"Biofeedback refers to any technique which uses instrumentation to give a person [or organism] immediate and continuing signals on changes in a bodily function that he is not usually conscious of" (Sullivan, 1975, p. 38).

Through biofeedback training the person (or organism) learns to use the feedback biological information to first of all recognize different bodily functions, and then to gain control over them (Karlins and Andrews, 1972). As Budzynski, Stoyva and Adler (1970) point out biofeedback training directly incorporates two major characteristics of operant conditioning: (a) immediate knowledge of results, and (b) gradual shaping of responses. Just as a blindfolded person would have difficulty learning to make a foul shot in basketball, many people, because they can recognize only gross differences in their bodily states, are unable to control their bodily functioning. The major tenet of biofeedback is that by teaching a person to recognize bodily functions we put him in a position to be able to control such bodily functions as skin temperature, muscle tension, brain wave pattern, heart rate and blood pressure (Karlins & Andrews, 1972).

Procedure

Using biofeedback as a therapeutic technique involves three related (nondistinct) stages. First, the therapist explains to the client the rationale underlying biofeedback training, and the client learns to use the monitoring equipment. The appropriate information may be fed back by means of a variable tone, a series of lights, or a pointer on a graph grid. Thus the person can "see" his heartbeats or "hear" his brain waves.

When the person begins the control phase he is instructed to try to change the tone, make the lights come on, or keep the pointer near the bottom of the graph grid. He is not told to slow down his heart rate or relax his muscles,

but instead to direct his attention to the feedback monitor. When people direct their attention at changing a subtle behavior, like heart rate, they frequently achieve the opposite of the desired result. However, by directing attention at the feedback monitor and attempting to change the rate of clicking or the pitch of the tone, most people can learn to control the bodily function that is being monitored (Karlins & Andrews, 1972). Green, *et al.* (1969) refer to the phenomenon as "passive volition", for when an individual directly attempts to produce alpha brain waves or muscle relaxation he inevitably fails, but when he stops trying and just lets it happen he can produce alpha waves or muscle relaxation at will.

During the course of three to ten sessions most people can learn to control the pitch of the tone, or the activation of the light, at will. A weaning process then begins whereby the individual learns to recognize his physiological symptoms, and controls them without the aid of the feedback monitor. Once he has achieved this stage the person is then free to implement his newly acquired skill wherever and whenever he deems it appropriate.

Equipment and Clinical Applications

Although a wide range of feedback instrumentation could logically be used in biofeedback training, the most popular feedback devices currently being used are: the electroencephalograph (EEG) for brain wave training, the electromyograph (EMG) for muscle training, and the thermal trainer for learning to control skin temperature. Although galvanic skin response (GSR) indicators have been used in the past (e.g. Lader & Mathews, 1970), their use is not currently popular, due mainly to replication problems.

The following discussion will outline the basic treatment procedures associated with each of the most popular areas mentioned above. After outlining the treatment procedure, the major treatment areas will be mentioned and some brief evaluative remarks will be made.

Brain wave training. Using EEG feedback a person can learn to achieve an alpha state or even a theta state at will. Typically, electrodes are attached to a person's scalp (using a harmless paste), and a tone or light comes on when an alpha pattern (eight to thirteen cycles per second) or theta pattern (four to seven cycles per second) is being emitted. The alpha state is most often described as being pleasant, passive and relaxing. The theta state typifies the transition zone be-

tween wakefulness and sleep and has been associated with increased creativity and suggestibility (Karlins & Andrews, 1972). The main thrust of brain-wave feedback is in exploring the relationship between mental states (e.g. hate, ecstasy, depression) and brain-wave patterns, and investigating the degree to which a person can control his consciousness. However, EEG research has many problems associated with it. Some subjects can produce alpha bursts with simple eye-muscle tremors, and lack of sensitivity or filtering capacity of the monitor can lead to false signals being registered as alpha states (Goleman, 1975). More expensive equipment feeds back a signal that results from a continuous averaging over, say, a four second interval. Although this more sophisticated equipment gives a more reliable indication of conscious state, replication difficulties continue to beset EEG research (Blanchard & Young, 1974).

Muscle training. The EMG picks up, amplifies, and feeds back information on, the electro-neural activity that is emitted when muscle fibres contract. The EMG picks up the signals accompanying muscle tension and feeds them back to the subject, usually in the form of a tone. EMG feedback has been used medically for muscle retraining (Johnson & Garton, 1973), and relief from tension headaches (Budzynski, Stoyva & Adler, 1970), remedially to inhibit subvocalization while reading (Hardyck & Petrinoich, 1969), and psychotherapeutically as a means to combat anxiety (Budzynski & Stoyva, 1973). Research involving EMG feedback is the one area of biofeedback training where consistent, replicated, and long-term results have been obtained (Blanchard & Young, 1974).

Temperature training. Thermal trainers measure the temperature of the skin (which is taken as a measure of amount of blood flow at the monitoring site), and feeds the signal back to the patient. In a relatively short period of time, people can learn to raise the temperature in their hand by as much as 5°C. (Specifically, the temperature difference between the hand and, say, the forehead is measured). This phenomenon is usually accompanied by spontaneous recovery from migraine headaches. It would appear that people who suffer from migraine headaches can gain relief by learning to regulate the blood flow between their head and their hand (Sullivan, 1975).

Clinicians using the above procedure report a high success rate (e.g. Sullivan, 1975 reports a 74% success rate) and follow-up contact indicates

sustained relief (Karlins & Andrews 1972). However, most of the reports consist of case studies. To date little work has been done to isolate the effect attributed solely to temperature training or to incorporate adequate controls for the placebo effect, and replication problems have often resulted (Blanchard and Young, 1974).

Of the three areas mentioned above, the most promising research area appears to be EMG feedback. Therapeutically, the results of EMG training to reduce muscle tension and to assist in relaxation training, could have great potential in the treatment of anxiety and other stress related psychological disorders.

Conclusions and Cautions

The foregoing discussion has outlined some of the methodological considerations and therapeutic claims of biofeedback training. As has already been mentioned, biofeedback works and that seems to have been amply demonstrated. However; when one considers the theoretical foundation of biofeedback and related conceptual implications, only the most preliminary theoretical conjectures have emerged. As Miller and Dworkin (1974) and Shapiro and Schwartz (1972) point out, the first step in research of this nature is to demonstrate the existence of a phenomenon, then appropriate controls can be introduced to determine more precisely the nature of the phenomenon. It would appear that the existence of the phenomenon has been established and now cries for controlled research and replication studies are beginning to surface (DiCara, 1975; Melzack, 1975; Shapiro & Schwartz, 1972).

Biofeedback has likely had a large enough impact that it is here to stay. EMG feedback (coupled with home practice) for the treatment of subvocalization, tension headaches and muscle retraining has demonstrated consistent, replicated and long-term, positive results. Further research incorporating other forms of feedback (e.g., EEG or thermal feedback) will help determine the parameters involved in those cases too. It is only by researching the grey areas, exploring the limitations, and systematizing the treatment procedures that the potential of this treatment procedure will be fully realized.

Biofeedback training has advanced to the point where clinicians likely do themselves a disservice if they ignore this therapeutic area. Biofeedback offers abundant research areas of potential interest to counsellor trainees, and important therapeutic implications for the practicing counsellor that cannot be overlooked. If further research findings

support the developing trends implied by existing research, then many new, and easily learned methods for combating certain psychological ailments will be available to counselors: methods for allowing individuals a greater measure of control over self, and a greater variety of ways to modify their existing behavior if they so desire.

References

- Blanchard, E. B., & Young, L. D. Clinical applications of biofeedback training: A review of evidence. *Archives of General Psychiatry*, 1974, 30, 573-589.
- Brown, B. *New mind, new body - biofeedback: New directions for the mind*. New York: Harper & Row, 1974.
- Budzynski, T. H., & Stoyva, J. Biofeedback techniques in behavior therapy. In D. Shapiro, X. T. Barber, L. V. DiCara, J. Kamiya, N. E. Miller, & J. Stoyva (Eds.), *Biofeedback and self-control* 1972. Chicago: Aldine, 1973.
- Budzynski, T. H., Stoyva, J., & Adler, C. Feedback-induced muscle relaxation: Application to tension headache. *Journal of Behavior Therapy and Experimental Psychiatry*, 1970, 1, 205-211.
- DiCara, L. Introduction. In L. DiCara, T. X. Barber, J. Kamiya, N. E. Miller, D. Shapiro, & J. Stoyva (Eds.), *Biofeedback and self-control* 1974. Chicago: Aldine, 1975.
- Goleman, D. The tranquillity box: A consumer's guide to biofeedback machines. *Psychology Today*, 1975, 9(6), 132.
- Green, E. E., Green, A. M., & Walters, E. D. Self-regulation of internal states. In J. Rose (Ed.), *Progress in Cybernetics* (Vol. 3). New York: Gordon & Breach, 1969.
- Hardyck, C. P., & Petrinovich, L. F. Treatment of subvocal speech during reading. *Journal of Reading*, 1969, 1, 1-11.
- Hefferline, R. F., Keenan, B., & Harford, R. A. Escape and avoidance conditioning in human subjects without their observation of the response. *Science*, 1959, 130, 1338-1339.
- Johnson, H. E., & Garton, W. H. Muscle re-education in Hemiplegia by use of electromyographic device. *Archives of Physical Medicine and Rehabilitation*, 1973, 54, 320-323.
- Karlins, M., & Andrews, L. M. *Biofeedback: Turning on the power of the mind*. New York: Warner, 1972.
- Lader, M. H., & Mathews, A. M. A physiological model of phobic anxiety and desensitization. In T. X. Barber, L. V. DiCara, J. Kamiya, N. E. Miller, D. Shapiro, and J. Stoyva (Eds.), *Biofeedback and self-control*. Chicago: Aldine, 1970.
- Melzack, R. The promise of biofeedback - Don't hold the party yet. *Psychology Today*, 1975, 9(2), 18-22.
- Miller, N. E. Learning of visceral and glandular responses. *Science*, 1959, 163, 434-445.
- Miller, N. E., & DiCara, L. Instrumental learning of heart rate changes in curarized rats: Shaping and specificity to discriminative stimulus. *Journal of Comparative and Physiological Psychology*, 1967, 63, 12-19.
- Miller, N. E., & Dworkin, B. Visceral learning: Recent difficulties with curarized rats and significant problems for human research. In L. DiCara, T. X. Barber, J. Kamiya, N. E. Miller, D. Shapiro, and J. Stoyva (Eds.), *Biofeedback and self-control* 1974. Chicago: Aldine, 1975.
- Shapiro, D., & Schwartz, G. E. Biofeedback and visceral learning: Clinical applications. *Seminars in Psychiatry*, 1972, 4, 171-184.
- Sullivan, E. A. *The future: Human ecology and education*. Homewood: ETC. 1975.