Biofeedback for chronic pain

Clinical Policy ID: CCP.1151

Recent review date: 2/2026

Next review date: 6/2027

Policy contains: Non-malignant musculoskeletal pain; primary headache disorders.

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Coverage policy

Biofeedback is clinically proven and, therefore, may be medically necessary for the treatment of any of the following indications:

- Thermal or electromyography biofeedback, alone or in combination with behavioral modalities, for treatment of migraine headache in members ages 16 years or older (Martino Cinnera, 2023; Nestoriuc, 2008a).
- Electromyography biofeedback with or without relaxation therapy for treatment of tension-type headache in children, adolescents, and adults (Nestoriuc, 2008b).
- Electromyography biofeedback for treatment of chronic low back pain (Qaseem, 2017; Sielski, 2017).
- Electromyography biofeedback for muscle re-education of specific muscle groups or treatment of either pathological (disease-based) muscle abnormalities of spasticity or incapacitating muscle spasm or weakness, when more conventional treatments (e.g., heat, cold, massage, exercise, support) have not been successful (Castelnuovo, 2016).

Members must meet all of the following criteria:

- Demonstrate motivation to actively participate in the treatment plan and responsiveness to the care plan requirements (e.g., practice and follow-through at home).
- Are capable of participating in the treatment plan (physically and cognitively).
- Have a condition that can be appropriately treated with biofeedback (i.e., there is no pathology to prevent success of the treatment).
- The biofeedback therapy is performed by a licensed health care professional with training in biofeedback.

Limitations

All other uses of biofeedback are investigational/not clinically proven and, therefore, not medically necessary.

Alternative covered services

Physician office visits, pharmacotherapy, physical therapy, and behavioral health treatments.

Background

Pain is a subjective and individual experience, and biobehavioral pain techniques (i.e., relaxation techniques, cognitive-behavioral treatment, and biofeedback) have been proposed to modulate pain processing and reduce pain (Kropp, 2013). Biobehavioral treatment strategies focus on “unlearning” of pain and on modification of pain triggers and conditions that reinforce and maintain pain.

Biomechanical and physiological responses are the two groups used in biofeedback. The body’s activity and movement are measured via biomechanical techniques using simple or complex sensors. Physiologic activity is measured by differing means. Electromyography is frequently used to measure muscle movement, and other modes are used to measure heart, lung, and skin activity. Different forms of biofeedback have been used as an adjunct to physical therapy for more than 50 years. The most common biofeedback use, aside from neuromuscular retraining, is the treatment of chronic pain, anxiety, and incontinence, by impacting the sympathetic nervous system response (Malik, 2023).

Biofeedback therapy uses visual, auditory, or other feedback signals to help patients improve certain bodily functions that are either under involuntary or voluntary control to alleviate an abnormal bodily condition. Biofeedback is based on the principle that a desired response learned by the member, can and will affect a desired physiological response. Patients need to be able to understand analog and digital signals received from an auditory or visual display. They must be self-motivated to perform via observation learning (Malik, 2023).

The goal of biofeedback treatment is to learn to actively change a normally involuntary physiologic function into a desired direction, by feeding the function back visually or acoustically so it can be perceived consciously by the patient (Kropp, 2013). The effects of biofeedback can be measured by monitoring skin temperature, skin conductance, galvanic skin response, muscle tension using electromyography, heart rate using electrocardiography, and brain wave activity using electroencephalography, also known as neurofeedback. While the mechanisms by which biofeedback acts to control pain or prevent the onset of headache are not understood completely, the cognitive processes of attention, expectancy, and memory may help to understand how non-pharmaceutical methods achieve pain relief (Sieberg, 2012).

A specific biofeedback license is not universally required; however, services must be delivered consistent with applicable state law, scope-of-practice rules, and facility credentialing requirements. Biofeedback therapists are

often licensed in another healthcare field and practice according to those guidelines. Because of its potential effects on physiology, the Association for Applied Psychophysiology and Biofeedback (2020) recommends that biofeedback therapy involve a trained therapist, a motivated patient, and a monitoring instrument capable of providing accurate physiological information.

Findings

The evidence base for biofeedback in chronic pain management varies considerably by indication and biofeedback modality. Clinical practice guidelines and consensus statements support the use of electromyography and thermal biofeedback as adjunctive treatment for migraine, tension-type headache, and chronic low back pain in appropriate candidates. For other chronic pain conditions including fibromyalgia, temporomandibular disorders, and chronic neck pain, the evidence remains limited and often inconclusive. Systematic reviews and meta-analyses generally demonstrate modest effects on pain outcomes, though effect sizes are frequently small and confidence intervals often cross zero. The overall quality of evidence is typically rated as low to insufficient due to methodological limitations including small sample sizes, heterogeneity of biofeedback protocols, risk of bias related to blinding challenges, and lack of long-term follow-up data. Electroencephalography biofeedback, also known as neurofeedback, lacks sufficient evidence to support its use for chronic pain conditions. Biofeedback is generally regarded as a safe intervention, although adverse effects have not been systematically reviewed; headache, nausea, and drowsiness are commonly reported.

Guidelines

Professional society guidelines and consensus statements provide varying levels of support for biofeedback depending on the clinical indication. For primary headache disorders, the American Headache Society consensus statement notes that biobehavioral therapy, including biofeedback, may be appropriate for acute and preventive treatment of migraine in adults (Ailani, 2021). These therapies may be particularly beneficial for patients who prefer nonpharmacologic interventions, have inadequate response or poor tolerance to pharmacologic treatments, have medical contraindications to specific medications, are pregnant or lactating or planning to become pregnant, have a history of acute medication overuse or medication overuse headache, exhibit significant stress or deficient stress-coping skills, or have high migraine-related disability or low health-related quality of life or comorbidities. The American Academy of Neurology and the American Headache Society guideline on acute migraine treatment in children and adolescents does not mention biofeedback (Oskoui, 2019).

A joint Department of Veterans Affairs and Department of Defense clinical practice guideline for headache management found insufficient evidence to recommend for or against biofeedback delivered through a smartphone application based on heart rate variability monitoring (Sico, 2024). This conclusion was based on one randomized controlled trial that failed to demonstrate a difference in disability or quality of life outcomes in individuals with migraine who received smartphone-based biofeedback compared with a waitlist control group.

For chronic low back pain, the American College of Physicians recommends electromyography biofeedback as an initial non-pharmacologic treatment option (Qaseem, 2017). In contrast, a joint Department of Veterans Affairs and Department of Defense clinical practice guideline for low back pain did not address biofeedback as a non-pharmaceutical treatment option (Macedo, 2024).

Few clinical practice guidelines include or recommend biofeedback for other types of chronic musculoskeletal pain. Guidelines addressing chronic knee pain from the American Academy of Orthopaedic Surgeons (2021), the American Society of Pain and Neuroscience (Hunter, 2022), and the American Academy of Family Physicians (Jones, 2015) do not recommend biofeedback. Similarly, clinical practice guidelines for temporomandibular disorders from Busse (2023) and the American Association of Oral and Maxillofacial

Surgeons (2024) do not include biofeedback among recommended interventions. The Italian Consensus Conference on Pain in Neurorehabilitation provided recommendations for treating various types of neuromuscular pain, but only tension-type headache and migraine were supported by high-quality evidence; all other indications were based on case reports, small case series, or expert opinion (Castelnuovo, 2016).

Systematic reviews

Systematic reviews examining biofeedback for primary headache disorders span several decades of research. Two seminal reviews established the foundation for guideline recommendations regarding biofeedback for migraine and tension-type headache (Nestoriuc, 2008a; Nestoriuc, 2008b). More recent systematic reviews have updated these findings. A systematic review of psychological treatments for headache disorders found that biofeedback may reduce the frequency and duration of headache attacks depending on the outcome measure used (Lee, 2019). Evidence for disability and quality-of-life outcomes is limited and inconsistent across studies, and variation in protocols across studies may have influenced effect sizes and the variability of results.

A comprehensive 2025 systematic review evaluated behavioral interventions for migraine prevention in adults across 50 trials with 6,024 participants and in children and adolescents across 13 trials with 1,444 participants (Treadwell, 2025). For adults, the strength of evidence for biofeedback was rated as insufficient to permit conclusions. For children and adolescents, evidence for biofeedback alone was inconclusive, though a combined intervention incorporating cognitive behavioral therapy, biofeedback, and relaxation training demonstrated improvements in attack frequency and disability with low strength of evidence. Another 2025 systematic review of nine randomized trials in 558 adults with migraine found that disability and quality-of-life outcomes could only be assessed qualitatively due to data limitations, with mixed results across individual trials (Paudel, 2025). The authors noted methodological limitations including risk of bias, small sample sizes, and heterogeneity of biofeedback protocols.

For chronic musculoskeletal pain conditions other than low back pain, systematic reviews of biofeedback performed alone or as adjunctive therapy have produced inconclusive or conflicting results. The overall study quality is very low, and studies generally lack long-term follow-up data and comparisons to placebo controls. Systematic reviews have addressed biofeedback for temporomandibular disorders (González-González, 2025), chronic neck pain (Campo, 2021; Tsiringakis, 2020), shoulder pain (Kamonseki, 2021), patellofemoral pain syndrome (Ferlito, 2024; Souto, 2024), and osteoarthritis of the knee (French, 2024).

For fibromyalgia, systematic reviews have examined both electromyography and electroencephalography biofeedback with limited conclusions. A systematic review including three studies found that while electromyography biofeedback improved pain symptoms in some patients, all studies were significantly flawed, preventing any firm conclusions (Steen, 2024). Another systematic review examined 17 studies of electroencephalography biofeedback for fibromyalgia and associated symptoms (Torres, 2024). The most commonly used method was traditional electroencephalography neurofeedback based on a sensorimotor rhythm protocol, but wide variation in study protocols prevented generalization of findings to clinical populations.

For electroencephalography biofeedback in chronic pain more broadly, a systematic review found insufficient evidence to support its use (Hesam-Shariati, 2022). Most studies applied neurofeedback targeting reinforcement of either alpha or sensorimotor rhythms while suppressing theta or beta bands on one brain region at a time. While a modest, short-term analgesic effect on pain intensity may be achieved, higher-quality studies are needed to confirm these findings.

Systematic reviews have also examined biofeedback for other chronic pain conditions with limited and low-quality evidence. These reviews suggest biofeedback may be effective for treating pain and associated symptoms in patients with chronic pelvic pain including anorectal disorders, chronic prostatitis, and female pelvic pain

disorders (Byrnes, 2022; Evans, 2019; Wagner, 2022), irritable bowel syndrome (Scaciota, 2021), sickle cell disease (van Veelen, 2023), spinal cord injury (Allison, 2024), and post-stroke shoulder-hand syndrome (Feng, 2023). Further research is needed to confirm a role for biofeedback as a standalone or adjunctive treatment for these conditions.

Meta-analyses

Meta-analyses provide quantitative estimates of biofeedback effectiveness across pooled studies. For primary headache disorders, most evidence was published prior to 2000 and includes adult and pediatric participants with predominantly tension-type and migraine headache disorders. Studies generally contained moderate to high risk of bias. The few randomized controlled trials published since 2000 generally support the effectiveness of electromyography biofeedback to reduce headache symptoms in adult and pediatric populations when compared to no treatment, placebo controls, and relaxation techniques. There is insufficient evidence to support biofeedback as treatment for other primary headache disorders.

A meta-analysis of 29 studies found that approximately one-third of the studies on biofeedback achieved results comparable to drug therapy in some patients for durations longer than one year, with a low risk of side effects (Martino Cinnera, 2023). Treatment with electromyography biofeedback appeared to reduce the intensity of headache pain, though the pooled effect did not reach statistical significance (Hedges g effect size 0.21, 95 percent confidence interval −0.02 to 0.44; P = .07; n = 293).

A 2025 meta-analysis of nine randomized trials in 558 adults with migraine found that biofeedback reduced headache frequency compared with waiting-list controls (mean difference −0.2, 95 percent confidence interval −0.39 to −0.01; P = .03), with no significant difference compared with active treatments including pharmacotherapy (Paudel, 2025). Another 2025 meta-analysis found that for adults with migraine, biofeedback versus control produced a pooled standardized mean difference of −0.37 (95 percent confidence interval −0.87 to 0.12), with the strength of evidence rated as insufficient to permit conclusions (Treadwell, 2025). In children and adolescents, a combined cognitive behavioral therapy plus biofeedback plus relaxation training intervention improved attack frequency by −1.6 migraine days per month (95 percent confidence interval −2.7 to −0.4) and disability by −14 points on the Pediatric Migraine Disability Assessment (95 percent confidence interval −25 to −3), with low strength of evidence. A network meta-analysis for pediatric migraine found biofeedback was significantly more effective than waiting-list controls in the short term (standardized mean difference 1.41, 95 percent confidence interval 0.64 to 2.17; three studies) with effects maintained up to three to four months after randomization (Koechlin, 2021).

For chronic low back pain, a meta-analysis of 21 studies with 1,062 participants demonstrated the efficacy of biofeedback as a standalone and adjunctive treatment in reducing pain intensity (Hedges g = 0.60, 95 percent confidence interval 0.44 to 0.76) (Sielski, 2017). Treatment effects were stable over an average follow-up period of eight months. Biofeedback also significantly reduced depression, disability, and muscle tension, and improved cognitive coping.

For temporomandibular disorders, a 2025 network meta-analysis of nine trials with 758 participants found no statistically significant differences between biofeedback and other interventions for pain intensity (González-González, 2025). The comparison of biofeedback versus no intervention produced a standardized mean difference of −0.123 (95 percent confidence interval −0.677 to 0.430). The authors characterized biofeedback as having comparable efficacy to other interventions and potential complementary value within a biopsychosocial treatment approach.

For fibromyalgia, a meta-analysis of seven studies with 321 adults found that electromyography biofeedback, but not electroencephalography biofeedback, significantly reduced pain intensity compared with control groups

(Hedges g = 0.86, 95 percent confidence interval 0.11 to 1.62) (Glombiewski, 2013). Biofeedback did not reduce sleep problems, depression, fatigue, or health-related quality of life compared with control groups, and long-term results were lacking.

In 2026, we restructured the findings section and incorporated three 2025 publications: a systematic review and meta-analysis of biofeedback for migraine (Paudel, 2025), a comprehensive systematic review of behavioral interventions for migraine prevention (Treadwell, 2025), and a network meta-analysis of biofeedback for temporomandibular disorders (González-González, 2025). The new evidence reinforced that biofeedback demonstrates modest effects on headache frequency compared with waiting-list controls, that evidence for biofeedback alone in adults with migraine remains insufficient to permit conclusions, and that combined behavioral interventions may be more effective than single-modality approaches in pediatric populations. No policy changes are warranted.

References

On January 16, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “neurofeedback” (MeSH), “biofeedback, psychology” (MeSH), “pain” (MeSH), “pain management” (MeSH), “headache disorders” (MeSH), and “headache” (MeSH), “musculoskeletal diseases/rehabilitation” (MeSH), and “musculoskeletal diseases/therapy” (MeSH). We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

2/2014: initial review date and clinical policy effective date: 6/2015

2/2017: Policy references updated.

2/2018: Policy references updated. Policy changed.

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2/2020: Policy references updated.

2/2021: Policy references updated.

2/2022: Policy references updated.

2/2023: Policy references updated.

2/2024: Policy references updated.

2/2025: Policy references updated.

2/2026: Policy references updated.

Related Codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1151. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code Description
90901	Biofeedback training, any method

90875	Individual psychophysiological therapy incorporating biofeedback training by any modality; face-to-face with the patient, with psychotherapy (e.g., insight oriented, behavior modifying or supportive psychotherapy)
90876	Individual psychophysiological therapy incorporating biofeedback training by any modality; face-to-face with the patient, without psychotherapy
E0746	Electromyograph, biofeedback device