THE APPLICATION OF VERBAL INSTRUCTIONS
AND EMG FEEDBACK TRAINING TO THE
MANAGEMENT OF TENSION HEADACHE
—PRELIMINARY OBSERVATIONS

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Sustained contraction of the scalp and neck muscles appears to be associated with tension headache.\textsuperscript{1,2} Electromyographic (EMG) feedback seems useful in the induction of muscular relaxation.\textsuperscript{3,4} Budzynski, Stoyva and Adler,\textsuperscript{5} described an EMG instrument and feedback training procedure which appeared to reduce both the intensity and frequency of tension headache and in two subsequent studies,\textsuperscript{6,7} we were able to replicate these observations. In a previous paper,\textsuperscript{8} it was hypothesized that a combination of verbal instructions and response contingent EMG feedback would enhance the effectiveness of systematic desensitization training. The purpose of the present study was to attempt to clinically note the effects of first verbal relaxation instructions and later EMG feedback training on tension headache.

RELAXATION TRAINING PROCEDURES

A. Verbal Relaxation instructions were taken verbatim from Wolpe and Lazarus\textsuperscript{9} and administered individually to each patient by the present writer on 3 consecutive days of muscular relaxation training. Each training session was about 40 minutes in duration.

B. EMG Feedback Training and Instrumentation

The purpose of this instrument is to enable the subject to monitor his muscle tension by means of an analog information feedback system. The subject hears a tone with a frequency proportional to the EMG activity in the relevant muscle group. The feedback tone tracks the changing EMG level of the muscle. Three surface electrodes are applied to the frontalis in such a way that the center electrode is centered on the forehead about one inch above the eyebrows. The instrument is constructed (for additional technical details, see the manual of this commercially available instrument) so that there is a maximum of 20K unbalanced electrode resistance and a maximum of 30K resistance to ground for each active electrode. The instrument is constructed to eliminate the EKG, EEG, and “noise” artifacts.

The subject is instructed to keep the tone low by relaxing the relevant muscle group. As the subject improves his control, the loop gain of the feedback system is increased, thus requiring him to maintain a lower EMG level in order to hear a low tone. The response of muscle relaxation is shaped by increasing the difficulty of the task in three steps (3 sensitivity settings, i.e., low, medium, high). Brief visual feedback was provided only in the first session of training with the use of a meter unit calibrated in microamperes. The microvolt level, sensitivity setting and meter readout are interrelated. For example, for a subject to hold a meter reading of 26 while the sensitivity control is increased from low to medium to high, the subject must drop microvolt level from 5.8 to 4.1 to 3.7.

PROCEDURE

Five female subjects diagnosed by neurologists as chronic (6-20 years) and almost daily tension headache cases, were

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accepted for the following medical and psychological procedures: 1. Psychological testing (M.M.P.I.), Stanford Hypnotic Susceptibility Scale forms A (pretested prior to EMG feedback training) and B (post-tested after EMG feedback training). 2. Complete physical by consulting internist, EEG and examination by consulting neurologist. 3. Next, patients were given charts on which they were required to keep during the duration of the study an accurate record of the intensity and frequency of all headache activity. 4. There was an initial observation period to determine base rate headache activity and frontalis EMG (averaged over 10 minutes of observation). 5. At the end of the 3 week baseline period, subjects were seen on 3 consecutive days by the present writer for muscular relaxation training with the Wolpe and Lazarus' verbal instructions. After each verbal training session (40 minutes), frontalis EMG was monitored for 10 minutes. After the formal verbal training period patients were required to come in to the clinic and practice relaxation thrice each week, during the second and third weeks of relaxation with verbal instruction. EMG monitoring of each patient occurred for 10 minutes after each relaxation practice session. 6. After 3 weeks relaxation practice with verbal instructions, subjects were instructed (for 10 minutes) in the use of the EMG feedback training procedure. The instruction was conducted with contingent EMG auditory feedback training for another 3 weeks. Each feedback training session was identical in length (40 minutes) and subjects were instructed to practice relaxation combining what they had learned (subjective physical feedback sensation of deep relaxation e.g., heaviness, lightness, numbness, tingling, etc.) from both verbal instructions and feedback training. Frontalis EMG was monitored during the last 10 minutes of the feedback training period. 7. After EMG feedback training was completed, patients continued to record the frequency and intensity of headache activity and also came thrice a week for a 10 minute session of frontalis EMG monitoring for another 9 weeks. Patients were instructed to continue to practice relaxation at home at least twice a week even after the EMG feedback training was completed.

RESULTS

Inspection of the records of all patients appeared to suggest a decline in the frequency and intensity of headache activity after the baseline period. The decline in the frequency and intensity of headache activity seems even more dramatic for 4 of the 5 patients and after the EMG feedback period. The small size of the sample and the confounding of the effects of verbal instructions and

![Graph showing mean maximum headache intensity per week for 5 female patients over an eighteen-week period](image)

Fig 1. Mean maximum headache levels per week for 5 female patients over an eighteen-week period.
EMG feedback training made it difficult to draw conclusions and generalize from this data. Nevertheless, clinical impression and the more dramatic decline in frontalis EMG associated with the feedback training procedure appears to suggest that the addition of response contingent EMG feedback training results in a more specific and powerful procedure for the clinical management of tension headache. Further factorial studies should separate out the effects of verbal instructions and EMG feedback training on tension headache and also study the interaction effects of the procedures. In order to control for “placebo effects” and experimenter bias, this should be repeated with non-contingent but non-frustrative EMG feedback and a “blind experimenter.”

REFERENCES

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