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PHASED BIOFEEDBACK APPROACH FOR EPILEPTIC SEIZURE CONTROL

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Summary—A phased biofeedback method for seizure control was used in an 18-yr-old female. Based on reports that epileptic seizures can be prevented by EEG biofeedback, we employed a phased sequence of relaxation training, EMG feedback, and feedback of alpha and theta EEG frequencies, to develop a low arousal, anti-stress response. Intervention over a 1-yr period resulted in a 46 per cent decrease in monthly seizures. Follow-up showed maintenance of her decreased seizure activity. Self-report and charges in locus of control orientation affirm the learning of an effective anti-stress response.

SINCE the dawn of human awareness, man has attempted various procedures to control epileptic seizures. Most attempts have been with chemotherapy, often without complete success yet complicated by pharmacological and psychological side effects. Miller (1969) suggested that epileptic seizures might be prevented by behavioral conditioning techniques that employ biofeedback. Forster, quoted in Lang (1970), had an epileptic patient who developed seizures when exposed to a light flickering at a particular frequency. A shaping technique using on-line computer analysis was effective in eliminating this sensory induced seizure pattern. Sterman and Friar (1972) report some success in one case, using operant conditioning of 12–14 cps rhythm from the sensorimotor cortex, based on the observation that quiet, alert animals in a laboratory setting demonstrate this rhythm. However, to achieve lasting success, it is likely that biofeedback conditioning in several modes is necessary, especially if this includes development of an anti-stress response (Stoyva and Budzynski, 1973). That strategy was employed in the present case.

Gannon and Sternbach (1971) employed alpha rhythm enhancement to curb headache pain. Although their patient could not get rid of a pain state once it occurred, he could on occasion prevent its onset. The present study emphasizes this preventive approach, by a learned anti-stress response, using phased sequence training for developing a low-arousal conditioned response (Stoyva and Budzynski, 1973).

CASE HISTORY

D.E., an 18-yr-old female, had had severe *grand mal* seizures since the age of 8. Neurological examinations revealed very disruptive EEG wave forms with epileptogenic foci on both sides. No other indications of impairment were found. Since she is allergic to Dilantin, a less desirable combination of drugs (Mysoline: 825 mg; Mesantoin: 225 mg; Mebaral: 300 mg; Phenobarbital: 100 mg) had stabilized seizure activity at three seizures per month.

TREATMENT

Treatment procedures, in a phased sequence (Stoyva and Budzynski, 1973) were administered by five clinical psychology student therapists who saw her at different times.† Following 2 weeks of relaxation training (Wolpe, 1958), electromyograph (EMG) training commenced,

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in order to supplement the relaxation and familiarizing D.E. with the apparatus.* Four ½-hr sessions focused on the forearm extensors and three on the frontalis muscle.

EEG training was then administered in 36 sessions over 1 yr. Brain wave activity was recorded with electrode placements, Oz and T_4, with ground electrode on the right ear. The first 12 ½-hr sessions were conducted at the rate of two per week. The next 17 sessions were on a once a week basis, and the remaining seven sessions on alternate weeks.

EEG training was administered in a phased sequence, beginning with alpha feedback, followed by alpha-theta, and lastly theta feedback. Training overlapped, so that as D.E. progressed to new wave components she continued practice on components already mastered. Thirty-three sessions concentrated on alpha training, 15 on alpha-theta, and nine sessions on theta. She was instructed to practice the relaxation exercises daily and told when she sensed an aura to try to relax and stay calm as if she were in the feedback situation. The Nowicki–Strickland locus of control scale (Nowicki and Strickland, 1973) was administered prior to and after the training period.

RESULTS AND DISCUSSION

D.E. had kept adequate records of prior seizure activity. During the 2 yr preceding our intervention, she had suffered 67 seizures, a mean of 2·79 per month. This agreed with reports from her parents regarding the latter years of her epileptic history. During the 12-month intervention period, she had 18 seizures, or a mean of 1·50 seizures per month, a 46 per cent decrease.

A regression equation was computed for the cumulative frequency distribution, and the cumulative number of seizures was predicted for the last month of the intervention as if there had been no intervention, and the cumulative frequency was extended from the 24-month baserate. The predicted number of seizures was 97·4; the actual number was 85, a significant difference. D.E. had a score of 15 on the Nowicki–Strickland scale before biofeedback training. After training, she scored 8, a move toward an internal orientation of almost two standard deviations.

During the 3 months immediately following the intervention period, D.E. continued to keep excellent records and reported no more than one seizure per month. Continuing follow-up has indicated no significant increase in seizures or change in personal adjustment.

D.E. was unable to suppress a seizure once it occurred, like Gannon and Sternbach's (1971) patient who could not rid himself of headache pain once present. She, too, was able to prevent the onset of a seizure once she experienced the premonitory signs. Having learned an effective low arousal, anti-stress response (Stoyva and Budzynski, 1973), D.E. could counter the previous patterns of the tension associated with her aura. She now states she goes into an "alpha state" at the onset of an aura. Her anti-stress response also gives her a sense of voluntary control over her seizures, which is hypothesized by some to be especially important in biofeedback training (e.g. Davidson and Krippner, 1972). Johnson and Meyer (1974) provide some support for this idea.

There were also beneficial side effects of the biofeedback intervention. Most notably, D.E. was judged sufficiently improved by school authorities to be able to return to normal classes after 6 yr of home tutoring. She also reported that "little things don't upset me" as they used to do.

It is worth noting that the phased approach has benefits in maintaining interest in the learning task. Once alpha training lost its novelty and became relatively easy for D.E., she was shifted to the more difficult learning task of theta training. When this proved too difficult,

*The apparatus used for the EMG and EEG biofeedback training was a commercially designed and marketed product of Bio-Feedback Technology, Inc., model BFT-113. In conjunction with this equipment, a time period integrator from the same company, model BFT-215, provided a digital readout of the EMG and EEG output.

an intermediate range of frequencies (6·5–9·5 Hz) was used for training. It was just difficult enough to keep her working, but not too difficult to make her give up trying.

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