

SPECIAL ISSUE

On Integrating an Integrative: Implications for Implementing a Biofeedback Program into an Inpatient Rehabilitation Hospital

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Implementing a viable biofeedback program into an integrative mental health inpatient rehabilitation program has its appeals and its challenges. This article describes the biofeedback program within the Sierra Tucson inpatient rehabilitation hospital. The fact that the field of biofeedback provides a dynamic system of training, education, and empowerment can yield creative programmatic solutions toward integrating this therapy to coalesce within a greater integrative mental health system. A brief outline of the challenges to consider when implementing such a program is offered, along with further discussion regarding the Sierra Tucson program's model and methods.

Introduction

The clinical applied sciences of psychophysiology and psychoneurophysiology are, by every account, true mind-body medicine. The very essence of an individual's ability to attend to the overactivation of his or her peripheral nervous systems and regulate these systems in the direction of his or her intention is—in itself—an act of integration. Include neurofeedback into this model, while coaching the individual toward an enhanced awareness of conscious state (Siegal, 2010), and mind-body integration becomes a multidimensionally profound experience.

The opportunity to implement this type of program is well suited to an organization that is recognized as an integrative mental health institution. The practice model established at Sierra Tucson is based on the bio-psychosocial-spiritual aspects of healing the whole person and not solely the disorder or symptoms. This model is an adaptation of integrative medicine (Maizes, Rakel, & Niemiec, 2009; Parks & Pollack, 2005; Sarris, Glick, Hoenders, Duffy, & Lake, 2014), whose principles are to (a) treat the whole person, (b) engage the patient collaboratively in treatment decision making, and (c) use appropriate treatments—whether allopathic or naturopath-

ic—to promote optimal health. The Sierra Model® comprises an amalgamation of primary therapies and integratives (our fond nickname for integrative therapy), which are implemented through multidisciplinary collaboration among treatment teams, made up of a core team (primary therapist plus psychiatrist) joined by other program and integrative therapists. Practitioners in biofeedback are members of these teams.

Sierra Tucson is a licensed inpatient rehabilitation hospital, nestled in the rural Sonoran Desert, offering five unique 30- to 45-day programs addressing (a) addiction recovery, (b) mood disorders, (c) trauma recovery, (d) complicated chronic pain, and (e) eating disorders. Although each program may be clearly defined, patients who admit themselves to Sierra Tucson bring with them a complexity of issues. A recent internal summary found that 86% of all patients treated at Sierra Tucson in 2013 were comorbid for two or more Axis I diagnoses. Whether referred to as coexisting disorders or comorbidity, such psychological profiles are the expected norm for today's treatment facilities (Hawkings & Gilbert, 2004). As we come to acknowledge the multifactorial nature of mental health issues (which I often refer to as “not occurring in a vacuum”), it is imperative to integrate mental health programs to combine a variety of therapeutic approaches to treat the myriad issues affecting the whole person.

Therefore, weaving biofeedback¹ into the fabric of Sierra Tucson has its merits, given the ample and growing scientific evidence supporting its efficacy to reduce symptomatology related to depression (Dias & van Deusen, 2011;

¹ Per Schwartz's 2010 commentary regarding the new definition of biofeedback as an integrative process combining tools to “measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature,” I will use the more simplified term *biofeedback* to refer to the multifaceted and complex work of our training, which historically has integrated neurofeedback, neuromodulation, and traditional biofeedback practices.

Karavidas et al., 2007; Siepmann, 2008), posttraumatic stress (Chamberlin, 2011; Tan, Dao, Farmer, Sutherland, & Gevirtz, 2011), anxiety (Hammond, 2005; Prinsloo, Derman, Lambert, & Rauch, 2013), stress (Conrad et al., 2007; Ratanasiripong, Ratanasiripong, & Kathalae, 2012), chronic pain (Hallman, Olsson, Schéele, Melin, & Lyskov, 2011; Nestoriuc, Martin, Rief, & Andraski, 2008), and substance abuse (Dehghani-Arani, Rostami, & Nadali, 2013; Scott, Kaiser, Othmer, & Sideroff, 2005; Witkiewitz, Kathleen, Lustyk, & Bowen, 2013).

Despite the promise that biofeedback may contribute to the overall patient recovery, one perplexing challenge was evident in implementing such a program: How can we successfully apply biofeedback to contribute to patient recovery in a narrow window of time? Granted, one from the outside may exult with zeal to have a captivated population available to receive daily biofeedback to maximize the benefits of psychophysiological training. Unfortunately, the reality of this ideal is far from practical, for several very good reasons.

The Challenge

As the fields of psychophysiology and psychoneurophysiology are advancing, it is apparent that we are in the very midst of a paradigm shift. As a scientist, this is pure stimulation and illumination, but as a manager, it is tricky business to locate and hire such professionals who either have earned reputable degrees in the field or have evolved into biofeedback practitioners through certifying agencies (e.g., the Biofeedback Certification Institute of America). There are plenty of patients needing our services, but we practitioners are a sparse lot. Currently at Sierra Tucson, the ratio of patients to biofeedback practitioners averages about 35-to-1. An immediate thought might be, “Why not engage several patients at once, like in a lab?” But then that points us to yet another challenge: space.

Whether you are a premier inpatient rehab or a small community clinic, space is a precious commodity. To grapple, plea, and negotiate one’s way to acquiring territory can be the material for comedy television; but in most circumstances, all practitioners at Sierra Tucson are provided individual offices (a lovely perk, indeed). So, one office: one patient at a time. Thus, the notion of “plugging in” several patients at once and running them through tailored protocols is—for now—out of the question. Which then brings us to: How do you offer efficacious training with limited space and time?

“Time” is as precious as “space.” Factoring patients’ schedules to fit an integrative mental health approach is not as easy as one might think. The beauty of an inpatient

integrative rehab is that patients are able to receive all of their treatment services in one central location, rather than the alternative, which might comprise driving around town to go to an integrative therapy, then to see the psychiatrist, then across town to pick up prescriptions, and finally to group therapy someplace else. Clearly, offering myriad primary and integrative therapies on one campus is advantageous. Nevertheless, systematizing 80–100 patients a day to receive several different integratives alongside meetings, groups, and meals is a bit of delicate work. Complicating this issue is that not all integratives are created equally: Some require more sessions than others, and biofeedback tends to be one of those therapies. The span of biofeedback’s efficacy can range anywhere from six sessions for heart rate variability (HRV) training (Lehrer, Vaschillo, & Vaschillo, 2000) to 20 or more sessions for attention-deficit hyperactivity disorder (ADHD) neurofeedback (Kirk, 2007). Furthermore, we do not always meet our patients during their first week of treatment, which could pose a problem to implementing conventional protocols.

So how do you offer a sustainable program that reaches all patients, integrates well with other integratives, and significantly contributes to patient overall recovery? You do so by integrating the integrative: by creating a program capable of flexing protocols that are concentrated, synergistic, and individualized.

Solution

Over the years of providing biofeedback at Sierra Tucson and facing such challenges of how best to weave it in order to mesh seamlessly with the greater integrative system, we have developed a flexible model of training whereby each patient receives a tailored program designed to engage them at their level of comprehension and capability, at whatever time point in treatment, to reduce disruptive symptomatology and enhance well-being. The aim of this stepwise process is to rehabilitate, reintegrate, and rehabilitate patient psychophysiology and psychoneurophysiology with the intention of reestablishing resiliency.

The R⁴ Model of Recovery

The manner in which biofeedback is offered should mirror that of the patient’s current phase of treatment. Typically, when patients first arrive to Sierra Tucson, they are highly activated or overwhelmed. As they settle into rehab, patients become more grounded and begin to become mindful of their issues and triggers. As the weeks progress, patients metamorphose into having resolve and clarity and are prepared to move on to the next phase of their recovery

trajectory upon discharge. Our R⁴ Model of Recovery was devised to coincide with this typical healing process.

The four “Rs” represent (a) rehabilitation, (b) reintegration, (c) rehabilitation, and (d) resiliency. It is a flexible system, embodying the cumulative process of biofeedback training over time. This program is designed to flex with symptom severity, patient need, time until discharge, and practitioner availability. Although we rely on published studies to guide our protocols, we may not necessarily follow all protocols to a “T,” because we may receive patients at varying times during their rehab process. Thus, it is necessary to meet patients at their level of progress (or distress) and to tailor protocols that are best suited to contribute to overall improvement.

Rehabilitation

re·ha·bil·i·tate: verb: to bring back to a normal, healthy condition after an illness, injury, or drug problem.

The first step in our biofeedback process is to evaluate patients’ current psychophysiological and psychoneurophysiological status. This comprises a brief self-report of patients’ overall perceived resiliency, a brief interview, a comprehensive psychophysiological stress evaluation, and an abbreviated quantitative electroencephalogram (QEEG; Swingle, 2008). These data provide us with an informative snapshot of the degree of patient physiological resiliency along with current psychoneurophysiological status.

It is often the case that patients will evince a typical psychophysiological pattern that parallels their emotional condition(s). Through HRV analyses, it is not uncommon to observe that depressed patients will typically respond to demands with increased high-frequency activity (which we may interpret as a state of overwhelm) or anxious patients typically responding to poststress recovery periods increased very-low-frequency activity (which we may interpret as “holding on” to stress). Each evaluation is methodically interpreted into an integrative profile, and when we discuss the findings with patients, they are often struck by the accuracy with which biorhythmic and EEG data can reveal their temperament and condition(s). From there, biofeedback protocols are chosen collaboratively with the patient and expectations for training are discussed. We then factor in time until discharge and patient-scheduling issues to determine the number of follow-up sessions possible.

Because most of our patients present with poor stress coping skills, the next step of rehabilitation is to begin prompt training for stress reduction. This is through a combination of breath work (while monitoring HRV analyses for instant feedback), mindfulness (Grossman,

Niemann, Schmidt, & Walach, 2004; Kabat-Zinn, 2004), and—when applicable and necessary—integrating various targeted neuromodulation systems (such as audiovisual entrainment [AVE], transcranial direct current stimulation [tDCS], or cranial electrical stimulation [CES]) for immediate relief from disrupted sleep, pain (Knotkova & Cruciani, 2010), or refractory depression (Holtzheimer & Mayberg, 2012). From the outset, patients are encouraged to begin daily mindfulness self-practice by attending to body/mind stress cues and to engage in their customized breath technique to alleviate symptoms and promote physiological regulation.

In those cases in which patients are able to receive only one or two biofeedback sessions overall, we will bypass any empirical evaluation and focus primarily on stress reduction or relaxation training. These one-time sessions are more akin to a biofeedback experience, rather than part of a cumulative training process.

Reintegration

re·in·te·grate: verb: to integrate again into an entity; restore to unity

The reintegration aspect of our biofeedback program is the essence of strengthening the integration of the nervous systems. Pun intended, we refer to this as the “heart” of the work, warmly introducing HRV training.

An essential first step in this training is literally to map each patient’s heart resonance frequency.² Our biofeedback system (Biotrace Nexus 10) allows us to accomplish this discerning process. Rather than have patients train with preset simulators, our patients train through simulators programmed based on their own unique heart resonance frequency, intermixed with “following” their own actual heart rhythm through gentle, passive volition with their natural respiration. Once an initial brain map or QEEG has been completed, neurofeedback at the central-midline structures will be integrated into HRV training (most often Fz or Cz). Others’ reporting of the synergistic effect of enhancing the connection between brain and heart (Porges, 2011; Reid, Nihon, Thompson, & Thompson, 2013; Thompson, Thompson, Reid, Thompson, & Hagedorn, 2013) substantiates our own clinical experience of how patients can reach and maintain a calm, yet alert state of homeostasis and focus. We believe that HRV combined with neurofeedback is critical to overall patient well-being and is the foundation for developing psychophysiological resiliency.

² The resonance frequency is the rate of breathing that produces the greatest heart rate variability (HRV). The resonance frequency model of HRV training was developed by Lehrer, Vaschillo, and Vaschillo (2000).

Table. Sample protocol with patient objectives and methods outlined

De-Sensitization	
Objectives	
√	Rehabituate Physiology toward a “new normal” of Resiliency & Calm
√	Quiet an Over-Activated Mind, thus Enhancing “Calm & Alert”
√	Increase Mental Flexibility and Creative Processing
Indications	
√	Anxiety, characterized by Fret, Worry, Panic Sx
√	PTSD Hyper-Arousal & Hyper-Vigilance
√	Chronic Pain Syndromes (w/ Trauma component)
√	Sleep Restoration Issues
√	Stress Management
Training Levels	Program
1) REHABILITATE (Sx Reduction)	
i. Physiological Reconditioning	BIO Respiration Training (de-stress/de-fatigue)
ii. Cerebral Calming	NEURO Squash if indicated + AVE Alpha Relaxer + CES tDCS for Pain if indicated
2) REINTEGRATE	
iii. HRV Training	BIO Heart Rate Resonant Coherency + Guided Imagery
iv. Cerebral Flexibility	NEURO Cz SMR Training (Pain) / Fz (Fast Beta Down) for Activated Cingulate NEURO Alpha Peak Frequency + AVE Alpha Relaxer + CES
3) REHABITUATE	
v. Mind/Body Integration	BIO Stress Management (other Peripherals), Systematic Desensitization
vi. Mental Tranquility	Integrated Pz Alpha/Theta Training Neurofeedback + HRV tDCS for Pain if indicated + Guided Imagery

Depending on the patient’s resiliency potential, symptom severity, and time-until-discharge factors, reintegration sessions may range from one to four sessions. Nevertheless, nearly all patients will have HRV training because of the powerful psychophysiological shift that occurs when an individual experiences his or her own heart rhythm frequency first hand. Patients are given homework to practice their heart-rhythm coherence breathing (Courtney, Cohen, & van Dixhoorn, 2011) as much as they can remember throughout the day.

Rehabilitation

re·ha·bit·u·ate: verb: become reaccustomed, refamiliarize, acclimate again

After stress reduction and HRV training, we refer to subsequent sessions as the “gym of biofeedback,” which comprise the essence of reconditioning patients’ psycho-

physiological and psychoneurophysiological functioning. Patients are educated that both brain and body are malleable, trainable systems that are capable of achieving a new normal of homeostasis and emotional balance. Rehabilitation protocols are selected based on symptom reduction (or enhancement) identified during the initial evaluation (an example of one protocol is outlined in the Table). With time and patient schedule allowing, sessions can be scheduled two to three times per week.

Each 50-minute session is compact with various training approaches that are synergistic, balanced, and cumulative. These usually begin with patients briefly rehearsing their breath techniques and HRV to shift their physiology toward regulation; this serves to reinforce actual rehabilitation and promotes self-empowerment. We then integrate various modalities of biofeedback, neurofeedback, and neuromodulation, which comprises most of the hour. We

integrate several tools from a small variety of choice equipment (and only those that pass the muster of my ever watchful skepticism) that provide reliable, no-nonsense, and efficacious outcomes. In addition to our main platform, we will often incorporate hemoencephalography (cerebral blood flow biofeedback), AVE, tDCS, and CES. Because we offer a clinical yet science-based service, it is important to provide science-based results; therefore, we use systems that allow for real-time data capture, which can be individually analyzed during each session. When patients see the results of their biorhythmic or EEG changes, we believe that this enhances the reinforcement process at a meta-cognitive level, above and beyond that which occurs during regular biofeedback training.

Resiliency

re-sil-i-ence: (1) *noun: the power or ability to return to the original form after being bent, compressed, or stretched.* (2) *noun: ability to recover readily from illness, depression, or adversity.*

The resiliency aspect of our training is not quite a process per se but an ongoing attainable state reached by engaging in biofeedback overall. I quip that the best thing I can do for a patient is “work myself out of a job” with them, knowing that they no longer require my services as they have mastered tapping into their own body’s resources to reduce symptomology and enhance their well-being. That’s the beauty of biofeedback.

Final sessions often will include an overview of the patient’s data in order to observe improvement over time, plus a take-away stress management practice (usually a 5-minute tailored sit incorporating (a) observation, (b) self-regulation, and (c) and heart rhythm coherency (while using HRV analyses to test their accuracy). When more training is needed postdischarge, patients are provided a list of certified practitioners in their hometown (via www.bcia.org) along with additional information about the systems they used while working with us.

Summary

Despite obstacles and challenges to implementing a complex integrative therapy into a greater system, biofeedback has become a viable source of healing for Sierra Tucson patients. The success of weaving our program into the fabric of Sierra Tucson is largely due to biofeedback’s dynamic nature. Not only have we fashioned its structure to rehabilitate, reintegrate, rehabilitate, and promote resiliency, but each session alone is a composite of this very structure, designed to be a complete experience within itself.

When several sessions are experienced in a cumulative fashion, it is our aim that through reintegration and rehabilitation, body and mind have transformed toward resiliency. Patients become in tune with and appreciate the dynamic nature of their own body’s bio- and neuro-rhythms; this, in my opinion, may contribute to the meta-cognitive expansion or profound insights we often observe in patients. Biofeedback to us is more than just training with a computer interface; it is the essence of profound mindful awareness when delivered in an integrative, dynamic way.

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