

Alpha-theta-based Clinical Outreach

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Abstract

A modified version of the alpha-theta protocol has been developed for the purpose of demonstrating the therapeutic power of neurofeedback. Neurofeedback demonstration has a different goal from that of therapy in that here the objective is educating the client at a personal level rather than modifying the client. A portable neurofeedback workstation using only audio feedback used in conjunction with this alpha-theta protocol enables an unfamiliar client to experience a single session of neurofeedback and understand what is to them a completely new approach for growth and healing.

Introduction

Neuronal regulation is poorly understood in the general population and because of this it is difficult to educate people about the benefits of neurofeedback. One of the most effective forms of education combines explanation and demonstration. This chapter describes the tools and methods I use to introduce neurofeedback to interested strangers who come to a free clinic that is hosted in an open, community space. This program engages both healthcare professionals and the lay public.

Neurofeedback lacks recognition in medical and personal growth circles. Traditional Western medicine has yet to accept the role of electricity in the body, and virtually all programs for personal growth ignore neurology. The clinician who wants to educate the public needs to know how neurofeedback can be applied in medicine, and also its role in the areas of personal growth and performance enhancement. By covering both of those bases I find it possible to engage anyone.

The Rondout Valley Holistic Health Community offers a free, walk-in clinic as a form of public outreach. The event is held monthly in the Marbletown Community Center in Stone Ridge, New York. Folding tables convert one of the two rooms of the 2,000 square foot space into an intake and registration area. Fabric dividers strung between removable telescoping posts, and folding gym mats used as wall partitions convert the main room into 17 treatment stations of which my neurofeedback therapy station is one.

Clients queue at the door and are given numbers as they enter to the staging area where a list is available showing the treatment modalities available that day. Most of the modalities are considered alternative therapy.

Clients submit the names of three practitioners in order of their preference, and sessions with practitioners are arranged on a first come, first served basis. When a practitioner becomes available a volunteer escorts the client to the practitioner's station. When the session is finished the practitioner escorts the client back to the staging area for sign-out.

Neurofeedback Station

My neurofeedback station consists of two small folding tables and a plastic storage box that together provide one half square meter of desk space. This space is taken up with a computer, EEG amplifier,

audio mixing board, and the usual sensor attachment supplies.

I sit on a folding metal chair and bring a folding, reclining camping chair with head and arm support for the client. The whole station occupies about three square meters of floor space. All equipment, aside from the two tables and chairs, pack into a computer bag and the storage box.

Hardware consists of a laptop computer, a BrainMaster EEG amplifier, an Auvio headphone amplifier, a Mackie 402 VLZ4 4-channel, ultra compact mixer that supports 2 input channels and a headphone output channel, a Sure PG38 hand-held microphone, PlaneQuiet Platinum noise reduction headphones, a set of earbuds, and a three-wire extension cord providing power to the computer and mixing board. My software consists of BioExplorer running a one-channel protocol, and a sound file that plays a short chime sound through the headphones when the session ends.

The neurofeedback protocol is audio-only; the client does not look at the computer screen. The reward and inhibit sounds are played through the computer's headphone port. Most computers do not have amplified audio output and their audio signal is too weak to be amplified with clarity by the mixing board. The sound level is boosted by the headphone amplifier that is plugged into the computer's sound port and joined to the mixing board with a stereo cable that has male jacks on both ends. The mixing board's second input port is connected to the hand-held microphone.

Mixing boards are designed to power amplifiers but in this case we are only using the mixing board's headphone output. Into this output port I plug a two-way splitter to which I connect the noise-reducing headphones that the client wears, and the earbuds that I wear in order to monitor the sound levels and the client's experience.

The mixing board allows me to control audio gain and volume. The most difficult aspect of this enterprise is balancing all the sound levels so that different sounds are equally audible. Balancing sound levels is done by running a pre recorded neurofeedback session stored on the computer's hard disk. By alternately donning the earbuds and the headphones I adjust the levels so that the sound is clearly audible through each device.

Adjusting sound levels requires attention because there are six volume controls: computer output level, amplifier boost level, mixing board input level, mixing board output level, headphone volume, and earbud volume. The computer output level must be set at its maximum volume because this provides the primary signal. Volume levels on the mixing board are set as low as possible to avoid distortion. The volume levels set on the headphones and the earbuds are set as high as possible since these do not amplify but rather attenuate. I use the mixing board's headphone output level to adjust and confirm volume levels for each client.

It is necessary to listen to the different feedback sounds to ensure that the gain is set for each to be heard clearly and that none are excessively loud. The computer, amplifier, and mixing board all have tunable sound profiles. You can leave them at their default settings or adjust them to improve sound quality.

Neurofeedback Session

The session begins with my requesting the client sign a release of liability form, and an explanation of my background and interest. I ask the client why they have come, what they know about biofeedback, and for an overview of their health. I ask them for one issue of personal importance with which they are struggling. I am looking for basic emotional issues and physical problems between which I hope to discern some correspondence. I use the issue that they present in an affirmation I later read to them.

The object of the session is to address whatever interest the client presents by intellectual engagement, establishing an empathic connection, and a session of neurofeedback. The amount of intellectual

engagement and empathic connection is determined by the client. My preference is to complete these aspects of the session before conducting neurofeedback but sometimes interaction is more relaxed after the session.

The objective of the neurofeedback is to increase sensitivity, control, and relaxation. The basic protocol is a single-channel alpha-theta training. To this I have added two optional audio rewards with independent threshold settings and bandpass filters. One reward is delivered according to a fast response threshold using a 1-second amplitude average that triggers a chime. The other is a 3-second average threshold linked to the volume of a continuously playing musical track. I can selectively turn on or off the alpha-theta, the fast reward, or the slow reward so that they are presented alone or a combination.

The headphones make it impractical to use the ears as reference sites so I place the reference on the scalp above the ear just beneath the edge of the headphone pad, which is a little above T3 or T4. This is not much different than an ear placement because the ear is not a neutral site to begin with. The correlation between an ear-to-ear circuit, or an ear to T3 or T4 circuit is roughly 80% over a broad frequency band. Consequently, I expect similar results using a reference near T3 or T4 as from using ear reference sites.

In most cases I select an occipital or parietal active site. If I discern in the client a particular openness to their unconscious I will follow Green (1999a) and Urgesi et al. (2010) and select O1 or O2. If their issues seem to relate to issues of orientation or boundaries then I select P3 or P4 (Berlucchi and Aglioti 1997). I will use Cz above the sensorimotor strip if their issues are somatic.

These choices are driven by our understanding of the functions of these areas and the presentation of the client. It is unclear whether the choice of sites will make much difference if one is only doing a single session of neurofeedback. The prefrontal site at Fp2 is an exception as most people are sensitive to feedback at this site with fear, anxiety, and depression being abreactions. I largely avoid placing contacts at Fp2 in the context of the walk-in clinic.

Alpha-theta as a teaching tool

People feel engaged when they sense an aptitude for, and a benefit from the training. Introducing neurofeedback through demonstration presents the conflict that “having an aptitude” usually means the client feels in control, yet being in control generally undermines what one might gain from neurofeedback.

I tell people that if they could have benefited from exerting conscious control they already would have: they would not need an EEG amplifier. I emphasize our goal is to develop unconscious control, something the Greens' refer to as “passive volition” (Green and Green, 1977, p.54). As true as this may be, unconscious control is a foreign concept that is poorly appreciated.

In most cases where people do develop unconscious control, as in natural movement, a facade of awareness fosters the illusion of control. Tor Norretrander (1999) argues this illusion extends to consciousness itself, over which, he argues, we have little control. Or to put it more simply, that our sense of self awareness is largely an illusion.

Someone looking for performance enhancement will appreciate this predicament. They understand that developing a skill that one does not have demands that one tolerate frustration. They know that they must develop their own goal and accept responsibility for reaching it. Being asked to accept frustration is more of a problem in a therapeutic context where the client expects clear direction and assessment. Someone attracted to an allopathic approach may find my directions unsatisfying but they will benefit from this training as much as anyone else.

If it were possible to deliver an obvious and resounding benefit in a single session of neurofeedback

with a complete stranger we could convince clients of neurofeedback's efficacy by simply improving their condition. However, as it is easy to train a person into an unwanted state we must introduce neurofeedback gently and avoid dramatic changes. It is better to leave the client unimpressed than to demonstrate the power of neurofeedback by making them uncomfortable.

Demonstrating Alpha and Theta

I begin the alpha-theta feedback by first letting the client experience pure theta and then pure alpha reward. This gives them some confidence and introduces them to the skills we are addressing.

Pure theta reward is achieved by turning off the alpha-theta reward sounds and replacing this with my slow average threshold linked to music volume. Speaking through my microphone into their headphones I described the theta state (Green and Green, 1977) as one in which one has no thoughts and in which one's visual field has gone dark and empty. I ask the client to breath slowly, relax, and attend to the pause between the end of their inhalation and the start of their exhalation. In this situation the feedback enables some people to hear bursts of theta activity.

Telling the client that this demonstrates their ability to control their brainwaves is somewhat of a ruse because I have control of the amplitude and sensitivity of the feedback. Using automatic thresholding, which I turn on or off at any time, I control the percentage of the time that the client experiences the reward sound.

The primary benefit of automatic thresholding is in retaining the attention of a client who can focus on the feedback. In this case I'm simply lowering the threshold to a level where anyone can succeed without trying. The client will usually not know whether they have produced theta as a result of voluntary or involuntary efforts. This does not undermine the success of the session because it does not matter how they produce a change in their EEG. This demonstration helps to satisfy those people focused on control, or who need to feel that they are in control. Once satisfied these people can relax, get out of their own way, and start learning through feedback.

After a minute of theta training I shift the frequency filter to the alpha band, and I shift the feedback to the fast reward. I describe the experience of being in an alpha state by instructing the client to open their eyes, clear their mind of thoughts, and focus their attention on "the edges of the sound." I am trying to guide them to a state of hypervigilant, non-verbal awareness. I want them to distinguish the alpha versus theta enhanced states.

Clearing one's mind is difficult in an alert state. Clients are more likely to succeed in raising their alpha levels intermittently which makes the use of the fast 1-second amplitude average more appropriate. This illustrates both the client's intermittency of awareness of their own mental state, and the fragility of their control. The client who can appreciate this is better able to understand the general goal of neurofeedback training.

I ask clients to remember these different states of mind and instruct them that the full alpha-theta training involves alternating between these two states. I then turn off the single band rewards and start a 20 minute alpha-theta training session.

Alpha-Theta Background

The alpha-theta protocol was created on an inspiration by Eugene Peniston who presented it, fully formed and without argument, as a method of remediating substance addiction (Peniston, 1998). Because the protocol was the result of a personal inspiration and did not develop from deductive research, and because neurofeedback did not have a place in addiction treatment Peniston's protocol and neurofeedback

in general has found little acceptance by providers in the addiction treatment industry. This is in spite of Peniston's approach having one of the highest success rates, if not the highest success rate of any institutional approach to the remediation of addiction.

Peniston's inspiration came from his experience with theta training at the Menninger clinic, and from Elmer Green's interpretation of theta and alpha as states that connect one's conscious ego with deep, trauma-formed behavior patterns (Green, 1999b). While this approach is consonant with transpersonal psychology it has limited correspondence with the currently popular, localized, neuronal model of cognitive function.

Variations of alpha-theta training have shown statistically significant improvements in the surgical performance of ophthalmic surgeons (Ros et al., 2009) and the musical expressive ability of conservatory students (Gruzilier et al., 2014). This is in spite of the fact that according to our understanding of localized brain functions these abilities should be handled by areas outside the occipital region: the sensorimotor strip for fine motor control, and the right temporal areas for emotive expression.

There is no precise explanation of what is being accomplished by alpha-theta training, although there are several suggestions. The first is that the training develops one's facility to intertwine a dominantly alpha state with a dominantly theta state. This proposal is built on the unmeasured assumption that the states of theta and alpha brainwave dominance provide access to lower and higher states of self-awareness, and that a new measure of integration is achieved by intertwining the two.

A second explanation suggests that equalizing the average amplitudes in the alpha and theta bands leads to a greater connection with one's unconscious and improved voluntary control over the habitual patterns stored there. According to this understanding the protocol's advantage comes from training a person to equalize alpha and theta levels at occipital sites, if only for the duration of the training.

A third explanation that is rarely discussed is that verbal affirmations have great effect when in the cognitive state precipitated by the alpha-theta training. This explanation is both difficult to quantify and runs contrary to the neuro-mechanical model of mental health. It involves the volitional model of mental health advocated by practitioners on the spiritual side of psychotherapy, such as Louis Hay (1984) and Caroline Myss (1998). According to this explanation it is the ability to state and internalize one's intentions in a way that resonates with one's deeper self that leads long-term changes in health and behavior.

After researching these questions Mark Johnson concluded that the effectiveness of alpha-theta therapy relies upon "Peniston's earlier contention (of) emergent emotionally salient imagery" (Johnson, 2011, p. 44). Johnson further resolved the aspect of the training most likely to accompany emergent imagery by defining a "therapeutic crossover." This is an event identified on the EEG when the theta amplitude rises at least 1 microvolt in amplitude above alpha and remains dominant over alpha amplitude for 3-10 minutes or longer, as well as contains the 15-20 Hz beta superimposed brainwave frequency components" (Johnson, 2011, p. 31). Johnson did not consider the role of the induction script.

Some aspects of each of these explanations are likely at the root of the protocol's ability to effect change, or perhaps a combination of all of them. None of these mechanisms explain why the protocol is effective over an area of function that is so wide as to include addictive behavior, trauma, fine motor skills, creative ability, and more. Gruzilier (2009) reviews alpha-theta's wide ranging cognitive effects. Raymond, Varney, Parkinson, and Gruzelier (2005) explore its general effect on mood. Boynton (2001) examines the effect on creativity. Von Stein and Sarnthein (2000) examine the protocol's neuroregulatory effects.

Alpha-Theta Configuration

Alpha-theta feedback presents alternating sounds depending on whether single-circuit amplitude is dominated by frequencies in the alpha or the theta band. The strength of these signals is determined by the width and location of the filters used to define these bands, the time over which the signals are averaged, the sites chosen, and by each person's different EEG profile.

The objective of alpha-theta training is for the client to alternate between the two sounds. I use the sound of rain alternating with the sound of frogs, 6th order Butterworth filters, and the standard ranges of alpha between 8 and 12 Hz, and theta between 3 and 7.5 Hz.

Alpha-theta is done eyes-closed both because this boosts the alpha levels as measured over the occipital region, and because it facilitates the targeted thoughtless states. This limits the protocol to rear placements and requires roughly 10 training sessions to develop the ability to balance the levels.

Alpha and theta rhythms are generated everywhere on the scalp, although their function and a person's ability to generate them vary. Training away from the occipital or parietal sites is not part of the original alpha-theta protocol, nor would it be alpha-theta training if we were not focusing on the alpha and theta bands. However, the general structure of the training and the potential for gaining flexibility and control using a protocol that does not entrain suggests that we may obtain benefits from both moving away from sites at the rear of the head, and in moving away from the alpha and theta bands.

Making either of these changes requires that we change the assumption that people can or should be trained to generate equal amplitudes in two bands. In fact, quite different results may obtain by training people to establish alternating, unequal levels. Rewarding unequal levels may be beneficial because most people start with average amplitudes that are unequal.

In order to enable clients to experience crossing over between the dominance of their alpha and their theta signals, and to facilitate working with crossing over between signals in any two frequency bands, I have added a feature to the protocol that boosts one of the signals. This boost is done in software and provides a crutch of varying strength that moves toward equality the amplitudes extracted from any two filter bands.

I have designed this boost to apply to the alpha signal, or whatever band I am using in place of the alpha signal, because that is usually the weaker signal. I can vary the boosting factor from 0 to 1. At zero there is no boost. When set to 1 the boost amplifies the associated signal so as to have the same long time average as the complementary signal. This is a multiplicative factor so that it does not distort either signal.

Boosting one of the frequencies is much like an automatic threshold in that it allows the clinician to set the level of difficulty that the client will have in generating cross-over in the feedback signals. I boost the alpha signal in almost every case as a way to enable the client to experience crossover. Without this it will take a client that much longer to simply find a state that generates the unrewarded, weaker frequency.

Induction Script

The induction script is an important but rarely discussed component of the alpha-theta protocol. It is essentially a guided meditation that focuses the client on what they intend to accomplish. The script is either composed for or by the client and read back to them during the first 5 to 10 minutes of the session.

Penniston and Kulkosky (1989) allude to this script without detail. Scott, Kaiser, Othmer, and Sideroff (2009) mention their three to five minute script as dealing with "identified essential elements of maintaining abstinence." The script is not mentioned at all in the work with ophthalmic surgeons (Ros et al., 2009) and music students (Gruzilier et al., 2014).

I find the induction script to be important, which is consistent with the experience of others (White,

1999, p. 343). “Visualization seems to be the quickest and surest way of programming the body... Patients’ visualizations of success or failure, sickness or health, and ideas about their body and mind together determine to an important extent what happens to them” (Green and Green, 1977, p. 167 ff). The script accomplishes several things:

- ☒ distracts clients from the cogitation that obstructs both the alpha and theta states,
- ☒ provides a sensory-focused experience aiding the client in relaxing into an psychosomatic experience,
- ☒ affirms a positive goal that will hopefully remain in focus as they enter a receptive state.

In my private practice I have developed a 10-minute script based on ideas from Louis Hay (1984) and Jacquelyn Aldana (2003). For use in this demonstration protocol I use the following 5-minute script that includes the issue the client has put forward.

“Imagine you are sitting on a mossy stump beside a beautiful forest lake on a warm spring day. The air is still and heavy with mist. You are wearing a loose parka. You are warm and comfortable. In front of you the surface of the wide lake is dappled with the texture of fine raindrops. You feel the warm air on the backs of your hands. You are relaxed.

“Rising slowly you stand, face the lake, and then turn left to look along the water’s edge. Smooth water spreads out to your right. The shore rises gently to the tree line. You relax your eyes. Stepping carefully, feeling every placement of your feet, you move along the shore following a smooth earthen path. You move effortlessly.

“Entering a small bay you see the path turn toward the trees. The path climbs to a tremendous tree and then drops down between two wall-like roots. You descend four large, stone steps and find yourself on a flat, sandy circle with the huge tree arching above you. A wide path leads through a stone arch into a dim passage beneath the tree. You are curious.

“After a pause you step under this arch and into the cave leaving the grey sky behind you. The cave walls are dry and sparkle with large crystals. The crystals cast a pale glow that is enough to light your way forward, fading to darkness ahead. You follow the path without a sound.

“After a minute the cave comes to an end at a wide wooden door set on heavy hinges. The door has a round brass knob and a sign hanging above it. The sign says “Grace.” It welcomes you. With hardly a touch the door swings into a carpeted study filled with books. Directly in front of you is a low table and an overstuffed armchair covered in lambswool. Walking to the chair you stop. You turn around and lower yourself into it. The chair fits you like a glove folding you in warm fur.

“The room is large, its walls covered in bookshelves. Desk lamps cast a peaceful yellow light. Colorful carpets cover the floor. Heavy wooden beams cross the ceiling. You feel secure. A journal is open on the table. Written in a neat handwriting you read this to yourself:

“Even though I _____, I value and love myself.

Even though I _____, I value and love myself.

“You feel the warm lambswool. You can still hear the forest sounds alternating between the light rain and the tree frogs. You listen first to one and then the other, back and forth. You are calm. You listen to the sounds.”

Into the blank areas above I insert a rewording of the client’s statement of their issue of personal importance. It is my intuition that in most cases in the walk-in clinic the clients are not ready to accept this self-affirmation. The intellectual tenor of our interaction and the novelty of the situation work against opening to sensitive personal issues. I include it in spite of this because I want to inject a relevant and positive affirmation, and because it may open the otherwise guarded atmosphere surrounding the demonstration.

Session Conclusion

After reading the induction script I turn off the microphone and watch the EEG and the client's body language as the alpha-theta session proceeds. I do not make any further changes to the protocol and I do not speak any further until the session ends.

A few minutes before the scheduled end of the session I turn the microphone back on and read a short, one-paragraph exit script that walks the client back out of the subterranean study where I'd left them and back to the lake shore where the induction script started. I press a button on the screen to play a sound file of a resonant bell. In an in-office setting I could strike a real bell, but as all audio here comes through the microphones I must play a recording. I then remove the clients headset and the electrodes.

I ask the client about their experience. Everyone is interested in their EEG and most people want to know whether or not it looked normal, by which they usually mean healthy. I explain the great variance of people's EEG patterns and point out something of note in theirs.

I have configured my software to show the session's amplitude traces over all major frequency bands, not just the alpha and theta bands. I also have a spectrograph, of the sort that is now in common use, that shows time along the horizontal axis, frequency along the vertical axis, with amplitude color-coded such that black is low amplitude and white is high. This makes the relative strength of the frequency bands immediately evident. I usually point out some aspect of the EEG that pertains to or correlates with their personal inventory.

The most common distinction I see is between people who show variable EEG patterns and those who do not. I often use these variations, such as sudden bursts of theta activity, to illustrate to clients how their awareness is episodic. Episodes of strong theta correlate with client's loss of self-awareness, while bursts of beta activity correspond to cognitive activity. If possible I summarize what neurofeedback training might do to address their personal issues in terms of a possible change in their EEG profile.

I solicit the client's email address in order to contact them the next day to further inquire about their experience. I then accompany the client back to the clinic's sign-out station where they complete their paperwork.

Cases

Hyperactivity

ADHD is a diagnostic jungle and most parents know little about its many aspects (Stoller, 2014). Most young people diagnosed with ADHD struggle with parental and social issues. When a mother came to my station with an active 8-year old child and asked if I could help her son calm down I felt that it was the mother who needed relaxation training.

There was little opportunity for me to introduce a solution so I explained what I was doing to the youth and gave him 5 minutes of alpha-theta training, after which he was anxious to run outside and play, followed by his frustrated and apologetic mother. I could hardly get a clean EEG reading for the artifact introduced by his movement, but I'm sure he and I could have a wonderful time exploring further training. If nothing else this would have given him a new level of control.

Mood improvement

I conducted a demonstration at a frontal site for a client who was focused on issues of depression and negativity. Neurofeedback is effective in relieving depression and I showed this client the high amplitudes of frequencies in the right frontal area postulated to sustain a depressed attitude (Hammond, 2009). Not

being certain in the effect I will have I moved the electrode to a less sensitive location between F4 and Fp2.

Training a change in frequencies at Fp2 often results in dramatic mood changes, but this version of alpha-theta training, which employs equalized amplitudes, only rewards flexibility. I cautioned this client to be prepared for unusual emotions over the next 24 hours, that such feelings could be ascribed to the neurofeedback, and that such effects will be temporary.

Two days after our session this client reported, “[Yesterday] was a rough day for me. Today I felt clear and like a functioning human being... I think I was feeling even more intense than my usual down cycling. I am interested in this process and curious about starting a regular practice.”

Cognitive flexibility

A physically rigid client manifesting conservative attitudes said they had no knowledge of neurofeedback. This person worked as an accountant making use of their inclination for organization but they had difficulty relaxing and sitting still. They could not meditate.

The client fidgeted throughout most of the session and was only able to relax while I was reading the induction script. I showed them their unusually high beta levels and explained that such a pattern typically correlates with anxiety and cogitation (Hammond, 2003, p. 28). I added a high-beta inhibit to the protocol that may have had some effect though the EEG continued to cycle into beta.

A few days later they reported “That was great! I was so anxious to find out what neurofeedback is about. I think it's really cool and I appreciate the way that you explain everything in detail. I felt wonderful, calm, and relaxed. I also found this to be very helpful in understanding myself better. Everyone should experience this, I think. It can only be positive.”

Outcome

Neurofeedback demonstration has goals and risks that are different from therapy. Education is a prime objective rather than achieving a change in symptoms or a change in the EEG. Engaging the client's interest and offering them a useful understanding can provide options for growth and healing outside of traditional medicine and the limited options they may have come to assume.

Without much of the client's history, a normative qEEG, or an assessment of their responsiveness we can only establish a rough correspondence between their personal inventory and EEG. The benign action of the modified alpha-theta described here makes it suitable for a situation where avoiding harm is a prime concern.

A basic knowledge of Brodmann areas and behavioral correlations with frequency profiles allows us to create a plausible hypothesis for the neuronal basis of our client's issues. This hypothesis may lack precision, it may be wrong, but it makes it possible to argue for what is most likely a completely new approach.

In addition to introducing people to neurofeedback the walk-in clinic introduces neurofeedback to practitioners of other modalities. There is a certain amount of discussion of experiences between practitioners in the kitchen, which is volunteer staffed and stocked with food donations. Also, if client load leaves open slots later in the day clinicians can sign up to experience each other's modality. In this manner neurofeedback is integrated into the community of alternative health care providers.

Finally, this sort of personal demonstration of how people can train their own health encourages greater self control, and presents new options for growth and health. Changes of this sort must occur for neurofeedback's participatory model of healthcare to find mainstream acceptance.

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