



Mini Review

Red Flags Warning for providers about risks in applying psychophysiological based interventions

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Citation: Sherman RA, Kerson CR, Willmarth EK, Manalang-Monnier PL, DeVore JR. Red Flags Warning for Providers About Risks in Applying Psychophysiological Based Interventions. APP. 2023;10(2):91-110

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DOI: 10.29052/2412-3188.v10.i2.2023.91-110

Received 20/10/2023

Accepted 20/11/2023

Published 01/12/2023

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Funding: The recording devices and computer were purchased by the Behavioral Medicine Research and Training Foundation (Port Angeles, Washington, USA) and then loaned to the investigators to use in the study.

Conflicts of Interests: The authors have declared that no competing interests exist.

Abstract

Many behaviorally oriented practitioners applying psychophysiological based interventions to symptoms such as headaches, early dementia, dysfunctional breathing, low back pain, anxiety, noncardiac chest pain, and irritable bowel syndromes may lack the training to recognize very serious underlying medical etiology, resulting in potentially life-threatening symptoms. Thus, some psychophysiological based interventions should be deferred until an appropriately trained medical specialist clears clients. Practitioners may lack an appreciation of the limitations and challenges of certain psychophysiological based interventions, such as hypnosis, neurofeedback, respiratory training, and biofeedback, for a variety of symptoms, including cluster headaches, temporomandibular joint (TMJ) disorder, psychosis, and neurodegenerative disorders. This paper identifies red flag warnings associated with specific symptoms and the psychophysiological oriented interventions employed to treat them.

Keywords

Screening, Biofeedback, Neurofeedback, Psychophysiology, Hypnosis



Introduction

Some behaviorally oriented practitioners lack the training to recognize very serious underlying medical conditions that are not amenable to psychophysiological interventions and may be life-threatening. They may also not be aware of when specific psychophysiological interventions should not be applied to clients presenting with a variety of symptoms. This paper summarizes some of the red flags practitioners should be aware of (a) before providing psychophysiological interventions for a variety of conditions such as headache, anxiety, dementia, and depression, and (b) providing specific behaviorally-oriented interventions such as hypnosis, neurofeedback, and biofeedback for a variety of symptoms. The key is for practitioners to know when to get assistance in assessing symptoms and when psychophysiological based interventions are not appropriate.

Some disorders are amenable to psychophysiological but not psychotherapeutic interventions, such as phantom limb pain, incontinence, and reflex sympathetic dystrophy¹. There are also disorders that usually have a physical etiology and may include psychological components that could be helped by psychotherapeutic interventions (e.g., male impotence). Developing a treatment plan that addresses the patient's symptoms and the causes of those symptoms requires a thorough assessment. A vital part of the assessment includes identifying problems that may not be responsive to psychophysiological based interventions - especially those problems that require medical attention that is not currently being provided.

Practitioners must keep in mind that their scope of practice may limit them to assessing

and treating only certain disorders using specific techniques. Commonly applied techniques such as electrical stimulation may be outside the scope of practice for many behavioral practitioners. In general, unlicensed practitioners can assess and treat stress or assess and assist optimal functioning among essentially healthy people such as athletes desiring to improve their performance. Only trained medical professionals who are licensed to do so can diagnose symptoms that could have severe consequences if not medically managed.

This paper reviews experiential and behavioral symptom presentations that may be secondary to serious medical conditions. It addresses what a behavioral health provider should assess to determine whether a referral for conventional medical or psychological evaluation and care is needed. An appropriate assessment of clients considering psychophysiological based services involves obtaining information from interviews and a careful review of their current status and history – including medications, psychophysiological measurements, and psychometric measurements – before deciding to provide a psychophysiological based intervention for a patient.

Headache problems, for instance, are often referred to practitioners who employ biofeedback as their main interventional modality. However, no behavioral modality will cure a brain tumor presenting with symptoms similar to those of common headaches. This is why properly trained medical professionals must assess symptoms such as headaches before practitioners without such credentials attempt to treat what may appear to be common problems. This can be true if a medical professional who is assessing outside the realm of their expertise refers the client. In other words, do not assume all



appropriate medical evaluations have been performed when the referral is from a medical professional without training and expertise in the symptom area.

Three key points paraphrased from Psychophysiological Assessment and Intervention for Chronic Pain¹:

1. Many disorders are a collection of comorbid symptoms that do not have well-defined explanations or etiologies. Some examples are migraine headaches, ADHD, and phantom limb pain. Several very independent underlying problems can result in the same collection of symptoms defining these disorders. The same cluster of symptoms can derive from psychological or medical mechanisms or some combination of both. For example, as recently as 20 years ago, reflex sympathetic dystrophy (RSD), now-called complex regional pain syndrome (CRPS), male impotence, and phantom limb pain were considered to be primarily psychologically based. Some behavioral therapists are still treating these disorders as if they are primarily caused by behavioral problems². There are literally hundreds of articles by behavioral therapists, including psychiatrists and psychologists, attesting to the psychological causes of many of these problems. For example, numerous authors characterized phantom pain as being a manifestation of some mental or emotional problem such as unresolved grief³, depression⁴, a psychosomatic manifestation of an unstable personality^{2,5,6}, and psychopathological misinterpretation of ordinary phantom sensations⁷. CRPS was considered to be caused by adolescent attachment problems to the mother primarily in young girls⁸. Male impotence was related to all manner of psychological problems⁹. Of course, for some, it is. However, empirical research has demonstrated that these problems are

not usually primarily psychologically based.

2. Physical and behavioral symptoms are often subjective and can be magnified by stress and other psychological problems.
3. Behavioural interventions can help and even resolve physically based problems such as migraine and tension headaches. Symptoms and Conditions Requiring Review by Appropriately Trained and Licensed Clinicians like Early Dementia/Memory, Problems/Cognitive, and Processing Problems. Cognitive problems initially present as neuropsychological issues—such as problems with cognition and adaptive functioning. Medications and medical conditions can produce or exacerbate these symptoms. Behavioral practitioners should not treat clients with memory problems unless thyroid and medication levels have been checked and acknowledged by a medical practitioner.

Hypothyroidism

This is an important consideration for the behavioral therapist. Hypothyroidism is clearly a common cause (not a correlate) of early dementia. This is not open to question any longer because far too many studies have demonstrated the relationship¹⁰. Hypothyroidism (low levels of thyroid hormone) and thyrotoxicosis (very high levels of thyroid hormone) can cause dementia. These thyroid issues are common in people diagnosed with early dementia, and they duplicate every symptom of both early- and late-onset dementia. A thyroid panel ordered by a medical professional can determine this, and proper adjustment of thyroid hormone levels may eliminate the problem if given in a timely manner.

Sleep Apnea

Sleep apnea is associated with symptoms of widespread cognitive decline. Screening questions—including whether the patient



snores a lot, whether sleep is restorative, and whether the patient falls asleep frequently during the day – especially if this pattern is not associated with recent stressors – should trigger a medical referral to evaluate for sleep apnea¹¹.

Medication

Medication can have cognitively impairing consequences, especially when given to geriatric populations. For instance, benzodiazepines to assist with anxiety and insomnia management significantly contribute to cognitive impairment and fall risks^{12, 13}. Many sleep medications can have similar adverse effects¹⁴.

Behavioral practitioners should not treat clients with memory problems unless thyroid and medication levels have been checked and acknowledged by a medical practitioner.

Headaches

If the headache symptoms are unremitting and constant in intensity, or if the basic character of the headache changed within the last 3 months, an immediate neurology consult is recommended, as these can be indications of severe problems, such as aneurysms and tumors. In this case, ask whether the pain is worse in the morning and gets better during the day. Such a pattern may reflect increased intracranial pressure (due to tumors, etc.). Ask if the pain gets worse when lifting or other exertions, including sexual intercourse. This pattern may reflect a leaking cerebral aneurysm, for example. A headache in people over 50 years of age that includes throbbing temples is frequently temporal arteritis rather than a migraine. This condition can lead to blindness and strokes if not treated promptly^{1, 15-17}.

Refer patients for medical evaluation (preferably to a neurologist) if there is/are:

1. History of treatment for cancer and a change in or onset of headaches.
2. Any recent-onset sensory or motor deficits (e.g., weakness or numbness in an extremity or slurred speech) that have not been previously medically evaluated.
3. Headaches that begin after a trauma to the head or neck. Cervical compression can cause headaches for years and is frequently overlooked in neurological examinations.
4. A unilateral headache.
5. Recent onset of a throbbing headache centered on the temples that do not abate but may vary in intensity, especially among people over 50 years of age.
6. Report of a noticeable change in personality, behavior, memory, or another revealing symptom.
7. Vomiting accompanying a tension-type headache.

Refer patients to a dentist specializing in TMJ disorder if there is a history of jaw issues such as clicking or misalignment.

Many medications cause headaches, especially as they wear off. Discontinuing them (including some headache medications), especially without medically monitored tapering, may cause headaches. If your patient starts getting headaches or notices a change in headache activity a few days to a few weeks after starting a new medication or after stopping a medication used for some time, a medical professional, preferably the prescriber, to determine if the medication is the cause of the headaches, should check the patient. Following is a list of some medications that are commonly associated with a high incidence of headache¹⁷:

- Adalat/Nifedipine (23%)
- Indocin (11%)
- Clinoril (3–9%)



- Isordil (25%)
- Halcion (10%)
- Lopressor (10%)
- Mexitil (6%)
- Minipress (8%)
- Sorbitrate (25%)
- Naprosyn (3–9%)
- Nitroglycerine products (25–60%)
- Terazol (25%)
- Procardia (15–23%)
- Tolectin (3–9%)
- Prozac (20%)
- Any nitroglycerine drugs (over 50%)
- Retrovir (10–42%)
- Trental (1–6%)
- Seldane (16%)
- Xanax (13%)

Frequent use of analgesics (e.g., aspirin, acetaminophen), barbiturates, ergotamines (i.e., Cafergot, Wigraine), and caffeine can cause or exacerbate headaches during use, as well as when withdrawing.

Low back pain

Patients reporting low back pain sometimes go directly from general medical practitioners to healthcare providers who may have little medical training. This means that patients occasionally are not appropriately screened for serious underlying issues. It is very important that a qualified practitioner screen for these. Turk and Melzack (2002) suggest the following red flags to use in identifying patients who may require further evaluation by specialists¹⁸. The nonmedical provider should document these as reasons to encourage the primary care provider to consider specialty consultation:

1. Severe back pain different from previous episodes (if any) in people below 20 and above 55 years of age
2. Recent violent trauma (falls, auto accidents, etc.)

3. Constant, progressive pain not related to movement
4. Thoracic pain
5. Previous history of cancer and ovarian cysts
6. Chronic use of systemic steroids
7. Use of illegal drugs
8. Positive for HIV
9. Chronically unwell, including unexplained weight loss, etc.
10. Severe restriction of lumbar flexion
11. Obvious structural deformities

Contacting the primary care provider may be indicated if one of the following is evident:

1. Widespread neurological signs
2. Erythrocyte sedimentation rate above 25
3. Plain X-ray showing vertebral collapse or bone destruction

If any of these signs are present, or if any other finding seems to warrant concern, err on the side of caution and report to the primary care provider with a recommendation for further investigation by a specialist. If these signs are absent, practitioners should be reasonably comfortable proceeding with an evaluation. Nonphysician providers would be practicing beyond their scope of practice in attempting to evaluate CAT scans, MRIs, X-rays, etc.

Empirical evidence concerning the teaching of self-regulation for low back pain only supports the use of biofeedback if, indeed, pain is secondary to or exacerbated by muscle tension. The psychophysiological evaluation needs to determine whether this relationship exists and if the pain is exacerbated by stress responses leading to increased muscle tension. For increased pain due to stress responses, behavioral interventions such as cognitive behavioral



therapy (CBT), which is intended to educate patients about stress responses that may increase back pain from any cause, may be appropriate.

Dysfunctional Breathing/ Respiratory Problems

Many behaviorally oriented practitioners teach clients to modify their breathing patterns through capnometry and the use of respiration belts mounted over the chest and abdomen to help their clients perform better in sports and reduce respiration-related symptoms, including anxiety, noncardiac chest pain, and asthma. Some may not realize that distorted respiratory patterns are frequently caused by underlying medical problems that are not amenable to psychophysiological based interventions^{19,20}. Dyspnea and hyperventilation are a type of dysfunctional breathing (DB) that involves a sensation of breathlessness/shortness of breath, labored breathing, or difficulty breathing. Primary and secondary dysfunctional breathing is marked by abnormal breathing patterns in the absence of organic conditions such as anxiety or secondary to cardiopulmonary/neurological diseases²⁰. Behaviorally oriented providers can only teach breathing methods for dysfunctional breathing or respiratory problems secondary to non-medically caused conditions. The evaluation, therefore, should assess the matter and determine if the condition is caused by physical deconditioning of respiratory muscles, underlying psychological causes, or both²¹.

Structural causes of dysfunctional breathing. Medical conditions, diseases, and underlying physical conditions of the respiratory and cardiovascular systems may cause dysfunctional or labored breathing²². Improving DB requires adequate breathing assessments, subjective clinical and psychophysical scales, and questionnaires to

measure, predict, and/or determine the pathophysiology of the underlying disease^{22,23}. The most common physical diagnoses of DB include lower respiratory tract infection, heart, liver, or kidney failure, pneumothorax, allergic reaction, chronic obstructive pulmonary disease, and asthma²⁴. If a patient has been diagnosed with any of these, they should be referred to their primary care provider for specially trained respiratory consultations. If a patient has not been diagnosed but exhibits one or more of the following symptoms in conjunction with DB, refer them to their primary care provider for further care:

- Pulse rate >120 bpm
- Tachypnea – Respiratory rate > 30 rpm
- Systolic blood pressure <100 mm Hg
- Oxygen saturation < 90%
- Peripheral edema
- Wheezing
- Special populations: Pregnancy
- Anatomical restriction of the nasal passages, chest, and abdominal cavity (i.e., heart, lungs, hernia, cesarean, etc.)

If none of these signs are present or pertain to the patient, proceed with the evaluation. Analysis of chest X-rays, lab analysis (serum electrolytes, white cell counts, assays, etc.), CT pulmonary angiographs, or lung ultrasounds performed by a nonphysician provider are outside the provider's scope of practice. Refer these patients to their primary care provider for recommendations regarding analyses of diagnostic reports and exams.

Psychological causes of DB. Acute or chronic cases of DB, such as hyperventilation syndrome (HVS) or idiopathic hyperventilation (IH), may be triggered by other factors that cannot be attributed to underlying diseases²⁰ and may not always be improved with pathophysiological treatments. Aside from pharmacological



interventions, nonpharmacological approaches that modify the brain's processing of signals from the respiratory afferent nerves may be used to modify the psychological and emotional management connected with DB²⁵. Jack et al. (2003) showed that idiopathic hyperventilation can become a condition caused by psychological factors²⁶. Anxiety disorders, including panic attacks, are two major psychological disorders that could cause or contribute to DB. Patients with sustained arterial and alveolar hypocapnia below 30 mmHG need to be referred to their primary care provider to rule out arterial hypoxemia or metabolic acidosis before beginning respiratory training sessions²⁶.

Dysfunctional Breathing and Pain.

Bartz-Overman et al. (2022) found that pain and DB might utilize inherently linked neurological structures and networks²⁷. For example, the role of the insular cortex as a central modulator for both pain and dyspnea has been established, and his recent research has shown that, from a patient's perspective, dyspnea and pain may share the same fundamental experiences, so when one symptom is treated, the other may improve as well. In the event that DB is related to pain, refer patient to their primary care provider prior to commencing treatment.

Anxiety

Physical causes of anxiety are frequently overlooked. Many diseases, some normally ingested substances (foods, drinks), and some prescribed and over-the-counter medications can cause intense, disabling anxiety. It is the provider's job to review the patient's medical record and patient reports to evaluate all substances the patient takes to identify any potential substances and diseases capable of causing sufficient anxiety that could account for the presenting symptoms.

An error made by too many therapists is noting that a patient is taking a medication that rarely causes intense anxiety—say in only one in 10,000 patients—then ignoring that medication because the effects are rare. However, this could be that one in 10,000 patients. Medical conditions and commonly ingested substances that can produce symptoms of anxiety include:

- Dietary: Some vitamin deficiencies, too much caffeine, monosodium glutamate, magnesium
- Diseases: Anemia, secreting tumors (pheochromocytoma, insulinoma, carcinoid), neurologic conditions including encephalopathies and some seizure disorders, and metabolic problems including Cushing's disease, hypoglycemia, and porphyria

In practice, nonmedical providers can use a checklist to identify anxiety-associated disorders and substances. The provider then can decide when patients with these issues should be referred for further medical evaluation. An expensive work-up to treat a condition that might resolve with a few treatment sessions of anxiety management training is not a model that is cost-effective or that is expected of any clinician. However, if behavioral and psychophysiological interventions do not provide the expected benefits, further evaluation would be warranted.

Breathing Disorders and Anxiety

DeGuire et al. (1996) have determined that any anxiety disorder presentation may actually hold a breathing disorder as the primary diagnosis and that once the breathing disorder is corrected, the symptoms of anxiety may be alleviated without further intervention²⁸. Thus, it is important to determine which is the primary diagnosis.



Hypoglycemia

Hypoglycemia can be extenuated by poor breathing. A drop in blood sugar causes extreme reactions in the nervous system, including feelings of anxiety, confusion, and even panic attacks²⁹. Thus, people subject to hypoglycemia need to be monitored carefully.

Depression

Nelson and Kriegsfeld (2017) noted that depression is often evoked by endocrine changes³⁰. The symptoms of depression may include reduced mood, low self-esteem, general fatigue, feelings of guilt, sleep disturbances, anger, irritability, and reductions in sexual motivation and food consumption.

Many people are very depressed without any obvious reason for such deep depression. This endogenous depression used to be ascribed to such causes as a "wandering uterus." It turns out that the uterus doesn't wander much, but there are lots of changes in the body's hormonal control system that go out of whack and can cause depression. Many diseases (such as diabetes) seem to cause depression by altering hormonal balances—entirely separate from people's natural reaction of becoming depressed because they are sick. It could be that some environmental event originally triggered a change in hormones, but there isn't evidence supporting this idea. Both high and low levels of some hormones—such as cortisol—can cause the same depressive symptoms.

According to Nelson and Kriegsfeld (2017):

1. Thyrotropin-releasing hormone and thyroid-stimulating hormone administration can ameliorate depressive symptoms.
2. Abnormalities in amounts of growth hormone and prolactin are linked to depression.

3. About half of depressed patients have elevated cortisol production.
4. Estrogen deficits are associated with depression, and estrogen replacement therapy can elevate mood in depressed women³⁰.

Nelson and Kriegsfeld (2017) conclude that depressed patients may have experienced an alteration in the neuroendocrine mechanisms underlying the feedback control systems of the hypothalamic-pituitary-adrenal axis³⁰.

The practical implication for the nonphysician provider is to consider referral for medical evaluation for depressed patients who are in the mild to moderate range and who are not responding to psychological treatment. Cases in the severe range of symptoms should always have a medical evaluation with consideration of specialty consultation, as medications and other medical interventions may be necessary.

Noncardiac Chest Pain

Using psychophysiology based interventions for anxiety-initiated or -amplified noncardiac chest pain can be problematic even when the patient has been cleared by a general practice provider because the actual underlying factors are difficult to identify by nonspecialists. Problems include:

1. People with noncardiac-related chest pain can also have or develop cardiac-related chest pain
2. The noncardiac-related chest pain may not be due to anxiety but some other problem that is amplified by stress
3. Patients sometimes leave out important information when talking with a healthcare provider, perceived to be hurried, so what looks like a simple case



of stress-related noncardiac pain can mask a cardiac-related event¹.

The following are some of the symptoms to consider and include in your interview.

If the patient reports a new pain in the chest area or chest pain that differs in any way (sensation, location, intensity, duration) from previous episodes that were evaluated and treated appropriately, they should be referred to a specialist.

If the nonphysician provider notes these symptoms, they should be included in documentation to the primary care physician to ensure that the patient consults with a qualified medical provider who can perform an appropriate evaluation in a timely manner.

If the patient reports burning pain that seems to come from the central chest—especially near the sternum—that spreads to the upper back and both arms (not just the left) and is not particularly affected by exercise, there is a distinct possibility that the patient has gastroesophageal reflux disease (GERD) and/or a hiatal hernia. Many people over age 50 have asymptomatic hiatal hernias. At the same time, nonphysician providers should not assume that the known presence of a hiatal hernia explains the pain. GERD is probably caused by a weakness in or other problem with the lower esophageal sphincter, which results in stomach acid leaking up into the esophagus. The most common symptom is heartburn.

Pulmonary embolisms and pericarditis can cause noncardiac chest pain. Chest pain is nothing to be complacent about. Any rational patient having chest pain will be highly anxious. They may need the therapist's help to deal with the anxiety and, perhaps, chest pain caused by anxiety, but a specialist needs to be sure that the pain is

only due to anxiety and not a missed diagnosis¹.

Irritable Bowel Syndrome (IBS)

It is important to ensure that the patient has IBS before initiating treatment because most other abdominal problems with similar symptoms do not respond to behavioral interventions, and a few can be life-threatening. It is important to appreciate that (1) people with IBS can also have and or develop a similar symptom set for other reasons, (2) the obviousness of IBS's symptoms can mask a life-threatening problem, and (3) patients sometimes omit important information when consulting with a healthcare provider. Typical symptoms of irritable bowel syndrome (IBS) include pain and bloating that usually occur together but not always. Constipation, diarrhea, cramps, urgency, mucus in the bowel movement, and a gassy-bloated feeling can also occur³². Symptoms are amplified by stress for at least one-third of patients. A patient with some or all of these symptoms may have IBS but could also have several serious medical conditions with similar symptoms that may also be exacerbated by stress. Providers with expertise in diagnosing organ-related pain are likely to rule out rectal bleeding as it is not a symptom associated with IBS. Expert providers assessing for severe pain in the abdomen described it as a constant dull pain, knife-like pain, or cramping pain when accompanied by tenderness to touch in the stomach area, bloody diarrhea, vomiting, black/tarry bowel movements, temperature above 101 °F, history of previous abdominal surgery, history of diverticulosis, pregnancy or likelihood of being pregnant. The combination of any of the above-presenting concerns could indicate appendicitis, infectious diarrhea, bleeding from the bowels, perforated appendix, bleeding ulcer or diverticula, miscarriage, ectopic pregnancy, pancreatitis, or bowel blockage.



If the patient has cramps and non bloody diarrhea (and perhaps even abdominal burning) without the problematic combinations noted above, IBS may not be of concern, even if symptoms are induced or worsened by stress. A combination of symptoms can indicate chronic gastroenteritis, especially if accompanied by fever, aches, chills, nausea, or vomiting. If burning is present, an ulcer or chronic gastritis may be the culprit. If the patient is a woman, vaginal discharge accompanied by typical symptoms of IBS may indicate a chronic infection. The same symptoms as above, accompanied by occasional blood or mucus in feces, can indicate ulcerative colitis and Crohn's disease³³. Pancreatitis can also mimic these symptoms³⁴.

Changes in Medications Caused by Behavioral Interventions

Individuals using medications including insulin, oral hypoglycemics, thyroid replacement, antidepressants, diuretics, vasodilators, anticonvulsants, and antihypertensive medication may require gradual modification in the dosage of these medications. The prescribing healthcare provider should be informed of the patient's participation in behavioral interventions.

Patients maintained on antihypertensive medication, vasodilators, antidepressants, diuretics, or any other medication with a potential side effect of postural hypotension should avoid any sudden changes in posture, such as standing abruptly from a sitting position. This practice should especially be observed while practicing biofeedback/relaxation training.

Warnings Related to Specific Techniques

This section contains warnings about pitfalls likely to be encountered when applying psychophysiological based interventions for specific symptoms and individuals.

Peripheral Biofeedback

Not all psychophysiological recording and biofeedback sensors are safe to use with all patients. Galvanic skin response (GSR/SCL) systems send a small current across the skin to record the amount of sweat (essentially a conductive salt solution) on the skin, which changes in response to autonomic nervous system reactions. As current follows the easiest—rather than the shortest—path, GSR should never be used with people with broken skin as the current may penetrate breaks in the skin, across the heart, and then out again. Some respiration sensors—such as belts for recording changes in chest circumference—may contain electronics that could interfere with pacemakers. Be sure to read the warnings in the equipment's manuals.

It is strongly recommended that behavioral interventions not be used to treat patients with cluster headaches, trigeminal headaches, hypertension, or TMJ disorder (the joint problem as opposed to TMD, the jaw area muscle problem). Empirical evidence fails to support the utilization of behavioral interventions for the aforementioned conditions. Note that because of a file drawer effect (i.e., negative studies are rarely published)^{35, 36}, citations supporting this assertion are rare, and the implication is based primarily on anecdotal experience. Two exceptions to the file drawer effect are Sherman's 1985 study concluding that SEMG biofeedback does not help alleviate TMJ pain and Sherman et al.'s 1978 study showing that relaxation training and biofeedback do not reduce blood pressure among pregnant hypertensive women^{37,38}. It is noteworthy that it has taken over 45 years since Sherman's initial publication in 1978 for sufficient evidence to accrue to determine that biofeedback is not effective either alone or in conjunction with relaxation training or cognitive restructuring to reduce stress labile hypertension³⁹. Both



cognitive restructuring and relaxation training can reduce stress labile hypertension, but adding any form of biofeedback does not improve outcomes.

Respiratory Training Paced Breathing Methods.

Although variations of paced breathing methods (resonance frequency training, heart rate variability (HRV) training, slow-paced breathing, etc.) have been used as a noninvasive strategy in modulating autonomic nervous system (ANS) functioning, improving overall health, reducing stress, and reducing anxiety, aberrant reactions have been documented in certain populations. Paced breathing methods, for instance, may trigger anxious arousal and a dynamic of defensive responses that result in an increased respiratory rate^{40,41}. Therefore, paced breathing methods should be employed only after a thorough medical history and assessment that includes the Suffocation Fear Subscale (SFS)⁴², Anxiety Sensitive Index-3 (ASI-3)⁴³, Body Vigilance Scale (BVS)⁴⁴, and the trait portion of the State-Trait Anxiety Inventory (STAI)⁴⁵. High scores recorded from these questionnaires have been correlated with predicted anxiety and panic attacks, exaggerated anxious response, and increased defensive mobilization⁴⁰. It is advised that individuals who score high in one or more of these inventories need additional support, such as education and the use of a pulse oximeter while training⁴¹. It is also advised that these individuals train under supervision to ensure dynamic defensive responses are not triggered prior to having them practice at home on their own.

Capnometry

Sidlecki et al. (2017) found that individuals with post-concussion syndrome (weeks to years after injury) will have abnormal ETCO₂ readings due to alterations of

cerebral physiology and deficits in the ANS⁴⁶. Mild traumatic brain injury (mTBI) may alter cardiorespiratory processes, resulting in poor prognosis, especially for individuals with respiratory disease⁴⁶. Damage to the brain stem or reduced blood flow to the thalamus can cause breathing issues. A thorough history should include screening for concussions due to the varying duration of post-concussion syndrome⁴⁶. Capnometry training will need to be modified to account for individuals who have histories of post-concussive syndrome and complicated mTBI.

Neurofeedback

Unlike peripheral biofeedback, neurofeedback (NFB), or electroencephalography (EEG), biofeedback trains the central nervous system (the brain). While the feedback is usually obvious—a sound accompanied by visual feedback such as a bar increasing and decreasing based upon the strength of the signal, the felt experience is not as tangible as with peripheral modalities. For example, in the case of muscle tension, one can easily acknowledge (and appreciate) the reduction of tension in a muscle. In the case of breathing and HRV training, it is very apparent when the patient's breath and heart rate have slowed. This is one reason it usually takes more sessions with NFB training.

The brain is the most complicated natural system known. Chemical and electrical phenomena combine to create communication and connections between brain areas that then realize specific tasks—and these phenomena are what make us who we are. These functions are the target of NFB training, and one can see that they are less observable when the brain is learning from the training than when one is practicing biofeedback.



Care should be taken when considering candidates for NFB training. In addition to the many cautions below, articulating what one should feel or experience while training and, ultimately, from the NFB training program itself can be challenging. For those who might become frustrated or confused, another modality, such as stimulation technology (audiovisual entrainment, transcranial direct current stimulation, etc.), may be indicated.

Patterns in the EEG vs. Behavior.

Often, the EEG does not contain patterns that are considered specific to a behavioral presentation. Clinicians may record an EEG for evaluation and discover biomarkers that do not match the behavioral symptoms. As well, the EEG assessment may show one finding, and different NFB software will show something else⁴⁷. Therefore, neurofeedback should include an assessment—ideally a 19-channel EEG recording, but minimally a 2- or 4-channel sequential recording—and the healthcare provider should not rely on a decision tree based on presentation alone or assume EEG patterns will be present based solely upon behavior.

Another important concern with NFB, with any client, is that the changes in the EEG do not always reflect behavioral patterns. It is not uncommon for the EEG to make remarkable advances from the protocols and modalities used without any noticeable behavioral change. There may even be an increase in symptom intensity. Conversely, the EEG may be stubborn, with no real sustained response to the training, and yet the client reports an alleviation or reduction of symptoms.

Many clients of neurofeedback take medications. Depending on what medications they are taking, which can be an extremely complicated cocktail, the

medications' effects can override any advances due to the neurofeedback training. For example, Adderall will increase beta and decrease lower frequencies, which may be great if it is needed. Generally, anxiolytics will reduce faster frequencies (if taking the appropriate dose). However, if the anxiolytic is a benzodiazepine, widespread increased amplitudes in beta frequencies are common and thought to reflect the activation of neuroinhibitory processes that are GABA-mediated. In fact, too high a dose of this class of medications can result in extremely elevated beta and possibly beta spindling. So, here you have two medications that have contradictory mechanisms, and now you want to add some operant conditioning to influence beta. While you may have a temporary shift in the EEG in response to the NFB, as soon as either of these medications is consumed, all positive gains will be overshadowed.

It is also important to frequently query clients, preferably at every session, about changes in their medications and/or dosages. While neurofeedback generates some positive changes in the EEG, the effects of medication dosage may become amplified, which can lead to unpleasant side effects. When this happens, faith in medications can overrule confidence in the neurofeedback training, and the client—and perhaps even their prescribing clinician—may blame the neurofeedback for unpleasant experiences. Watch the client carefully when on medications and, if possible, communicate with the prescriber so that any ill effects due to the effectiveness of the NFB can be considered as just that, and a reduction in dosage can be contemplated. Depending on the medication and the interest the prescriber has in neurofeedback's success, this can be challenging.



While not necessarily a red flag (meaning that you can still work with patients on medications), understanding the effects of certain medications on EEG recordings is essential. The clinician should refer to *Drug Effects on the EEG: A Reference Guide*⁴⁷ or other references to enhance confidence concerning where and how EEG patterns originate.

Neurofeedback for Anxiety.

One of the main concerns when using neurofeedback with people who present with anxiety is, well, their anxiety—notably anxiety about whether the neurofeedback is working. You might see clinical changes in the EEG, meaning that the operant conditioning is working and the brain is responding well. However, as discussed above, this may not translate to the efficacy of treating the behavioral presentation. People with anxiety syndromes, including PTSD and phobias, have little patience and fear the continuation of their anxious symptoms, which often spiral into more intense symptomology. Positive reinforcement of their successes in their EEG, no matter how small, can be reassuring if presented often and consistently, and this may be what the client needs to start experiencing lower levels of anxiety. It may be a slow process and could be contraindicated if anxiety levels are severe. It is common knowledge that alpha-theta training can result in abreaction or unexpected negative emotional response⁴⁸. This is especially true if this protocol is administered too soon in the healing process. As with any therapy, slow and steady provocation of underlying fears and memories is required. The client's emotional state is very important for influencing how they may respond to the uprising feelings and memories. If they are very anxious, they may lack the capacity to deal with the feelings and abreact (form a negative reaction). Conversely, if the patient is in a

state of lowered vigilance and arousal, the coupling of the more relaxed state and emotional experience will become a more fitting association, leading the client to be able to manage these resurfaced feelings and memories.

Neurofeedback for Schizophrenia.

Schizophrenics are poor candidates for neurofeedback. They generally have extremely high levels of paranoia and are unlikely to trust the efforts of the clinician or what is happening in their brain during neurofeedback. I (Cynthia Kerson) once worked with a client who reported anxiety, but after eight sessions, I questioned the authenticity of his report. He came to the practice complaining that the protocol I had chosen was destroying his brain and demanded I do neurofeedback to reverse the effects. He admitted to having been diagnosed with schizophrenia, and we ceased the neurofeedback training. Unfortunately, for this client, the emotional and perceptual implications of the disorder challenged his ability to trust the process and ultimately sabotaged any gains. This client might fear any change that may be taking effect, especially without their conscious knowledge, and the changes that occur with NFB are generally unconscious until the behavioral presentation is changed and observed.

Neurofeedback for ADHD.

Often, parents seek NFB for their children once they are diagnosed with ADHD, primarily in an effort to avoid the use of stimulant medications. In the interview phase, be sure to observe the child carefully. There are times when their motives don't seem aligned with their parent/caregiver—or they may not fully understand that their behavior is undesirable. Giving them an opportunity to articulate their perceptions can help them understand what they understand about their behavior. As well,



there are times when medication is indicated to make initial progress with NFB. If the child is severely hyperactive, suggesting sitting and attending for even 20 minutes is challenging. There are times when a low dose of a stimulant will help the child settle enough for neurofeedback to start working with the intention of titrating and ultimately eliminating medication as neurofeedback takes effect. Collaboration with prescribing providers is therefore essential for the coordination of care and enhancing the likelihood that stimulant medication is discontinued if NFB is effective. In this case, try to work with the prescriber. Be sure they know that the patient plans a short trial and that reducing the dose over a few months is the plan.

Children with ADHD are also less frustrated with their symptoms than the people around them. This generates a challenge for using NFB as it may be a chore they are not interested in. Secondary rewards may provide the essential incentive and motivation needed for children with ADHD to participate in NFB. In practice, I (CK) provided coupons that tallied the session's points (which can be made up in any formula necessary to have success each time). Essentially, the children are deceived into being successful in NFB. The family maintains the coupons and creates a program for the transfer of the points to a reward. Some give the child some desired item at 1,000 points. Or a penny a point. Or maybe a sleepover. This is more effective and less wasteful than having inexpensive prizes in a basket for them to choose from. They're usually cheap plastic (bad for the environment), and the kids generally don't care much about them. Using the coupon system raises the bar, and kids really want to get the reward that they chose. They don't realize or, sometimes, don't even care that their ADHD symptoms are improving, but with that much effort towards getting points

(rewards when the brain is being trained), they do care, and your NFB will be a success.

Neurofeedback for Oppositional Defiant Disorder (ODD).

ODD children will likely not tolerate NFB. It will likely be too boring, and children diagnosed with ODD often engage in defiant behaviors to get what they want. Parents of ODD children may enable, be in denial and/or be inappropriately strict. When these children are introduced to NFB, they can be quite stubborn and – predictably – oppositional. It is not uncommon for parents to assign too much authoritative responsibility to the practitioner, requiring the practitioner to maintain a professional role with appropriate boundaries. Parents may assume that you, as a professional, are skilled in managing the child's behavior. And you may well be, but not in the context of NFB training. If the child doesn't engage in secondary reward systems, such as the coupon system mentioned above, there is little hope for the ODD behavior to dissipate enough to make meaningful brain shifts. An alternative strategy could be to refer or engage the parents in coaching or other therapeutic alternatives.

Neurofeedback for Neurodegenerative Diseases.

Parkinson's, multiple sclerosis (MS), Alzheimer's, progressive neuropathies, and other neurodegenerative diseases are not indicated for NFB as a resolution. NFB can help lessen, though not alleviate, the symptoms of this class of diseases. Some anecdotal evidence demonstrates temporary symptom relief, such as with pulsed electromagnetic field therapy, but there is no evidence that neurofeedback has completely reversed any neurodegenerative disease.



Neurofeedback When There are Structural Issues.

Shunts, plates, scar tissue, skull damage, and other head or brain assaults can cause complications in reading the EEG. Consequently, location and functional implications need to be carefully understood. The scalp at the site of injury may be thicker, which will attenuate any signal from below. This can be incorrectly read as a deficit in power, and the clinician may attempt to train at that site. In fact, there isn't an attenuation of power; there is only an attenuation of the signal. As well, the plastic brain may redirect and arborize neurons to skirt a structural issue. These are functional pathways, but they are not normal. If compared to a normative database, they will appear to be dysregulated. However, they provide an alternate functional route and need to be valued as such. These cases should only be monitored with the consent of an overseeing practitioner who is aware of the structural implications.

Neurofeedback and Epilepsy.

It is normal for brain function to occasionally go offline. These offline moments may be represented in the EEG as subtle epileptiform transients that do not constitute a diagnosis of epilepsy. However, a patient seeking NFB for seizure reduction or cessation must be carefully studied. First and foremost, only those who are licensed to treat this medical disorder can treat it using NFB. Secondly, the clinician can misinterpret and even overlook an epileptic transient, failing to properly diagnose epilepsy. When unsure, proceed with caution and consult with an epileptologist.

Herein lies one of the main issues with brain mapping services that use artificial intelligence (AI) to complete the artifacting process. If a client has seizures only periodically and there is only one small epileptic transient present, the AI system will

eliminate it or average it into the parts of the EEG that are used for evaluation. Needless to say, not recognizing an epileptic transient can be detrimental to the well-being of the client. Additionally, more of these undetected EEG behaviors may occur during the NFB sessions if the practitioner is unaware of their morphology or simply not paying attention.

Neurofeedback and Headaches.

There are three types of headaches: tension, migraine, and cluster. The intensity, duration, and frequency of headaches are important measurements when considering treatment options. Tension headaches are the most common type and are better controlled with electromyographic (EMG) biofeedback since they are the result of tense shoulder, neck, scalp, and/or facial muscles. About 10–15% of headache patients have the more debilitating migraine type. These may be categorized as primary or secondary when they are triggered by neurologic disorders, infections, hormonal shifts, allergies, stress, and/or medications. Thus, it is better to treat the etiology rather than the symptom (which is the headache).

As is well documented^{49,50}, migraine headaches are better treated with distal temperature training. Combined-type headaches need attention to both the migraine and the tension aspects. Cluster headaches should not be treated with neurofeedback. These cause severe pain to one side of the head; their etiology is not understood, and there is no evidence that neurofeedback can work to resolve these symptoms. While there are some studies that report success with neurofeedback for headaches in general⁵¹, it is best to consider the above and refer to or complement other modalities.

This population may regularly cancel appointments or keep appointments in



hopes of remediation during a headache event. Doing neurofeedback when a headache is present is not advised. It is compelling to think the training will alleviate the headache, but this is not substantiated and should be avoided. In addition to the many possible EEG profiles that could emerge during their headache, they could also be exhausted from a bout of headaches and the accompanying loss of sleep, so doing neurofeedback at this time may result in an exacerbation of the pain and frustration.

Headache medications (triptans) tend to disrupt alpha power and reduce task response efficiency, which cannot be rectified by the training, causing a cycle of shifts in the EEG that cannot be sustained. (As noted above, this is true for all medications that have lasting effects on the EEG.)

Mild Traumatic Brain Injury (mTBI).

Mild traumatic brain injuries occur from a multitude of causes, including direct head impact from falls, having objects dropped on the head, or accidents that insult the brain from the side or neck. Additionally, blast injuries—those caused by a nearby explosion—result in back-and-forth acceleration of the brain without blunt, local impact and cause diffuse global damage. Thus, they result in subtle global effects on the EEG, making it difficult to target the damage. The behavioral changes—such as anxiety, anger issues, headaches, and others—may guide the training and assessment, but this is not always an accurate picture of what needs to be resolved physiologically. Commonly, mTBI patients experience connectivity issues in the EEG, which can be trained, however, some dysregulations may be compensatory and training can cause reversal of progress and/or more intense symptoms.

A full history of the injury is very important and should include the length of time since impact and whether (and how long) the client was concussed and/or unconscious. The brain naturally heals during the first few months of recovery with slower and prolonged improvement thereafter. Assessment revealing excess slow wave power should not be considered pathological. Removing the power shutdown forces the brain to work rather than heal. Waiting until the EEG assessment reveals a return to somewhat normal patterns—likely about 4–6 months, depending on the extent of the damage—is highly suggested.

Clinical Hypnosis

Patients have been benefiting from the therapeutic use of hypnosis for hundreds of years, and yet there remains a good deal of misinformation and mistrust related to this adjunctive technique. While there are thousands of books on the topic of hypnosis, this section will review a few of the most important red flag considerations here.

First, unlike the popular presentation in movies, cartoons, and television shows, hypnotic ability resides within the patient, not the clinician (i.e., hypnotist). Just as a music teacher does not "do" music to a student, a practitioner using hypnotic techniques does not "do" hypnosis to anyone. Rather, a skilled practitioner educates and creates a positive context to maximize an individual's skill in accessing their own hypnotic ability.

Secondly, learning hypnosis does not typically qualify anyone to treat a patient they were not qualified to treat before learning hypnosis, though there are some exceptions to this rule. Many clinicians may not have treated individuals with chronic, acute, or procedural pain prior to learning hypnosis, though they are quite qualified



and competent to do so upon the completion of appropriate clinical hypnosis workshops and hours of individual and/or group consultation with a more experienced clinician. Hypnotic techniques should increase one's effectiveness in many situations, but learning to teach the ability to alter the perception of pain, for instance, does not remove any of the considerations related to pain listed above. In fact, covering the perception of pain without prior medical evaluation can result in major problems.

Also, individuals vary in their level of hypnotic ability, and the success of a hypnotic intervention can vary due to multiple factors, including the context of the intervention, the skill of the practitioner, the relationship and trust level between practitioner and patient, environmental factors, patient attitudes, and prior experience with hypnosis, just to name a few. In most settings, hypnosis can be best characterized as a collaborative relationship. In the emergency room, however, the approach might be more effective when it is very directive or even authoritarian if that is what best serves the patient and their situation.

There are few absolute red flags related to the use of hypnosis by a trained professional. The following, in particular, deserve special consideration.

Psychosis, Schizophrenia, or Other Disorders of Consciousness. Hypnosis is often described as a set of skills and interventions used for effecting an altered state of consciousness. This definition, of course, assumes that there is something akin to a normal state of consciousness. Still, if a patient struggles already in their efforts to hold a common reality with others, intentionally altering this reality should only be attempted by those highly experienced

with this population and only then if there is clear potential for benefit to the patient.

Legal Issues.

Hypnosis is often used to help trauma patients safely review past events through techniques such as age regression. However, most states within the United States do not allow testimony related to the use of hypnotically enhanced memory in court. By using this technique, you may be eliminating a client's ability to testify on their own behalf. In contrast, federal courts often permit hypnotic testimony but only if very specific procedures are followed. As a practitioner, you are not likely to know what might come to light in a hypnotic session, so a discussion of the potential legal complications is highly encouraged as an element of informed consent.

Symptom Removal Without Prior Medical Evaluation. As already discussed, behavioral interventions for the treatment of medical symptoms should always be preceded by medical evaluation. While even a comprehensive medical evaluation cannot guarantee anything, all reasonable steps should be taken to rule out dangerous etiologies. For example, sudden adult onset of severe headaches should never be treated with hypnosis and/or biofeedback before tumors or other neurological conditions have been ruled out.

Religion.

Unfortunately, the 300+ year history of therapeutic hypnosis comes with a good deal of baggage related to religious objections and the inaccurate portrayals of hypnosis by stage hypnosis, popular books, TV, and movies. Religious objections can be particularly delicate since some patients will belong to churches or denominations with a long history of admonitions to avoid hypnosis. A popular Baptist minister published a book and video referring to



hypnosis as "a portal to lucifer." In general, if a patient has a strong belief that hypnosis is wrong, bad, or evil, it is best to avoid this intervention and find an alternative treatment option that is more acceptable to the patient. For those who are on the fence about this topic, the book *Hypnosis, Healing, and the Christian* by John Court (1997) can be very useful⁵².

Conclusion

While this is an overview of contraindications to biofeedback, hypnosis, and neurofeedback training, there are others that may exist due to individual patterns and experiences. Each and every case should be considered from a personal medicine approach and assessed with multiple instruments.

Acknowledgment

This review is dedicated to all the mental health survivors.

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