

Psychophysiologic Therapy for Chronic Headache in Primary Care

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Background: Headaches account for a high percentage of office visits to primary care physicians, with migraine and tension-type headaches the most common. This article provides a summary of psychophysiologic therapies for migraine and tension-type headache and considers psychosocial factors relevant to headache. Psychophysiologic therapy of headache consists primarily of relaxation and biofeedback.

Method: Representative controlled studies, meta-analysis, and reviews are utilized to assess the efficacy of biofeedback and relaxation for migraine and tension-type headache.

Results: Psychophysiologic therapy comprising biofeedback and relaxation can be provided in standard or limited therapist contact formulas to patients as sole therapy or concurrently with medical therapy. Effectiveness has been demonstrated for thermal biofeedback- and electromyograph biofeedback-assisted relaxation with minimal or no side effects. A typical treatment protocol is offered to exemplify the integration of psychophysiologic therapy into primary care practice.

Conclusion: Psychophysiologic therapy represents an important adjunctive treatment for chronic benign headache that can be incorporated into primary care.

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Headache is a clinical syndrome affecting 91% of all males and 96% of all females at some time during their life.¹ Headache is the seventh leading presenting complaint in ambulatory care in the United States, accounting for about 18 million visits a year.² Many headache sufferers do not consult a physician and are never diagnosed or treated systematically.^{3,4} For those patients who are driven by severe pain to seek care, the majority are managed in primary care, with less than 5% referred to specialists.¹ This article describes the management of chronic headache in primary care with psychophysiologic therapy.

The differential diagnosis of headache represents one of the longest lists in medicine; more than 300 headache types are identified. Although most headaches are relatively benign, for 1% to 3% of patients, the etiology is life-threatening pathology.⁵ In primary care practice, the most commonly diagnosed variety of headache is tension type, with vascular headaches occurring approximately half as frequently.⁶ Migraine accounts for 12% of headache presentations.⁷ Gender, socioeconomic status, culture, and lifestyle influence the incidence of migraine,⁸ and the prevalence of migraine increases as household income decreases.⁹ Genetic or family-related environmental factors are associated with about 50% of all cases.⁹

In pediatric practice, headache is also common.¹⁰ Bille's cross-sectional study¹¹ of nearly 9,000 Swedish school children found that the prevalence of common forms of headache steadily increased from ages 7 to 15. By age 15, approximately 5% of the sample experienced migraines and another 15% experienced (probably) tension-type headaches. Prevalence of migraine was similar in males and females at younger ages; after age 10, however, headache prevalence leveled off for males but continued to climb for females. A small subset of children (N = 73) who had developed migraine at about age 10 were contacted again 20 years later. Sixty percent (50% of the males and 70% of the females) were still troubled by migraines.¹² Thus, pediatric headache is highly prevalent and resilient over time.¹³

Besides providing direct care of headache patients, primary care physicians are pressured to perform a wider range of services and to make fewer referrals to special-

ists, particularly if care is provided on a capitated basis.¹⁴ Lifestyle change recommendations, shown to be central determinants of health,¹⁵ and brief mental health interventions increase the time pressures of an office visit. In addition, physicians are asked to collect outcome data to demonstrate the quality of the services that they provide.¹⁶

PSYCHOPHYSIOLOGIC THERAPY

This section summarizes the use of biofeedback and relaxation therapy for tension-type and migraine headache based on representative controlled studies, reviews, or meta-analysis. Biofeedback is a therapeutic modality in which information about a specific physiologic function is provided to patients to increase awareness and improve control of that function. Reinforcement is provided by the feedback for lowered arousal. Electromyographic (EMG) biofeedback and thermal biofeedback coupled with relaxation therapy are used for tension-type and migraine headache. EMG biofeedback facilitates decreased muscle tension and thermal biofeedback is used to train increased hand temperature. Cognitive-behavioral therapy is sometimes incorporated into psychophysiology therapy.¹⁷

Tension-Type Headache

An early, small study¹⁸ entailed a controlled comparison of 3 groups totaling 31 persons with tension-type headaches. Group 1 received EMG biofeedback and were encouraged to alter cognitive and behavioral responses to symptoms, while the second group (meditation) concentrated on increasing body awareness and developing mental control. The monitoring group (group 3) received no therapy. Group 1 evidenced a 66% reduction in number of headaches 1 month after treatment, while groups 2 and 3 showed only a 12% decrease.¹⁸

In a larger study,¹⁹ 311 tension-type headache patients were assigned at random to 4 groups: relaxation therapy, transcutaneous nerve stimulation, EMG biofeedback, or 2 of the therapies combined. Outcome analysis showed that the biofeedback techniques were most effective in decreasing intensity and frequency of headache posttreatment. The addition of biofeedback to relaxation alone was highlighted in a study of 34 subjects²⁰ with chronic headache who were treated with relaxation therapy plus noncontingent feedback or EMG biofeedback/relaxation therapy for 8 weeks. EMG biofeedback/relaxation therapy was more effective than relaxation therapy alone.

EMG biofeedback/relaxation therapy has also been studied in a reduced therapist contact framework, where less than 6 treatment sessions are provided and home practice of relaxation is emphasized. Meta-analysis of 10 studies in which EMG biofeedback/relaxation therapy with limited therapist contact was used found a 48% decrease in headache.²¹ Reducing therapist time with no loss of efficacy has important cost implications for primary care.

Two reviews are mentioned here to serve as a summary of the data on EMG biofeedback in tension-type headache. An assessment was conducted by a National Institutes of Health (NIH) panel on efficacy of behavioral and relaxation therapies in chronic pain. EMG biofeedback was found to be more effective than psychological placebo but equivalent to relaxation therapy for tension-type headache.²² In a meta-analytic review of 78 articles with 2866 patients, cognitive therapy, relaxation therapy, or EMG biofeedback alone or combined with relaxation therapy were superior to no treatment or to pseudo placebo therapy.²³

Maintenance of therapeutic effects after the end of formal treatment is an important consideration in recommending EMG biofeedback to patients.²⁰ Nine tension-type headache patients treated with EMG biofeedback/relaxation therapy were followed for 5 years after treatment using a headache index computed from a 4-week headache diary. Seventy-eight percent of the tension-type headache patients remained improved.²⁴ Stability of improvement in patients treated with reduced therapist contact was similar.²⁵

In children, adolescents, and the elderly, investigations of biofeedback or relaxation therapy are more limited, but available data support the efficacy of various nonpharmacologic treatments in children and adolescents.²⁶⁻²⁸ Preliminary results in the elderly are also promising,^{29,30} but further research is needed to substantiate efficacy.

Migraine Headache

The NIH panel also reviewed the literature on migraine headache and found biofeedback to be better than relaxation therapy and no treatment, but the advantage of biofeedback over psychological placebo was less clear for migraine than for tension-type headache.²² In a large study (N = 392),¹⁹ patients were assigned to relaxation therapy, transcutaneous nerve stimulation, thermal biofeedback, or 2 therapies combined. Thermal biofeedback was most effective in decreasing headache. Clinically and statistically significant reductions in pain intensity and frequency were based on the daily headache diary kept by patients.

Biofeedback has been contrasted with medical therapy in migraine. The effects of thermal biofeedback/relaxation therapy with minimal therapist contact in 18 patients were compared to results of abortive ergotamine tartrate combined with compliance training in 19 patients.³¹ Patients were diagnosed with migraine or mixed migraine and tension headache. A headache index, indicating frequency, intensity, and duration of headache, was the outcome measure. Medical therapy produced a 30% decrease in the first month and 11% more later. Biofeedback yielded a 26% reduction within the second month and 26% more at posttreatment. Furthermore, 78% of the patients in the biofeedback and 40% in the medication group decreased analgesic use by at least 50% at the posttreat-

ment assessment.³¹ In another study, thermal biofeedback was compared with biofeedback combined with propranolol in a minimal therapist contact format. The combined therapy yielded a 79% improvement rate, while biofeedback alone produced a 54% decrease in headache.³²

Data from 25 clinical trials evaluating propranolol and 35 trials evaluating thermal biofeedback/relaxation therapy in a total of 2445 subjects with migraines were integrated for meta-analysis. Controls either received placebo medication or only monitored headaches. Based on subjects' diary, 43% improvement in headache was observed in both the propranolol and biofeedback groups; based on physician/therapist assessment, 63% improvement was documented. Placebo resulted in 14% improvement, and no improvement occurred with monitoring.³³

A controlled comparison tested the effect of thermal biofeedback (16 sessions in 8 weeks) in 116 patients divided into 4 groups: thermal biofeedback and progressive relaxation, thermal biofeedback and cognitive therapy, pseudomeditation, and monitoring only.³⁴ The biofeedback groups had a significantly reduced number of headaches compared with controls and maintained these improvements at 3 months. The thermal biofeedback and cognitive therapy groups also reduced their intake of medication.³⁴ Most of the empirical headache studies on biofeedback/relaxation therapy include patients who are taking medication. Patients participating in research studies are not required to discontinue analgesic use or other prescribed medicine in order to participate. An important conclusion from the studies of combined pharmacotherapy and psychophysiologic interventions is that biofeedback/relaxation therapy can be utilized concomitantly and successfully in medicated patients.³⁵

A 12-session combination of EMG biofeedback/relaxation therapy (4 sessions) and thermal biofeedback/relaxation therapy (8 sessions) was tested in 48 patients in 2 randomized controlled studies.^{36,37} Controls relaxed on their own with no instructions. Cerebral blood flow was measured with transcranial Doppler ultrasonography in both groups. A headache index and medication log were used as outcome measures. Biofeedback/relaxation therapy provided a significant advantage over self-relaxation in decreased pain and medication usage. Improvements in pain were related to decreases in cerebral blood flow velocity in the middle cerebral artery, but no changes were observed in blood flow velocity in the basilar or ophthalmic arteries.^{36,37} Minimal therapist contact biofeedback/relaxation therapy treatment is also effective in migraine.²⁷ A meta-analysis was conducted of 9 studies in which patients received an average of 3 sessions. Headache activity decreased by an average of 51%, a similar percent improvement to that found in longer protocols.²¹ Long-term follow-up studies of migraine patients treated with biofeedback/relaxation therapy suggest that improvements made during treatment are maintained.³⁸

Thermal biofeedback/relaxation therapy has been studied in children, adolescents, and the elderly with migraine. In pediatric migraine, a recent meta-analysis based on effect size reflected pretreatment-to-posttreatment changes in headache activity with various pharmacologic and nonpharmacologic treatments.³⁹ Nonpharmacologic treatments were compared with one another, pharmacologic prophylactic approaches were compared with one another, and the 2 types of treatment were compared with each other. Outcomes for thermal biofeedback/relaxation therapy exceeded those obtained by multicomponent treatments (3 or more behavioral treatments combined), calcium-channel blockers and serotonergic agents, psychological and drug placebos, and wait-list controls. Both active medications exceeded drug placebo. Behavioral treatments of childhood migraine have been shown to be adaptable to less intensive delivery models, without any loss in effectiveness, making them more cost-effective and cost-competitive.^{27,28,40} Thus, treatment approaches incorporating behavioral components can be valuable to young migraine patients; in fact, children may be particularly well suited to nonmedical approaches.⁴¹ Research in the elderly shows promise, but more extensive investigations are necessary to document efficacy.⁴²

Efforts to characterize headache patients most likely to respond to biofeedback/relaxation therapy are not prolific. Besides children, pregnant women⁴³ and women of childbearing potential⁴⁴ may benefit from nonpharmacologic therapy for pain control. A review of psychophysiologic headache therapy results performed in Italy suggests that the best candidates for biofeedback are young motivated patients with a brief history of headache who have not previously received extensive pharmacotherapy.⁴⁵ The presence of psychopathology in migraine patients would require additional assessment and treatment.

In summary, over 100 empirical studies are available with which to judge the efficacy of the most widely used behavioral therapies for migraine and tension-type headache. Recent meta-analyses of this literature have shown that biofeedback/relaxation therapy and stress-management training (i.e., cognitive-behavioral) therapies have yielded, on average, about a 50% reduction in headache activity from pretreatment to posttreatment.^{46,47} These improvement scores have proved significantly better than those reported for wait-list control groups (which yield on average less than 5% improvement) and medication placebo groups (yielding about a 15% improvement for migraine).⁴⁶⁻⁴⁸ Longer term studies, though less numerous, suggest that improvements are stable over time.

In 1994, the Agency for Health Care Policy and Research (AHCPR) commissioned a new meta-analysis of this literature to serve as the scientific basis for their Headache Treatment Guideline Project. This project was designed not only to update the previous meta-analyses, but

to provide a highly rigorous new analysis of the published literature. The AHCPR final report⁴⁹ considers only migraine headache and concluded that behavioral treatments have a consistent body of research supporting their efficacy. Thermal biofeedback, relaxation therapy, and cognitive-behavioral therapy were found to be at least moderately effective in alleviating migraine when compared with wait-list control (standardized effect size scores ranging from 0.6 to 1.3). For tension headache, other meta-analysis showed that EMG biofeedback, relaxation therapy, and cognitive-behavioral therapy were at least moderately effective in alleviating tension-type headache relative to wait-list controls (effect size scores from 0.7 to 1.1).⁵⁰

PSYCHOSOCIAL FACTORS RELEVANT TO HEADACHE

In addition to the demographic variables discussed earlier,^{1,3,8,9} psychosocial risk factors have been empirically associated with incidence of headache. These include affect, social support, life events, hypnotizability, and negative thinking. Trait negative affectivity refers to the predisposition to a wide range of aversive mood states, like anxiety or depression, that are stable across time, independent of objective stress,⁵¹ and partially genetically determined.^{52,53} Trait negative affectivity is elevated in chronic headache⁵⁴ and has been related to overreporting of somatic symptoms like headache pain independent of organic disease.⁵⁵⁻⁵⁷

Catastrophizing is marked by an overlearned and automatic conscious tendency to become cognitively absorbed in negative anticipations and negative self-statements about specific sensory events. Catastrophizing verbalizations amplify the threatening properties of even minimally aversive sensory cues⁵⁸ and similarly can maximize the experience of acute or chronic headache pain.⁵⁹⁻⁶¹

Hassles, or minor but frequent stressors, are associated prospectively^{62,63} and retrospectively^{62,64,65} with migraine and other types of chronic headache pain. Major life events such as divorce, surgery, and deaths of close family members induce negative affect and require adjustment to change. Those events in the prior year have been modestly related to the persistence of headache.⁶⁴

Social support is the degree of emotional help and information received from formal or informal social contacts with persons or groups.^{61,66} Paradoxically, but consistent with operant conditioning theory, social support can amplify chronic pain behaviors,^{67,68} but may attenuate other forms of sympathetic reactivity to stressful events.^{69,70}

High hypnotizability, the ability to be hypnotized, and deep absorption in sensory or imagined experiences were correlated with a greater experience of chronic pain.^{61,71-76} Healthy, highly hypnotizable college students, outside of hypnosis, were more sensitive to acute sensory pain than a

Table 1. Biofeedback/Relaxation Program^a

Step 1	Clinical interview and assessment Begin daily headache log
Step 2	Develop awareness of overarousal and tension Diaphragmatic breathing Presentation of progressive muscle relaxation Begin home practice with audiotapes and script
Step 3	EMG biofeedback to learn difference between relaxed and tense muscles
Step 4	Presentation of passive relaxation utilizing imagery and breathing as relaxation cues
Step 5	For tension-type headache, continue EMG feedback until patient can reliably decrease tension by about 50%; emphasize facial, neck, and shoulder relaxation For migraine headache, utilize thermal biofeedback and passive relaxation; continue until patient reliably can warm hands to 95°F
Step 6	Generalize relaxation through frequent short relaxation exercises Utilize techniques at headache onset
Step 7	Decreased frequency of sessions. Terminate.

^aAbbreviation: EMG = electromyographic.

matched control group.⁷⁷ A positive correlation between pretherapy migraine pain intensity and high hypnotizability has also been proposed.⁷⁸ Thus, it is important to consider not only demographic but also psychosocial factors in determining the risk for headache and choosing the most appropriate therapy.

PROTOCOL FOR PSYCHOPHYSIOLOGIC THERAPY IN PRIMARY CARE (Table 1)

A typical program comprises between 8 and 15 sessions of biofeedback/relaxation therapy, each about 40 minutes long, the exact number determined by clinical judgment and patients' progress.^{79,80} The clinical interview is performed to determine symptom history and past treatment, daily activities, lifestyle, and pain-coping strategies. The evaluation already performed by the primary care physician need not be duplicated, but can be briefly reviewed by the practitioner. Patients begin to keep a daily headache diary to record throughout treatment the frequency, intensity, and duration of headache and medication utilized. Patients maintain pharmacotherapy as prescribed by the physician, until reductions in pain have occurred. Short questionnaires are utilized to assess the psychosocial risk factors. If there are indications of overt psychopathology, particularly of depression, further in-depth assessment and treatment by a mental health professional are recommended. A psychophysiological profile, consisting of measurements of forehead muscle tension by electromyograph and peripheral skin temperature by thermal device, is conducted under resting and stress conditions. Blood pressure and pulse rate can be retrieved from the patient's chart if these are appropriate indicators of stress. Therapeutic goals, such as learning control of

physiologic responses related to overarousal, are explained to the patient. Better control of headache is conceptualized as occurring through learning lower arousal, which translates into decreased muscle contraction and increased skin blood flow.⁸¹ Sensors are placed on the forehead, back of neck or shoulders,⁸² and index finger.

For patients of low or moderate hypnotic ability, biofeedback should be used first to induce physiologic relaxation,^{83,84} while for those high in hypnotizability, verbal instruction procedures, self-hypnosis, or relaxation are most effective.^{73,85,86} Later, patients' cognitions can be shaped to improve recognition of negative affect and the contributory role of negative mood to the perception of pain. Deep breathing, concentrating on relaxing self-statements, or progressive relaxation is coupled with biofeedback.^{87,88} Clearly written scripts can be obtained, modified for individual patients, tape-recorded, and provided to them.⁸⁹ Patients are encouraged to practice relaxation daily with the audiotapes and scripts. The headache diary is reviewed at each session, and biofeedback data from each session are used to document and reinforce progress. Generalization is promoted by the use of short periods of relaxation throughout the day to heighten body awareness and reduce physiologic arousal when it develops. Cognitive-behavioral therapies are incorporated in therapy as necessary to improve coping, alter pain perception,⁷⁸ and reduce tendencies toward catastrophizing.^{61,73,90} During the termination process, the headache log is reviewed by the physician and recommendations for adjustments in medication are transmitted to the patient. Limited therapist paradigms are appropriate for motivated patients with uncomplicated headache, without psychopathology, who do not overuse analgesics and who are generally adherent to physician recommendations.

CONCLUSION

Psychophysiological therapy is effective for tension-type and migraine headache either as sole therapy for mild-to-moderate headache or combined with pharmacotherapy. The combined treatment is currently underutilized in primary care.⁴⁴ Biofeedback/relaxation therapy services are most likely to be used by primary care patients if they are offered within an outpatient primary care service.^{73,74} Biofeedback emphasizes the physiologic aspects of patients' symptoms, later incorporating the psychological or stress-related aspects. The sensations of physiologic relaxation (heaviness and warmth) occurring in a secure medical setting facilitate acceptance of mind-body interactions. Locating psychophysiological services within primary care instead of a psychiatric practice reduces the association of psychophysiological therapy with mental illness and increases the probability that patients will follow through with the referral for psychophysiological services.

Drug names: ergotamine tartrate (Ergomar and others), propranolol (Inderal and others).

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