Biofeedback as a treatment of chronic pain, including but not limited to low back pain, is considered **investigational**.

**Policy Guidelines**

**Note:** Some Blue Shield of California (BSC) plans exclude coverage of biofeedback. Please check benefit plan descriptions for details.

**Biofeedback devices:** Unsupervised home use of a biofeedback device has not been well studied, and further is excluded from coverage per Blue Shield Evidence of Coverage (EOC) General Exclusions and Limitations.

**Description**

Biofeedback is a technique intended to teach patients self-regulation of certain physiologic processes not normally considered to be under voluntary control. Electromyography biofeedback has been evaluated as a method to reduce chronic or recurrent pain of musculoskeletal or psychosomatic origin.

**Related Policies**

- Biofeedback as a Treatment of Fecal Incontinence or Constipation
- Biofeedback as a Treatment of Headache
- Biofeedback as a Treatment of Urinary Incontinence in Adults
- Biofeedback for Miscellaneous Indications
- Neurofeedback

**Benefit Application**

Benefit determinations should be based in all cases on the applicable contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control. Please refer to the member’s contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

Some state or federal mandates [e.g., Federal Employee Program (FEP)] prohibits plans from denying Food and Drug Administration (FDA)-approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of FDA-approved technologies on the basis of medical necessity alone.

**Regulatory Status**

Since 1976, a large number of biofeedback devices have been cleared for marketing by the U.S. Food and Drug Administration through the 510(k) process. Food and Drug Administration product code: HCC.
Rationale

Background
Treatment for chronic pain is often multimodal and typically includes psychological therapy. Psychological techniques vary but may include cognitive therapy, which teaches subjects the ability to cope with stressful stimuli by attempting to alter negative thought patterns and dysfunctional attitudes, and behavioral approaches to reduce muscle tension and break the pain cycle. Relaxation, using any of a variety of techniques including meditation or mental imagery, is considered a behavioral therapy that may be used alone or as a component of a cognitive-behavioral therapy program. Electromyography biofeedback also has been used for the treatment of chronic pain, on the assumption that the ability to reduce muscle tension will be improved through feedback of data to the patient regarding degree of muscle tension. While some consider electromyography biofeedback to be a method used to obtain relaxation, others consider biofeedback to be distinct from other relaxation techniques.

Biofeedback provides physiologic information not normally available to the patient, with a concerted effort employed by the patient to use this feedback to help alter the physiologic process in some specific way. Biofeedback training is done either in individual or group sessions, alone or in combination with other behavioral therapies designed to teach relaxation. A typical program consists of 10 to 20 training sessions of 30 minutes each. Training sessions are performed in a quiet, nonstimulating environment. Patients are instructed to use mental imagery techniques to affect the physiologic variable being monitored, and feedback is provided for successful alteration of that physiologic parameter in the form of lights or tone, verbal praise, or other auditory or visual stimuli.

Literature Review
This evidence review was informed by a 1995 Blue Cross Blue Shield Association Technology Evaluation Center (TEC) Assessment, which concluded that evidence was insufficient to demonstrate the effectiveness of biofeedback for treatment of chronic pain.

Psychological treatments involve both nonspecific and specific therapeutic effects. Nonspecific effects, sometimes called placebo effects, occur as a result of contact with the therapist, positive expectations on the part of the patient and therapist, and other beneficial effects that occur as a result of the patient being in a therapeutic environment. Specific effects are those that occur only because of the active treatment, beyond any nonspecific effects that may be present. This literature review focuses on identifying evidence that the effects of biofeedback are distinct from nonspecific placebo effects. Because establishing an ideal placebo control is problematic with psychological treatments and because treatment of chronic pain is typically multimodal, isolating the specific contribution of biofeedback is challenging. An ideal study design would be a randomized controlled trial (RCT) comparing biofeedback with a sham intervention; an alternative design would be an RCT comparing an intervention such as exercise with and without the addition of biofeedback. The following is a summary of the key literature to date.

Biofeedback
General Chronic Pain
Several meta-analyses were identified that reviewed RCTs on psychological therapies for a variety of nonheadache chronic pain conditions. A 2009 Cochrane review by Eccleston et al focused on chronic pain in adults. Two RCTs were identified that compared behavioral therapy with an active control designed to change behavior (i.e., exercise or instruction). Three RCTs had sufficient follow-up to be included in a comparison of behavioral therapy vs usual treatment. Reviewers found that although the quality of trial design had improved over time, there were too few studies to achieve a meaningful conclusion about the effects of behavioral therapy on pain, disability, or mood.
Another 2009 Cochrane review by Eccleston et al focused on children and adolescents with chronic and recurrent pain.³ Although psychological therapies were found to improve pain, only one of the 5 studies on nonheadache pain evaluated biofeedback. Biofeedback was not found to improve abdominal pain more than cognitive-behavioral therapy (CBT) in this 2000 trial (published by Humphreys and Gervitz; see section on Abdominal Pain). In 2010, Palemò et al published an updated meta-analysis of studies on psychological therapies for the management of chronic pain in children and adolescents.⁵ Reviewers did not identify any new RCTs on biofeedback for managing nonheadache pain.

**Low Back Pain**

A 2010 Cochrane review on behavioral treatments for chronic low back pain included a meta-analysis of 3 small randomized trials that compared electromyography (EMG) biofeedback with a waiting-list control group.⁶ In the pooled analysis, there were a total of 34 patients in the intervention group and 31 patients in the control group. The standardized mean difference (SMD) in short-term pain was -0.80 (95% confidence interval [CI], -1.32 to -0.28); this difference was statistically significant favoring the biofeedback group. Reviewers did not conduct meta-analyses of trials comparing biofeedback with sham biofeedback and therefore were unable to control for any nonspecific effects of treatment.

At least 1 RCT has compared biofeedback with a sham intervention for treatment of low back pain. In 2010, Kapitza et al compared the efficacy of respiratory biofeedback with sham biofeedback in 42 patients with low back pain.⁷ All participants were instructed to perform daily breathing exercises with a portable respiratory feedback machine; exercises were performed for 30 minutes on 15 consecutive days. Patients were randomized to an intervention group that received visual and auditory feedback of their breathing exercises or to a control group that received a proxy signal imitating breathing biofeedback. Patients recorded pain levels in a diary 3 times a day, measuring pain on a 10-point visual analog scale (VAS). Both groups showed a reduction in pain levels at the end of the intervention period and at 3-month follow-up. Between-group differences were not statistically significant. For example, 3 months after the intervention, mean change in pain with activity was a reduction of 1.12 points in the intervention group and 0.96 points in the sham control group (p>0.05); mean change in pain at rest was a reduction of 0.79 points in the intervention group and 0.49 points in the control group (p>0.05).

Several trials with active comparison groups have not found that biofeedback is superior to alternative treatments. A 2010 study published by Glombiewski et al assessed whether the addition of EMG biofeedback to CBT improved outcomes in 128 patients with low back pain.⁸ Patients were randomized to one of 3 groups: CBT, CBT plus biofeedback, or a waiting-list control. Both treatments were found to improve outcomes including pain intensity compared with the waiting-list control (moderate effect size of 0.66 for pain intensity in the CBT plus biofeedback group). However, the addition of biofeedback did not improve outcomes over CBT alone.

More recently, in 2015, Tan et al evaluated 3 self-hypnosis interventions and included EMG biofeedback as a control intervention.⁹ This RCT enrolled 100 patients with chronic low back pain. After the 8-week intervention, reported reductions in pain intensity were significantly higher in the combined hypnosis groups than in the biofeedback group (p=0.042).

**Chronic Knee Pain**

In 2012, Collins et al published a systematic review and meta-analysis of RCTs on nonsurgical interventions for anterior knee pain.¹⁰ In a pooled analysis of data from 2 trials, there was no significant benefit of adding EMG biofeedback to an exercise-only intervention at 8 to 12 weeks (SMD = -22; 95% CI, -0.65 to 0.20).

**Chronic Neck and Shoulder Pain**

In 2011, Ma et al in Hong Kong published an RCT that included 72 patients with chronic (at least 3 months) computer work-related neck and shoulder pain.¹¹ Patients were randomized to 1 of 4
interventions that continued for 6 weeks: biofeedback, exercise, passive treatment (e.g., hot packs), or a control group receiving only an educational pamphlet. Members of the biofeedback group were given a portable EMG biofeedback machine and were instructed to use it for 2 hours daily while performing computer work. The exercise group was given an active routine to perform on their own for no more than 20 minutes, 4 times a day. At the postintervention follow-up, 60 (83%) of 72 participants were available for assessment (n=15 per group). By the end of the intervention, the average VAS and Neck Disability Index scores were significantly lower (improved) in the biofeedback group than in the other 3 groups. The mean VAS score postintervention was 1.87 in the biofeedback group and 2.10 in the exercise group (p<0.05).

Although this trial found a short-term benefit of a biofeedback intervention, the magnitude of difference in the VAS and NDI scores was small and of uncertain clinical significance. In addition, there were several methodologic limitations. The trial included a small sample size and had a substantial number of dropouts. The interventions were not balanced in intensity; e.g., the biofeedback intervention was more intensive (2 h/d) than other interventions (e.g., passive treatment), which received two 15-minute sessions per week. Long-term data were not available due to the low rate of follow-up; at 6 months, data were available on only 39 (54%) of 72 of participants, which was too small for meaningful analysis.

**Orofacial Pain**

A 2011 Cochrane review by Aggarwal et al identified 17 trials evaluating nonpharmacologic psychological interventions for adults with chronic orofacial pain (e.g., temporomandibular joint [TMJ] disorder). For studies reporting on short-term pain relief (≤3 months), a significantly greater reduction in pain was found for interventions that combined CBT plus biofeedback compared with usual care (2 studies; SMD=0.46; 95% CI, 0.02 to 0.90). However, when reviewers assessed results from studies reporting on long-term pain relief (≥6 months), no significant benefit was found with a combined intervention of CBT plus biofeedback, and there were no studies that compared CBT alone with CBT plus biofeedback. For studies reporting on biofeedback-only interventions, a pooled analysis of 2 studies on short-term pain relief did not find a significant benefit compared with usual care (SMD = -0.41; 95% CI, -1.06 to 0.25). There was only 1 study reporting long-term pain relief after a biofeedback-only intervention, so a pooled analysis could not be done. The authors concluded that there is weak evidence to support psychosocial interventions for managing chronic orofacial pain and the most promising evidence is for CBT, with or without biofeedback. They noted that the trials comprising the review were few in number and had a high risk of bias, and they recommended additional high quality trials be conducted.

The conclusions drawn from this Cochrane review are similar to those of previous systematic reviews on treatment of temporomandibular joint disorder. These older reviews also concluded that there was weak evidence that psychosocial/physical therapy interventions (including biofeedback) are beneficial for treating temporomandibular joint disorder and that, of the few studies available, they tended to be of poor methodologic quality.

**Fibromyalgia**

In 2013, Glombiewski et al published a systemic review and meta-analysis of RCTs reporting data on the efficacy of EMG and electroencephalography (EEG) biofeedback (i.e., neurofeedback) for treating patients with fibromyalgia. Reviewers identified 7 RCTs that compared EEG biofeedback with a control method in patients with fibromyalgia. Studies in which biofeedback was evaluated only as part of multicomponent interventions were excluded from the review. Three studies used EEG biofeedback, and four used EMG biofeedback (total N=321 patients). A sham intervention was used as a control condition in 4 studies, two using EEG biofeedback and two using EMG biofeedback. In a pooled analysis of the studies using EMG biofeedback, a significant reduction in pain intensity was found compared with a different intervention (effect size, Hedges g=0.86; 95% CI, 0.11 to 0.62). A pooled analysis of studies on EEG biofeedback did not find a significant benefit in pain reduction compared with control methods. Pooled analyses
of studies of EMG and EEG biofeedback did not find a significant benefit of either intervention on other outcomes such as sleep problems, depression, and health-related quality of life. None of the studies included in this review were of high quality, with the risk of bias assigned by reviewers being either unclear or high for all included studies. In addition, all of the studies reported on short-term outcomes, resulting in a lack of evidence on whether longer term outcomes are improved with these interventions. (For more information on EEG biofeedback, see Blue Shield of California Medical Policy: Neurofeedback.)

One of the larger RCTs on EMG biofeedback for fibromyalgia is a 1998 trial by Buckelew et al, which enrolled 119 patients; however, the trial did not follow a double-blind design. Patients were randomized to one of 4 treatment groups: (1) biofeedback/relaxation training, (2) exercise training, (3) combination treatment, and (4) an educational/attention control program. While the combination treatment group had better tender point index scores than other treatment groups, this trial did not address placebo effects or the impact of adding biofeedback to relaxation therapy. In another large, unblinded RCT that was published in 2002, van Santen et al evaluated 143 women with fibromyalgia, and biofeedback was compared with fitness training and with usual care. The primary outcome was pain measure on a VAS. Compared with usual care, the authors reported no clear improvements in objective or subjective patient outcomes with biofeedback (or fitness training). In a small, double-blind RCT (2007) from Asia, actual and sham biofeedback were compared for effects on pain, fitness, function, and tender points in 30 patients with fibromyalgia. Pain reduction as assessed on a VAS did not differ significantly between groups. The authors calculated that a sample size of 15 patients could detect a difference of 5 cm (on a 10-cm scale) on a VAS, suggesting that the trial lacked adequate power.

Abdominal Pain
In a study by Humphreys and Gevirtz (2000), 64 children and teenagers with diagnosed recurrent abdominal pain were randomized to groups treated with increased dietary fiber; fiber and biofeedback; fiber, biofeedback, and CBT; or fiber, biofeedback, CBT, and parental support. The similar nature of the 3 multicomponent treatment groups was associated with better pain reduction than the fiber-only group. This study did not address placebo effects.

In a 2003 systematic review of therapies for recurrent abdominal pain in children by Weydert et al, the behavioral interventions of CBT and biofeedback had a generally positive effect on nonspecific recurrent abdominal pain and were deemed safe. The specific effects of biofeedback were not isolated in this systematic review and therefore cannot be assessed.

Osteoarthritis
A 2012 systematic review by Macfarlane et al evaluated practitioner-based complementary and alternative medicine treatments (defined as any treatment not taken orally or applied topically) for osteoarthritis and identified 2 trials on biofeedback. One was an RCT from 2010 that assessed whether the addition of EMG biofeedback to strengthening exercises improved outcomes in 40 patients with knee osteoarthritis. After a 3-week treatment period, no significant differences between the 2 treatment regarding pain or quality of life were found. The other RCT, published in 2007, compared electrical stimulation with biofeedback-assisted exercise in 50 women with knee osteoarthritis. After 4 weeks of treatment, there were no statistically significant differences between groups in pain and functioning scores.

Systemic Lupus Erythematosus
In a 2004 RCT by Greco et al, of 92 patients with systemic lupus erythematosus (SLE), those treated with 6 sessions of biofeedback-assisted CBT for stress reduction had statistically greater improvements in pain posttreatment than a symptom-monitoring support group (p=0.044) and a group receiving usual care (p=0.028). However, these improvements in pain were not sustained at 9-month follow-up, and further studies are needed to determine the incremental benefits of biofeedback-assisted CBT over other interventions in patients with systemic lupus erythematosus.
Biofeedback as a Treatment of Chronic Pain

Vulvar Vestibulitis
A 2001 randomized study by Bergeron et al of 78 patients with dyspareunia resulting from vulvar vestibulitis compared treatment with electromyographic biofeedback, surgery, or CBT.24 Patients who underwent surgery had significantly better pain scores than patients who received biofeedback or CBT. No placebo treatment was used.

Summary of Evidence
For individuals who have chronic pain who receive biofeedback, the evidence includes multiple RCTs for different pain syndromes. Relevant outcomes are symptoms, functional outcomes, quality of life, and medication use. The results of these RCTs, some of which were sham-controlled, did not consistently report a benefit for biofeedback. Some RCTs reported improved outcomes with biofeedback, but these improvements were often of uncertain clinical significance or were not durable. Many other RCTs have found that biofeedback did not provide a significantly greater benefit in outcomes when it was used either instead of or in addition to other conservative interventions such as exercise. Overall, the available RCTs were limited by small sample sizes and high dropout rates. This evidence base does not permit conclusions about the specific effects of biofeedback beyond the nonspecific effects of sham interventions, nor does it permit conclusions about the contribution of biofeedback beyond that of other conservative treatments for pain. The evidence is insufficient to determine the effects of the technology on health outcomes.

Supplemental Information
Practice Guidelines and Position Statements

American College of Physicians
In 2017, the American College of Physicians issued clinical practice guidelines on noninvasive treatments for acute, subacute, and chronic low back pain.25 For patients with chronic low back pain, the guidelines recommended that initial treatment should be nonpharmacologic, such as “exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction, tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavior therapy or spinal manipulation” (strong recommendation).

European League against Rheumatism
In 2017, the European League Against Rheumatism issued recommendations on the management of fibromyalgia based on systematic reviews published through May 2015.26 The multidisciplinary group used the 4-point scale of Grading of Recommendations Assessment, Development, and Evaluation system for making recommendations (“strong for,” “weak for,” “weak against,” “strong against”). The group rated biofeedback as “weak against,” which indicates that most people would, although a substantial minority would not, recommend biofeedback for the treatment of fibromyalgia.

American College of Occupational and Environmental Medicine
The 2016 guidelines by the American College of Occupational and Environmental Medicine recommended biofeedback for “select patients with chronic low back pain as part of a multidisciplinary rehabilitation program.”27 Biofeedback was not recommended for acute or subacute back pain.

American Society of Anesthesiologists et al
The 2010 practice guidelines from the American Society of Anesthesiologists and the American Society of Regional Anesthesia and Pain Medicine indicated that “Cognitive behavioral therapy, biofeedback, or relaxation training … may be used as part of a multimodal strategy for patients with low back pain, as well as for other chronic pain conditions.”28

U.S. Preventive Services Task Force Recommendations
Not applicable.
Biofeedback as a Treatment of Chronic Pain

Medicare National Coverage
Biofeedback therapy is covered by Medicare “only when it is reasonable and necessary for the individual patient for muscle reeducation of specific muscle groups or for treating pathologic muscle abnormalities of spasticity, incapacitating muscle spasm, or weakness, and more conventional treatments (heat, cold, massage, exercise, and support) have not been successful. This therapy is not covered for treatment of ordinary muscle tension states or for psychosomatic conditions.”

Ongoing and Unpublished Clinical Trials
Current ongoing clinical trials that might influence this review are listed in Table 1.

Table 1. Summary of Key Trials

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<th>Trial Name</th>
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<td>NCT02426476</td>
<td>HRV Biofeedback in Pain Patients: Pilot Intervention for pain, Fatigue, and Sleep</td>
<td>80</td>
<td>Dec 2019</td>
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<td>NCT02920853</td>
<td>Testing the Efficacy of Enhanced Biofeedback on Chronic Musculoskeletal Pain</td>
<td>60</td>
<td>Aug 2020</td>
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<tr>
<td>Unpublished</td>
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<td>NCT03182556</td>
<td>Comparison of the Efficacy of Electromyographic Biofeedback, Aerobic Exercise (Biodanza) and Stretching in Patients with Fibromyalgia</td>
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NCT: National Clinical Trial.

References


Documentation for Clinical Review

- No records required

Coding

This Policy relates only to the services or supplies described herein. Benefits may vary according to product design; therefore, contract language should be reviewed before applying the terms of the Policy. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement.

IE

The following services may be considered investigational.

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<td>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); 30 minutes</td>
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<td>90876</td>
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<td>Electromyography (EMG), biofeedback device</td>
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ICD-10 Diagnosis

All Diagnoses

Policy History

This section provides a chronological history of the activities, updates and changes that have occurred with this Medical Policy.

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<td>BCBSA Medical Policy adoption</td>
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**Definitions of Decision Determinations**

**Medically Necessary:** A treatment, procedure, or drug is medically necessary only when it has been established as safe and effective for the particular symptoms or diagnosis, is not investigational or experimental, is not being provided primarily for the convenience of the patient or the provider, and is provided at the most appropriate level to treat the condition.

**Investigational/Experimental:** A treatment, procedure, or drug is investigational when it has not been recognized as safe and effective for use in treating the particular condition in accordance with generally accepted professional medical standards. This includes services where approval by the federal or state governmental is required prior to use, but has not yet been granted.

**Split Evaluation:** Blue Shield of California/Blue Shield of California Life & Health Insurance Company (Blue Shield) policy review can result in a split evaluation, where a treatment, procedure, or drug will be considered to be investigational for certain indications or conditions, but will be deemed safe and effective for other indications or conditions, and therefore potentially medically necessary in those instances.

**Prior Authorization Requirements (as applicable to your plan)**

Within five days before the actual date of service, the provider must confirm with Blue Shield that the member's health plan coverage is still in effect. Blue Shield reserves the right to revoke an authorization prior to services being rendered based on cancellation of the member's eligibility. Final determination of benefits will be made after review of the claim for limitations or exclusions.

Questions regarding the applicability of this policy should be directed to the Prior Authorization Department. Please call (800) 541-6652 or visit the provider portal at www.blueshieldca.com/provider.

Disclaimer: This medical policy is a guide in evaluating the medical necessity of a particular service or treatment. Blue Shield of California may consider published peer-reviewed scientific literature, national guidelines, and local standards of practice in developing its medical policy. Federal and state law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over medical policy and must be considered first in determining covered services. Member contracts may differ in their benefits. Blue Shield reserves the right to review and update policies as appropriate.