Biofeedback for Headache

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Biofeedback training has been one of the principal non-drug methods for managing headache since it was first developed in the early 1970s. Applications of biofeedback for head pain management are based upon a very simple concept: with training, headache sufferers can learn how to voluntarily control headache-related physical functions. This improved physical self-regulation may, in turn, help prevent or minimize their headaches.

This type of self-regulation training generally requires specialized biofeedback equipment that can reveal physical processes that ordinarily function outside of our awareness, such as muscle tension or body temperature. So voluntary self-regulation is the principal goal of biofeedback training and refers to a person’s ability to make willful changes in a specific bodily function.

Exactly what is biofeedback?

Biofeedback refers to methods for training voluntary self-regulation of a specific physical process. Electronic biofeedback equipment monitors that process and then provides feedback to the patient in the form of an audio tone or visual display that changes continuously as the process changes. The patient uses the feedback in learning how to better self-regulate that process.

The electronics of biofeedback equipment work much the same way that a thermometer or bathroom scale functions. In the same way that a thermometer continuously samples temperature and displays temperature information (provides feedback) with sensitivity to even slight change, biofeedback equipment accomplishes the same task for internal bodily functions.

For patients with migraine or tension-type headaches, the target of biofeedback training usually is either reduced muscular tension or reduced sympathetic nervous system arousal. (The sympathetic nervous system or SNS is the part of the nervous system responsible for responding to stress; greater stress leads to greater SNS arousal.) The two types of biofeedback training most often used in headache clinics are:

- **Electromyographic** or **EMG** biofeedback—feedback of minute electrical signals generated by muscle contractions in the scalp, neck, and sometimes the upper body.
- **Handwarming** or **thermal** biofeedback—feedback of skin temperature from a finger. Finger temperature is chiefly determined by blood flow through the fingertips. Fingertip blood flow, in turn, is chiefly determined by the level of SNS arousal—less blood flow and thus cooler fingers mean higher SNS arousal and vice versa.

Biofeedback training for headache focuses chiefly upon preventing rather than halting headache episodes. The enhanced self-awareness that patients develop through biofeedback training can alert them to headache-related physical changes that signal a looming headache. With sufficient forewarning, patients often can take steps to ward off an approaching headache before it becomes severe. These steps include:
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- Addressing stressors or other circumstances triggering the headache
- Using self-regulation skills to alter headache-related physical reactions
- Taking headache medication early in the course of an attack, if the headache continues to build

**How is biofeedback training accomplished?**

A typical biofeedback training program for head pain management consists of 5 to 25 treatment sessions (usually about 50 minutes long) in a clinic setting with a biofeedback therapist. The therapist serves as the technician who operates the equipment as well as the facilitator or “coach” who aids the patient as she refines her self-regulation skills.

During EMG biofeedback training, for example, the biofeedback therapist attaches several small disc sensors to the patient (usually on the forehead) using double-sided tape. The sensors are then connected to an EMG biofeedback unit that detects tiny electrical signals from the muscles and translates the signals into a clicking tone that clicks faster as the patient’s muscles become tenser. The patient’s task is to slow down the clicks by learning to relax the muscles. With sufficient training, patients become much better sensitized to their muscle tension levels, more aware of muscular reactions that can signal oncoming headache, and better able to control their muscular activity and thus to avoid headaches.

Biofeedback training for headache is almost always administered in conjunction with relaxation training. Several approaches to relaxation training are commonly taught for head pain management, all focused on assisting the individual to learn how to rapidly achieve a state of physical and mental calmness. The three most common approaches are:

- **Progressive muscle relaxation**—alternately tensing and relaxing selected muscle groups throughout the body
- **Autogenic training**—the use of self-instructions of warmth and heaviness to promote a state of deep relaxation
- **Meditation** or **passive relaxation**—use of a silently repeated word or sound to promote mental calm and relaxation

As another approach to teaching voluntary self-regulation skills, relaxation training is seen as complementary to biofeedback training.

During treatment, patients typically are instructed to practice the new self-regulation skills they are learning through relaxation and biofeedback training for at least 30 minutes daily. Audiotapes usually are provided to assist the patient with these home-practice exercises. A word of advice: Learning voluntary self-regulation skills takes time and practice. Patients should not expect to notice much headache improvement until after several weeks of training. In fact, it often takes 6 weeks or more before substantial headache reductions are achieved. But patients who persevere and are diligent in learning the self-regulation skills often experience continued headache improvement over a period of several months after treatment.
How well does biofeedback training work?

Non-drug therapies for headache, including biofeedback training, have been evaluated in hundreds of scientific studies. These studies provide ample evidence that biofeedback training can yield meaningful reductions in headache activity. In general, the improvements reported with biofeedback therapies have been at least three times as large as improvements reported with placebo ("sugar pill") treatments.

EMG is the type of biofeedback that has been most often studied for treatment of tension-type headache. The studies have reported an average 50% decrease in headache activity after treatment. While it is effective when used as a sole intervention, much evidence indicates that combining EMG biofeedback with relaxation training can improve outcomes. Likewise, adding cognitive-behavioral stress-management training also can improve outcomes for many patients. This is especially true when psychological or environmental problems such as chronic daily stress, depression, or other adjustment problems that are not effectively addressed by relaxation or biofeedback training contribute to headaches or prevent patients from effectively using self-regulation skills.

Handwarming is the type of biofeedback that has been most often studied for treatment of migraine. The studies have reported an average 40% decrease in headache activity after treatment. Although fewer studies have evaluated EMG biofeedback for migraine treatment, the research indicates EMG training can yield about the same level of improvement. As for tension-type headache, combining biofeedback training with relaxation or stress-management training can improve outcomes for patients with migraine (into the 50% range for average headache decrease after treatment).

Fortunately, when patients are initially successful in reducing their headache activity through these interventions, their treatment gains appear to endure long after treatment is completed. Many studies have reported additional headache improvement for several months after the completion of treatment, and other studies have reported maintenance of headache improvement 1 to 3 years after treatment, without the need for additional treatment sessions.

Biofeedback-assisted self-regulation training can be used as a sole therapy or it can easily be combined with medication therapies for added benefit. Many patients find that behavioral therapies like biofeedback training can substantially improve their ability to manage their problem headaches.

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