A PRACTITIONER'S GUIDE

Applications of the emWave® PC Stress Relief System

(Formerly known as the Freeze-Framer®)

Timothy P. Culbert, M.D.
with Howard Martin and Rollin McCraty, Ph.D.

HeartMath®

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HeartMath LLC
14700 West Park Avenue, Boulder Creek, CA 95006
1-800-450-9111 • 1-831-338-8700 (outside the U.S. or Canada)
www.heartmath.com

I. Introduction

Over the span of a few decades health care has evolved from a singular faith in biomedicine and technology to a recognition of the biopsychosocial nature of all illness.

—Donald Bakal[1]

The purpose of this booklet is to introduce health and education professionals to the emWave® PC Stress Relief System (emWave PC), an innovative stress reduction and emotional management system. The booklet includes a discussion of why it is an ideal time to consider such a tool, the importance of "psychophysiological coherence" and self-regulation skills, and specific guidance on how to use the emWave PC for research and educational purposes with a variety of clients in a variety of settings.

The emWave PC Stress Relief System (with related HeartMath materials and techniques), represents a new tool for health care that is complementary with and reflective of new theoretical, scientific, and cultural findings, rapidly leading to the redesign of health care.

Increasingly, emotional self-regulation is being recognized as a key factor to balance health, recover from illness and improve performance. More than ever before, health professionals are aware of this reality – that the nature of almost all illness is best addressed both in mind and in body. The public is also increasingly aware of this and are seeking out health care options that are more congruent with this value.[2] Additionally, educators recognize the critical role of emotions to the learning process.

Emotions and feelings have a powerful impact on the human body. Negative emotional reactions mediate undesirable physiologic changes that can create or exacerbate a variety of health problems including heart disease, hypertension, headaches, stroke, depression and sleep disorders. Positive emotions on the other hand, such as appreciation, care, love and compassion, not only feel good, they are good for one's health.

A growing body of research is beginning to provide objective evidence that positive emotions may indeed be the key to optimal functioning, enhancing nearly all spheres of human experience. Positive emotions have been demonstrated to improve health, increase longevity, increase cognitive flexibility and creativity, facilitate broad-minded coping and innovative problem-solving, and promote helpfulness, generosity and effective cooperation.

The emWave PC with its patented Heart Rhythm Monitor fosters the ability to self-regulate emotional and physiological changes associated with stress.

Stress is ubiquitous. It can be defined as the "wear and tear" on the mind and body in response to everyday tensions and hassles. When left unchecked, it can be quite detrimental to health and well-being. Stress affects people physically, emotionally, mentally and spiritually. According to the American Institute of Stress, up to 90% of all health problems are related to stress. It is, however, not the stressful events themselves that do the harm; it's how people perceive and respond to them. Chronic health conditions often evolve from persistent stress or, in other cases, are exacerbated by stress, which can impede recovery.

Research is continuing to show the important, bidirectional pathways by which stress, negative emotions, social and psycho-spiritual factors affect physiological events and processes, thus serving as important co-determinants of health and performance.

By learning and mastering the self-regulation techniques incorporated in the emWave PC, clients can manage stress as they become active and empowered participants in directing their own health and wellness, while moving toward symptom resolution and recovery.

The emWave PC has potential applications within many health care settings, including primary care clinics, inpatient units, psychology practice, in educational settings (mainstream and special), in rehabilitation settings and chronic pain clinics, and in myriad private practice specialty settings (conventional and alternative).

Medicine
- Pediatricians
- Family physicians
- Gerontologists
- Cardiologists
- PM & R (Physiatrists)
- Oncologists
- Endocrinologists
- Pain Specialists
- Obstetricians/Gynecologists
- Internal Medicine
- Psychiatrists

Psychology, Nursing and Allied Health
- R.N.'s
- Nurse Practitioners
- Psychologists

- Social Workers
- Child Life specialists
- Physical therapists
- Chaplains/Pastoral care workers
- Marriage and Family Therapists

Complementary Health
- Osteopaths
- Chiropractors
- Homeopaths
- Naturopaths

Education
- School nurses
- Teachers
- Special Educators
- Academic therapists
- Educational/School Psychologists

Applications Overview
The emWave PC is appropriate for use with clients with conditions for which reducing stress and restoring ANS balance is appropriate. One benefit of using the emWave PC in primary care settings is that clients can begin feeling better much faster, sometimes with less medicine and fewer mental health referrals.

Some applications where the emWave PC has been successfully used for reducing stress-related symptoms as a primary or adjunctive approach include:

Acute, Chronic and Recurrent Pain
- Headaches – tension type and Migraine
- Recurrent Abdominal pain
- Burns
- Acute procedural pain

Psychophysiological Problems
- Insomnia
- Stress management
- Cardiovascular Rehab
- Irritable Bowel Syndrome
- Somatization/Somataform/Conversion Disorders
- Habit Disorders
- Tics/Tourettes

Emotional/Behavioral Problems
- Anxiety Disorders
- Depression
- Anger Management
- Emotional Dysregulation
- Asperger's Syndrome

Learning and Performance Issues
- Performance Anxiety
- Peak Performance Training
- ADHD

Chronic Illness
- Asthma
- Chronic Pain
- Fibromyalgia
- Cancer
- Atopic Dermatitis
- Diabetes Type I and Type II
- Hypertension
- Reflex sympathetic dystrophy (complex regional pain syndrome)
- Sickle Cell Anemia
- Immune System dysfunction
- Inflammatory Bowel Disease (Crohn's and Ulcerative Colitis)
- Muscle Spasticity

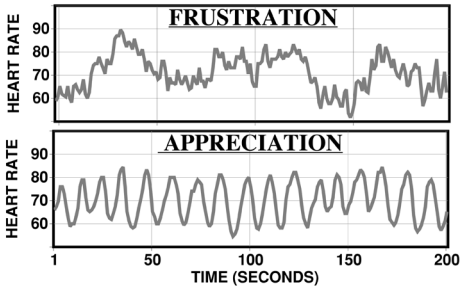
II. What is the emWave® PC Stress Relief System?

The emWave PC Stress Relief System (emWave PC) is an easy-to-use software program, learning system and patented heart rhythm monitor developed by the creator of the HeartMath® system, Doc Childre. The emWave PC has been designed to help people learn how to transform stress and anxiety into free energy for personal and professional effectiveness while improving health and well-being.

The technology was developed based on research conducted by the Institute of HeartMath in Boulder Creek, California. It embodies the successful merging of the latest scientific findings on physiological balance, and combines state-of-the-art technologies with proven psychological tools. It assists individuals in achieving a state of psychophysiological coherence or, as referred to in this document, coherence. (More information below and in Appendix B.)

With the emWave PC one can see in real time how thoughts and emotions affect the heart and nervous system. One can objectively monitor heart rhythms and confirm when coherence has been achieved. The program shows in real time how attitudes and the emotional response to stress affect heart rhythms (heart rate variability patterns), which in turn impacts cognitive performance, learning ability, mental clarity and overall health and wellness. It acts as a mirror of the emotional state, and this real-time information enables a user to more effectively reduce stress and the impact of negative emotions.

Heart rate variability (HRV) analysis suggests that the heart is a sensitive marker for emotional changes, as reflected in heart rhythm patterns. In addition, perturbations in the body's preferred coherent pattern of heart rate variability may be a marker for the impact of chronic illness on homeostasis – the body's hardwired system to stay in balance. In fact, lack of balance, disharmony, incoherence – all describe the end-state we reach when various kinds of illness/disease befall us.



When in a healthy or balanced state, the cardiac system displays regular variations in rate and rhythm that are mediated by multiple inputs. Over the last several years, as research and technology in this area have improved, there has been considerable interest in and support for the concept of HRV as a marker for/predictor of health outcomes. For example, studies by a variety of authors suggest that decreased HRV is associated with increased morbidity and mortality. Studies suggest that maximal, rhythmic HRV is desirable and may create and/or reflect a more optimal state of health. (For more detailed information on Heart Rate Variability please refer to Appendix A.)

The use of the emWave PC in some cases has led to improvements in immune function, drops in blood pressure, decreases in stress hormone release, and increases in levels of beneficial hormones . These effects have had both immediate and long-lasting benefits.

Messages the heart sends the brain can significantly affect performance and mediate brain activity. Taken together, studies indicate that intentionally altering one's emotional state through heart-focused activities modifies afferent neurological input from the heart to the brain. The data suggest that as people experience sincere positive feeling states, in which the heart rhythms become more coherent, the changed information flow from the heart to the brain may act to modify cortical function and improve performance.

One of the mechanisms of action is that as a person shifts to a more positive emotional state, respiration becomes more rhythmic and deeper. Through the process of respiratory sinus arrhythmia, sensors in the chest wall expand and contract in a more rhythmic fashion, causing the heart to beat in a more rhythmic cadence. Key research by the Institute of HeartMath (IHM) has shown that the addition of emotional self-regulation techniques, as with use of the emWave PC, enhances the impact of rhythmic breathing techniques.

The emWave PC also allows individuals to create a clear and definable mode of physiological function that IHM researchers call physiological coherence. This mode is associated with a sine wave-like pattern in the heart rhythms, a shift in autonomic balance towards increased parasympathetic activity, increased heart-brain synchronization and entrainment between diverse physiological systems. In this mode, the body's systems function with a high degree of efficiency and harmony, and natural regenerative processes are facilitated.

Although physiological coherence is a natural human state which can occur spontaneously, sustained episodes are generally rare. While specific rhythmic breathing methods may induce coherence and entrainment for brief periods, IHM's research indicates that individuals can maintain extended periods of physiological coherence through actively self-generating positive emotions. Using a positive emotion to drive the coherent mode allows it to emerge naturally, and results in changes in the patterns of afferent information flowing from the heart to the respiratory and other brain centers. This, in turn, makes it easier to sustain the positive emotional state and coherent mode for longer periods, even during challenging situations.

When the physiological coherence mode is driven by a positive emotional state, it is called psychophysiological coherence. This state is associated with sustained positive emotion and a high degree of mental and emotional stability. In states of psychophysiological coherence, there is increased synchronization and harmony between the cognitive, emotional and physiological systems, resulting in efficient and

harmonious functioning of the whole. (For more detailed information on psychophysiological coherence, please refer to Appendix B.)

In addition to displaying HRV, the emWave PC uses patented algorithms to provide analysis of the heart rhythms. It shows when the user is in a state of Low, Medium or High coherence, with a greater degree of High Coherence being the goal. It also includes three interactive games, four challenge levels, audio feedback, a comprehensive tutorial, and a review mode. Each session can be saved with the ability to record comments.

Professionals can recommend the emWave PC as a safe, effective component of a stress management program, pain management package, self-regulation skills training approach or in other emotional management or lifestyle change situations where lowered arousal and coherence would be indicated.

The emWave PC Stress Relief System includes:

- emWave PC Software CD
- USB Sensor Pod
- USB Fingertip Pulse Sensor
- USB 6 ft. extension cable
- Owner's Manual
- Registration Card
- Peel and Stick Registration Nos.
- Free Technical Support
- One Year Limited Warranty

The emWave PC is easy to install and use. The Tutorial and Help Menu provide a full understanding of its features, functions, scientific foundation, and techniques.

Minimum System Requirements

· Pentium® II compatible processor
· Microsoft® Windows® ME-2000-XP-Vista
· 800 x 600 resolution, 16-bit color display or better
· 64 Mb DirectX® 9 compatible video card (recent ATI or NVIDIA recommended)
· CD-ROM drive
· One available USB port

III. Self-Regulation and the emWave PC Stress Relief System

There are two ways in which a human being can be viewed: from the outside in or the inside out. Looked on from the outside by a physiologist or physician, human beings are very different from the beings they appear to be when they view themselves from the inside out. This living, self-sensing internalized perception of oneself is radically different from the externalized perception of what we call a body.

—Hanna, 1988[3]

The emWave PC and the Quick Coherence® Technique foster the individual's ability to self-regulate emotional and physiological changes associated with stress, anxiety, frustration and negative affect. In interrupting these undesirable response patterns and replacing them with a health-supporting response, the individual develops an internal sense of control over their own health. This sets the stage for realizing greater health, wellness and symptom improvement.

Self-regulation skills can be defined as strategies that identify and cultivate the innate ability to achieve a desired level of health and wellness. This includes techniques that empower one to focus the mind and emotions in ways that positively influence the body (and vice versa). Through the directed use of self-regulation, children and adults of all ages and abilities learn to participate actively in the modulation and alleviation of undesirable medical, behavioral, and academic problems.

Self-regulation, broadly conceived as a set of self-management activities, can include:

The voluntary control of life activities such as:
- sleep
- exercise
- diet
- daily activities

The modulation or directed control of more specific activities, such as:
- physiological functions (heart rate, breathing, muscle tension)
- emotional state (anger, joy, fear)
- cognitive activity (self-talk, attentional focus)

Through the practice of self-regulation and psychophysiological coherence, individuals develop health-enhancing strategies and cultivate an improved sense of control over their health and wellness. They

acquire skills that can serve them for the rest of their lives in promoting optimal emotional and physical health.

Studies supporting the efficacy and cost-effectiveness of self-regulation techniques for a wide variety of medical, behavioral and psychophysiological problems continue to expand. To the surprise of some, children are actually as good as or better than adults at learning a variety of self-regulatory techniques.

Today, many people are searching for non-pharmacological alternatives for a variety of medical and mental health concerns. Self-regulation and self-awareness are key life-long skills that can pay off in promoting and protecting long-term health. By using self-management strategies to respond effectively to stress, create positive emotional states, and achieve optimal autonomic nervous system (ANS) stability and function, individuals are laying the groundwork for enhanced lifelong health and wellness.

Examples of Self-Regulation Systems and Techniques (include but are not limited to):

- emWave PC Stress Relief System (with HRV analysis)
- EEG, GSR and hand temperature Biofeedback
- Relaxation and mental imagery
- Cognitive/behavioral therapy
- Diaphragmatic Breathing
- Progressive muscle relaxation
- Autogenics

Effective self-regulation strategies share several key features:

- Provision for voluntary modulation of selected physiological, cognitive, emotional functions
- Incorporation of self-monitoring as a consistent practice
- Development of a positive self-talk repertoire
- Use of techniques that facilitate enhanced awareness of mind/body connections
- Promotion of an increased sense of control over one's own health and wellness
- Active, collaborative decision making shared between client and practitioner
- Provision of intensive educational and supportive informational materials

Common characteristics include:

- Cultivation of lowered state of arousal
- Enhanced and narrowed focus of attention
- Heightened awareness of internal events and sensations
- Facilitation of a sense of curiosity
- Reinforcement of sense of personal effectiveness in controlling health
- Awareness of mind/body linkages

Through the use of self-regulation, individuals are encouraged to take control of and acknowledge the dimensions of a given health-related issue or symptom, take ownership of the related emotional state and assume responsibility for contributing to resolution.

IV. Using the emWave PC Stress Relief System with Clients

We are coming to understand health not as the absence of disease but rather as the process by which individuals maintain their sense of coherence, i.e,. the sense that life is comprehensible, manageable and meaningful, and the ability to function in the face of changes in themselves and their relationships with their environment.

—Aaron Antonovsky[4]

Once clients have received adequate and accurate evaluation, the emWave PC and accompanying HeartMath techniques can be safely used for research and education. It is reasonable to think a health professional could set up the emWave PC in multiple rooms or have a demonstration unit in a waiting room. One benefit of using the emWave PC regularly is that clients could feel better faster, sometimes with less medicine and less need for mental health referrals. It is also possible that allied health staff (nurses, social workers) could demonstrate and monitor use of the emWave PC, with the supervising health professional doing initial assessment and intermittent follow-up.

Typical Use of the emWave PC

In terms of typical advice about the use of the emWave PC, the author's experience suggests that an initial evaluation with initial discussion will take approximately 30-90 minutes depending on the need for comprehensive evaluative components. For most clients, four to six, 30 to 45 minute follow-up sessions, spaced one to two weeks apart is typically adequate. The emWave PC and related self-regulation strategies can be offered concurrently (and often are quite synergistic) with therapies such as psychotherapy, cognitive/behavioral therapy, lifestyle counseling, physical therapies, etc.

The author recommends five steps in the process of using the emWave PC effectively with clients:

- Client Evaluation
- Explanation of heart rate variability (HRV) and the emWave PC technology and its benefits
- Introduction of techniques using the emWave PC tutorial
- Instruction and hands-on use
- Follow-up and evaluation of progress and results

1. Evaluation

The emWave PC offers a comprehensive self-regulation approach and represents a safe and effective educational tool, as balanced and prioritized with an individual client's needs. The decision to use the emWave PC with a particular client is entirely dependent on the professional's judgment that this use is within the scope of his/her professional practice. (See the disclaimer on page 21.)

For Medical Professionals: As is the case for all patients, an adequate history, physical exam, neurological exam, and laboratory evaluation should take place depending upon the presenting symptoms, the reason for office visit, previous assessments, etc. Documenting and understanding all medications for each patient is also important, since medication needs and responses for certain conditions (pain, anxiety, diabetes) can be affected by the use of self-regulation techniques.

For Mental Health Professionals: Patients may be referred specifically for self-regulation skills or stress reduction training or the need for these approaches may become apparent within the normal course of therapeutic work with a patient. When indicated, the author recommends that patients have completed an initial medical screening with a physician or other health care professional to determine if self-regulation skills training is safe and appropriate and that there are no contraindications to such therapy (see Cautions below). One basic intake decision is whether emotional self-regulation skills training is relevant and appropriate for this patient.

For Educational Professionals: Children with anger management, ADHD, anxiety, adjustment and learning issues are a few examples of good candidates for inclusion of the emWave PC. Appropriate integration of the program should be reviewed with relevant team members and the child. It is important to consider a dialogue with the child's physician and/or therapist, when indicated, to assess the emWave PC relative to any medical conditions, medications, psychological therapies or other ongoing treatments.

Cautions:

In general, there are a few situations/disorders for which self-regulation skills training may be contraindicated. These include:

- acute, severe or unstable medical illness,
- significant psychiatric disorders(schizophrenia, mania, major depression, paranoia, severe OCD, PTSD
- treating a minor or incompetent client without informed consent
- disorders which involve severe, unstable ANS or metabolic functions

Caution is also recommended when using self-regulation techniques for clients with severe impairments of memory, of attention or in neurological conditions, such as seizure. Again, we emphasize that the decision to use the emWave PC with a particular client is entirely dependent on the professional's judgment that the use is within the scope of his/her professional practice.

2. Explaining the emWave PC to Clients

The emWave PC can be presented as an educational tool to practice ways of achieving stress reduction and optimal harmony of the emotions, mind, and body.

As a general rule, the author has found that most clients can be introduced to the emWave PC easily and then coached in using it across four to six 30 - 45 minute sessions, spaced one to two weeks apart. Clients are instructed to practice at home, work or school for a minimum of 10 minutes twice a day, although more practice is encouraged.

With most clients, a developmentally appropriate explanation of the rationale behind use of the emWave PC and self-regulation techniques is important to set positive expectations. An important part of "reframing" the etiology of their situation and the mediating/maintaining factors is helping them to understand the role of stress, emotions and coherence on health and wellness in general, and in their situation specifically.

A simple direct explanation is all most people need. Explain that the individual will be learning skills for stress management, controlling excess physiological arousal, mediating unhelpful thought patterns, and utilizing positive emotional states to achieve a balanced state of mind, body and emotions.

A good analogy to use is as follows:
You know when an elite athlete is in 'the zone.' Everything is just right. Their mind and body are in sync and everything is working well. Balance, coordination, reaction time. It feels as though things are happening in a positive cascade. One experiences this state that is also called "flow".

It is helpful to have a basic discussion of the client's own experience, about times when they are feeling tense or stressed versus feeling relaxed, content or calm. The professional can ask them to identify the cognitive, emotional and physical differences they notice as correlated to their own experiences.

Sometimes it is helpful to begin with a few basic exercises to amplify and tune in to somatic awareness, such as:

- Focusing attention on effortless, slow, full breathing while quieting distracting thoughts
- Closing the eyes and recalling a favorite, pleasant feeling/memory or imagining a peaceful scene

This can be followed by a discussion of what is "different" as they shift into and out of these activities and experience state changes.

It has been shown useful to discuss with clients a basic overview of HRV. The emWave PC tutorial is an excellent tool for achieving the needed understanding. The seven minute Science section is valuable for initiating a brief discussion about the topic.

3. The Quick Coherence® Technique

This self-regulation technique can be introduced as a first attempt at promoting a desired state of ANS coherence. The Quick Coherence tool is easy to learn and is the primary technique used to improve performance on the emWave PC. It also provides a tool the client can use in daily life between sessions to reduce the negative effects of stress.

Achieving a state of psychophysiological coherence is different than merely "relaxing," in some important ways. For example, one might describe that we feel relaxed when we are listening to music or watching TV or going for a walk in nature. But the key point is that our subjective experience of "relaxation" may or may not translate to objective, desirable mind/body/emotional changes that result from pyschophysiological coherence and the benefits that come with it.

Script for introducing this simple three step technique:

Step 1 - Heart Focus
The first step is to focus your attention in the area of your heart. You can focus your attention on any part of your body, so let's start with this simple exercise. Focus on your left big toe and wiggle it... Okay, now focus on your right elbow... Now, gently focus on the area in the center of your chest, the area of your heart. If you'd like, you can put your hand over your heart to help.

Now that you've learned Heart Focus, let's go on to Step 2, Heart Breathing.

Step 2 - Heart Breathing
In Step 2, as you focus on the area of your heart, pretend you are breathing through your heart. Pretend your breath is flowing in and out through that area. Breathe slowly and gently—in through your heart to a count of 5 or 6 (about 4 or 5 seconds) and slowly and easily out through your heart to a count of 5 or 6 (about 4 or 5 seconds). Do this until your breathing feels smooth and balanced - not forced. As you continue to breathe with ease for a few moments, you will find a natural inner rhythm that feels good.

Step 3 - Heart Feeling
The third step involves positive feelings and attitudes. Continue to breathe through the area of your heart and find a positive feeling, like appreciation, care or compassion. You can recall a time you felt appreciation or care to make it easier to find a positive feeling now. This could be the appreciation or care you have towards a special person, a pet, a place you enjoy, or an activity that was fun. If you can't feel anything, it's okay, just try to find a sincere attitude of appreciation or care. Once you've found a positive feeling or attitude, you can sustain it by continuing your heart focus, heart breathing and heart feeling.

Summary of the Quick Coherence Tool

- Focus your attention in the area of your heart.
- Pretend you are breathing slowly and gently through your heart for a count of 5 or 6 (about 4 or 5 seconds).
- While continuing to breathe with ease and rhythm through your heart, find a positive feeling or attitude like care, compassion or appreciation.

A decision should be made about whether the emWave PC is to be used during the first session. For some clients, adding the HRV feedback right away while learning a new technique adds a distraction and can be confusing or increase performance anxiety. Therefore, sometimes, it is best to introduce the Quick Coherence technique without using the emWave PC, which can then be introduced at the second session.

4. Hands-on use of the emWave PC Stress Relief System

In the first or second session, the emWave PC can be introduced as an educational tool that can facilitate developing the ability to achieve self-regulation of emotions. It can also clarify when one is in the desired state of balance. Let the client know that the emWave PC offers a way to check out whether the skills learned so far are resulting in helpful changes. Also encourage regular use of the emWave PC and the Quick Coherence tool, as that will result in improvement in creating higher levels of coherence.

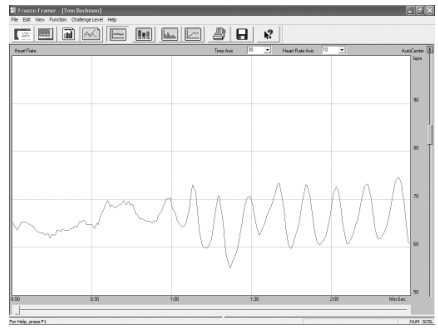
Provide the client with a basic idea about what the visual information seen on the emWave PC screens. Explain that the emWave PC offers a way to associate internal feeling shifts with what is on the screen. Let them know that the goal is to create a smooth and ordered HRV pattern and to see an increase in coherence.

Here is a sample explanation:
Your heart rate is sensitive to different events taking place in your mind and body. Most people think that the heart beats at a very steady, unchanging rate all day, but in fact it doesn't. Your heart beats faster and slower for all sorts of reasons. When you climb stairs it increases. When you sleep, it decreases. The finger sensor picks up the pulse in your finger and all your heart beats are plotted to create a pattern. Each upslope in the line represents a series of heart beats speeding up while each downslope in the line represents a series of beats slowing down.

You may notice that a lot of the time the heart rhythm pattern is somewhat random, maybe even a little chaotic looking with no strong, consistent pattern. Some variation in your heart rate pattern is a good thing. It can indicate a healthy, flexible nervous system. However, things like stress, pain and chronic illness can contribute to the heart rhythm pattern being more jagged when you don't want it to be. You can intentionally change the pattern into a smooth one with the Quick Coherence steps and actually help the nervous system and body in general; that will also help you start to feel better. The heart rhythm monitor will show you how the heart rhythms change as you go. Go ahead and try it now.

Review the HRV trace with the client and point out where the heart rhythm pattern is coherent and relate that to what the client is experiencing internally. That is, how the pattern relates to any physical, mental and emotional changes.

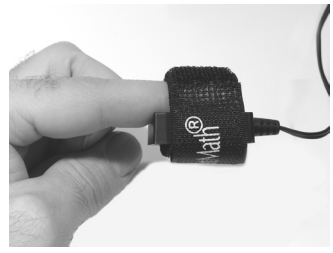
It's important to encourage any success, however slight, to minimize performance anxiety. We suggest that you narrow the heart rate axis to make the wave easier to see, adjusting from 10-beat increments to 5-beat increments, for example. This is especially helpful if there is not a lot of variability and the height of the wave is small. On the other hand, you may want to adjust the heart rate axis the other way for young clients who tend to have high variability, from 10-beat increments to 20-beat increments, for example.



5. Step-by-step outline for initial use of the emWave PC

1. Position the client in a chair next to the unit, comfortably and with the forearm resting on a flat surface or on the thigh. Once connected to the sensor, it's important for the client to remain still since movement can cause artifacts.

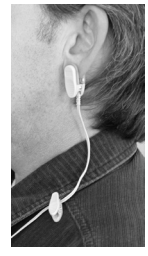
2. Explain how the finger sensor works and how to position the finger in it. The positioning of the finger and the security of the strap are important to pick up a proper signal.



a. Make sure the "finger print" or "fleshy" part of the index finger is over the red light of the sensor. If the joint is over the sensor, the sensor cannot pick up an accurate signal.

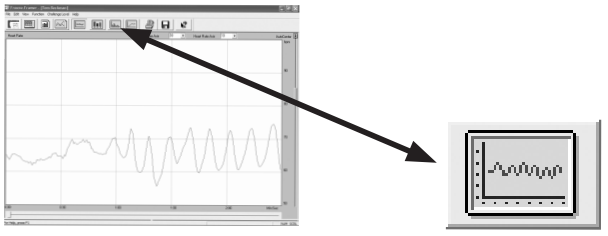
b. Make sure the strap is not too tight or too loose. The sensor is sensitive to the pressure changes in the fingertip.

c. If you are using the ear sensor, clip the sensor on the "fleshy" part of the earlobe and clip the lapel clip on shirt collar or other part of clothing.



3. Emphasize that the objective of the EmWave PC is to illustrate how quickly the heart rhythm pattern responds to thoughts and emotions.

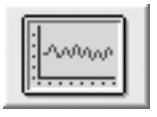
a. Click on the Heart Rhythm Display



b. Click on the Start button

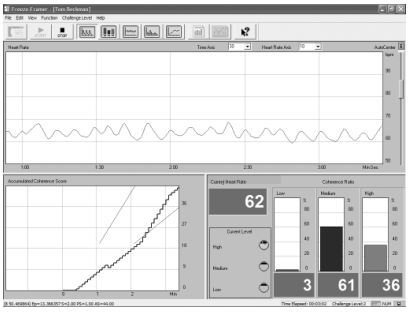
4. Make sure the finger or ear sensor is picking up a clear signal. If it isn't, red lines, indicating artifacts, will appear in the HRV trace and your computer may beep, indicating that the sensor is not picking up a pulse properly.

a. Click on the Pulse Wave icon.



b. Describe the split screen: HRV trace on the top and Pulse Wave on the bottom.

c. The connection is good if the Pulse Wave looks like the pattern in the Pulse Wave icon.



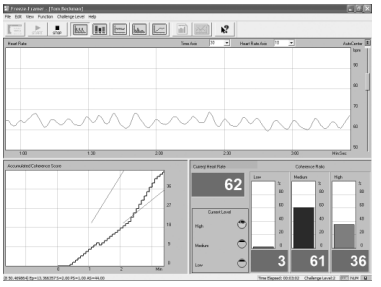
d. The connection is poor if the Pulse Wave pattern looks like stair steps or a flat line. Reasons for this include: 1) finger not over the red light of the sensor; 2) strap too tight or too loose; 3) cold fingers or poor circulation; and 4) movement.

5. Once you've determined the connection is good, click on the View Coherence Ratios icon.

a. Collect 1 to 2 minutes of baseline data.

6. After 1-2 minutes, click the stop button.

a. Explain to the client that they are looking at autonomic nervous system activity and that they can change the sympathetic and parasympathetic activity.

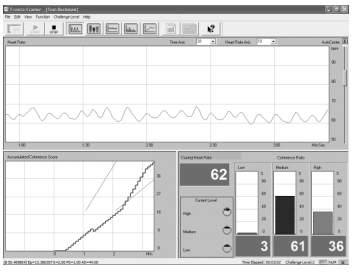


7. Re-start the emWave PC (click the Start icon) and lead the client through the Quick Coherence® technique: Heart Focus, Heart Breathing, Heart Feeling (see page 8 for the details of the steps). Once they have found a positive feeling, encourage them to sustain it by continuing the Heart Focus, Heart Breathing, Heart Feeling steps. Do this for about one minute and note any changes in the pattern and coherence scores.

8. Watch the screen to note when the heart rhythms change. After several minutes stop the session, review the pattern changes and ask the client for personal observations of any internal shifts.

a. If no Medium or High coherence shows up in the trace, look for and point out any place the heart rhythm patterns looked like the client was starting to get coherence.

b. Explain that achieving any Medium Coherence on the first try is very good. Achieving High Coherence is the goal but usually takes practice.



c. Point out where positive changes have occurred and emphasize that this gets easier with practice.

d. If a client consistently has very low coherence, reduce the challenge level in the EmWave PC.

9. Save the session if you'd like to review it at a later date. Repeat the entire process if appropriate.

6. Common problems

Technical glitches – red lines

- Red lines seen in the HRV trace indicate that the sensor is not picking up the pulse/heart rate adequately, movement has occurred, there is pre-ventricular contraction or an arrhythmia. Look at the Pulse Wave to see what is going on. If red lines are appearing, readjust the sensor on the finger or change fingers, reset the strap and try again. Often it is helpful to stop the recording and then restart after adjusting.
- Of note, if the audio feature is turned on, a sound will also correspond with the red line. This can be disruptive for some. For this reason, some health professionals choose to turn off their computer speakers.

Breathing Problems

• Observe for and correct fast, shallow, paradoxical, or thoracic breathing. Use rhythmic breathing exercises, such as counting four or five seconds on the inbreath and four or five seconds on the outbreath to help in finding an optimal breathing pattern.

Too easy or too hard to attain Medium and/or High Coherence

• People will vary in terms of their ability to achieve and sustain higher coherence levels. The Freeze-Framer has four challenge levels. The "Normal" level (default level) (Level 2) works well for most people. If, however, someone is having a hard time getting any medium and/or high coherence, lower the challenge level to "Low" (Level 1), which will reward them more easily. If you find that your client is getting into sustained High coherence quite easily, you can motivate them to go further by increasing the challenge level to "High" (Level 3) or "Highest" (Level 4).

Having trouble with emotional shift

• If your client is having a hard time experiencing a positive feeling, use mental imagery, music, metaphors or stories to help them shift into a positive emotional state.

Cold hands, circulation problems

• A client's Pulse Wave may not be picked up even after appropriate sensor placement and adjustments. Sometimes this is secondary to peripheral vasoconstriction, reduced peripheral blood flow and "cold hands." Generally, as coherence progresses, many, if not most, clients will experience peripheral vasodilatation as the sympathetic nervous system (SNS) activity declines and the hands will warm as blood flow picks up. If this is an interfering factor, you can initially facilitate temporary hand warming to enhance pulse detection by having the client place their hands under their upper arms for a few moments or have a small hand warming device available such as a hot water bottle, blanket, etc.

7. Practical Tips on Designing Effective Strategies

Based on the author's experience, establishing an overall strategy and systematic approach to the integration of the emWave PC into one's practice maximizes its effectiveness and patient compliance. In general, when teaching any form of self-regulation, it is important to proceed in a logical, stepwise manner and verify some reasonable level of understanding and mastery at each step before moving on to the next.

- Explore and explain motivations, attributions and readiness for change.
- Identify obvious impediments to use of self-regulation techniques.
- Start by helping clients to first become better at discriminating day-to-day differences in mind/body/emotional states.
- Establish the ability to identify, enter and maintain a coherent state ("the zone"). It is important to emphasize that the client practice during this phase, outside of times when stressed or aroused, to first get good at it before attempting to apply it in difficult situations. Explain that one generally must give it a few days to weeks before expecting to use it successfully in challenging situations.
- Help each client to then transfer this ability to various situations (physical, interpersonal, intrapersonal) where using the technique will be most beneficial.

Self-Care for the Practitioner:

- The emWave PC is a useful tool for professionals themselves to master for at least three reasons. First, it facilitates one's own stress management and emotional well-being. Secondly, one can understand how to better guide a client in the nuances and skills that are most effective. Finally, being familiar and fluent with the technical aspects will make the client experience more effective and efficient.
- Making a heart connection with clients can be a significant factor in improving outcomes as well.

The use of music and the emWave PC games:

• The emWave PC includes music. Playing this music softly in the background while clients are using the emWave PC can create an environment more conducive to achieving higher levels of coherence.

• The emWave PC has three simple games that can be used to make the client experience more enjoyable and fun. In each game, changes on the screen occur as the user achieves higher levels of coherence. The games often provide additional motivation and compliance with more regular use of the emWave PC. It is best not to attempt to play the games until one has practiced the Quick Coherence technique. It is recommended to practice using the Heart Rhythm Display screen first. Once the Low Coherence score has been successfully reduced to about 50%, the emWave PC games can be tried.

Compliance:

Look for and support even small changes. Encourage regular practice. Ritualize practice so it is something to look forward to, as opposed to a "homework" type task. Set up a system for regular use, with criteria that include some or all of the following (Adapted from Schwarz and Andrasik[5]):

• Allow clients to participate in setting goals and sub-goals
• Create readily accessible, easy to use self-report record systems
• Ask clients to record readily observable and meaningful behaviors
• Provide adequate instruction on why and how to self-monitor
• Reinforce client's accuracy and completeness
• Convey that client's records will be reviewed
• Determine realistic scheduling, time commitment, transportation
• Use motivators and reinforcers
• Refer appropriate clients for time-management training
• Pre-book a series of appointments

Additional tips:

• The use of adjunctive techniques, such as diaphragmatic breathing, can play an important role in achieving optimal HRV and coherence. Clients may want to experiment with adjustments to breathing, including alterations of pacing, posture and thoracic versus abdominal movement.
• Use guided imagery choices (multisensory) for those clients who struggle with easily developing/identifying a heartfelt emotion. Guided imagery practice can help in identifying special events, past experiences and other favorite things that help to engage positive emotional feelings – the key to facilitating higher levels of coherence.
• Pay attention to environmental setting factors, such as pleasant music, reduced background noise, comfortable seating, pleasant smells and reduced lighting, which can facilitate the experience.
• Don't expect perfection early on. Move behavior and responses gradually in the desired directions. Some clients may be unfamiliar with self-regulation strategies. Resistance may be multi-factorial and may include a fear of failure.
• If a client isn't initially very successful with using the emWave PC at first, but uses the Quick Coherence technique and reports significant positive benefits, remember that physiological change is not always the ultimate expression or necessary marker of success. Just continue the use of the Quick Coherence tool and related techniques for awhile. Often, psychophysiological coherence as measured by the emWave PC will come eventually.
• In between sessions encourage "mini coherence breaks" during the day where the client takes 60 seconds in the heart of daily activity to practice the Quick Coherence technique and "zone" into a more coherent state. The results of this practice can be nicely demonstrated and reinforced with the emWave PC.

Sample Sequential Sessions Map:

The emWave PC can be effectively used in sequential sessions. Based on the author's experience, the following represents a typical sequence of activities for an average client:

Session One

- History, physical exam, neurological exam as indicated
- Evaluate appropriateness for self-regulation practice
- Determine any contraindications
- Agree on expectations, responsibilities of client
- Explain Psychophysiological Coherence
- Introduce the Quick Coherence technique using the emWave PC tutorial
- Establish a practice diary and tracking system
- Schedule 4-6 sessions
- Review options for telephone or email communication between sessions
- Review a suggested practice plan

Session Two

- Review practice – successes and impediments
- Review worksheets
- Review Psychophysiological Coherence
- Review the Quick Coherence technique
- Offer adjunctive techniques as needed to enhance experience
- Use the emWave PC with the client
- Identify when and how to use the Quick Coherence technique in daily activity
- Explore triggers of the stress response

- Review plan for an ongoing practice diary
- Review practice strategies

Session Three
- Repeat the steps of Session Two
- As client is beginning to show coherence control and mastery, use games to augment and reinforce the experience
- Review practice diary
- Review longitudinal data from all 3 sessions as composite to show progress or lack thereof
- Assign homework
- Review effective practice strategies

Session Four
- Repeat the steps of Sessions Two and Three
- Discuss challenges and impediments in day-to-day use of the Quick Coherence technique.
- Discuss strategies to transfer the skills to more challenging settings and situations.

Session Five
- Repeat the steps of the previous sessions as needed and continue to focus on transferring the client's insights and use of the emWave PC and the Quick Coherence technique into daily life
- Begin talking about the long-term view, to think about continuing to utilize skills and maintain progress
- Develop a personal plan for future use of the emWave PC and the Quick Coherence technique

Session Six (After six to eight weeks, for long-term follow-up)
- Review
- Discuss maintenance sessions and the possible benefits of a follow-up session (even email contact or phone call) once every one to six months (individualized to each person.)

emWave® Personal Stress Reliever® (PSR)

A perfect home trainer for cleints to use in between sessions. emWave PSR is a portable, interactive stress relief system that fits in the palm of the hand.

emWave PSR reads the heart rhythms through its finger or ear sensor and gives immediate feedback through the changing colored lights and sounds.

V. Practical Applications

Interviews by Tim Culbert, MD, Children's Hospital, Minneapolis, MN

"The basic science of mind-body unity suggests that every shade of emotion and every facet of selfhood is curled together with body states relevant to health."
—Henry Dreher

Professionals are using the emWave PC Stress Relief System (emWave PC) in a variety of situations for stress-reduction, emotional self-regulation, and self-control. This includes most stress mediated illness, many chronic illnesses and conditions that are psychophysiological in nature.

In the following sections are descriptions of case studies of clients with common illnesses that have improved while using the emWave PC as a stress reduction and emotional management trainer.

1. Pain

Introduction
Acute chronic and recurrent pain is a significant problem worldwide for children and adults and one of the leading reasons that people seek medical (conventional or complementary) treatment. Negative emotional states such as anxiety and fear go hand in hand with pain experiences and are often as important as the pain stimulus itself in the patient's experience of distress. In addition, patient perceptions of control or lack thereof over their pain, can contribute to poor coping with pain. Excess sympathetic nervous system arousal may contribute to or mediate pain intensity in certain conditions. Therefore, the emWave PC and its techniques that promote stress reduction, reframing of emotional states and offer active control, are very helpful.

Pain Case Study I: Chronic Lower Back Pain

Here is a case from a pain specialist, at a hospital in California, that gives a good sense of how the emWave PC Stress Relief System can be used in a chronic pain situation:

Author's Commentary: Patients come into our inpatient chronic pain management program having tried unsuccessfully with surgery, medication, single outpatient treatment modalities and talk therapy to deal with their chronic pain condition. With repeated failure they frequently report feeling utterly helpless to modify their pain or function in a meaningful way. Their attempt

to cope is often maladaptive such as muscular bracing and guarding, lying down or sitting throughout most of the day, and social isolation, which itself becomes part of the problem of chronic pain.

Tom had worked in construction for many years prior to his back injury and subsequent 2 back surgeries. He had been a very active person and someone who loved organizing social events with co-workers. He described himself as the person others sought out when they had problems or needed advice or support. Now he was unable to work, had limited tolerance for activity as he experienced increased pain with exertion and rarely got together with anyone other than family. He had turned increasingly to narcotic medication to cope with his unremitting back pain and now experienced negative side effects from the medication, and still had debilitating pain. Tom came into the chronic pain program to slowly wean off his narcotic medication while simultaneously increasing his strength and endurance, learning proper body mechanics and pacing during activities and developing coping skills from our interdisciplinary team.

He said he used to be "high on life" and his biggest goal was to somehow "get back to being the person he used to be". He reacted negatively to his pain as if the pain sensations were triggers reminding him of what he feared he had lost forever. At first he was angry to hear he would be learning to manage his pain, not get rid of it.

As a biofeedback specialist I may use a number of modalities, depending on the problem. I began with EMG biofeedback training to bring Tom's awareness to the excessive muscle tension in his neck and shoulder area (his "solution" to keep pressure off his back) and a likely source of his aching shoulders and frequent headaches. I also trained him in Autogenic Relaxation and gave him my relaxation tape to use in learning what relaxation is and developing "intentional" self-quieting skills. After he learned to breathe deeply without fear that his back would spasm, I introduced the Quick Coherence technique and the emWave PC. I knew he needed to change his relationship to his pain and asked him if he would react angrily to his child if he were injured. Of course he said he would give him his love, support, and do everything he could to comfort him. I suggested that he consider offering his injured back the same love and concern as he would his child; that his pain merely signified injured tissue. As he practiced with the emWave PC and began to open his heart, he changed his perception and shifted away from his emotional battle with his pain. Frequently he reported his pain sensation decreased following training. A wonderful moment came after a session when he exclaimed that he experienced for the first time in years had longed to feel again. With training he said that even when he had a pain flare, he was able to maintain peace in his heart and use that feeling "as a shield from the pain over his pure self".

During the 4-week program, Tom had tapered off all his narcotic medications and switched to non-opioid medication and as happens so often, his pain was often decreased. He stopped talking about pain, his sense of humor returned, he rarely used his cane, and he had several plans for fun activities after returning home. Tom "got his life back", which is what most patients really want out of the program. HeartMath tools have become an indispensable treatment component for me to use with chronic pain patients to promote emotional wellness and perception change about themselves and their pain.

Pain Case Study II: Teenager with Abdominal Migraine

Author's Commentary: This case is an example of how the emWave PC can help kids and teens with migraine and migraine variants. Studies clearly support the efficacy of a variety of relaxation/self-regulation techniques in the treatment of headache. This was extrapolated to an application with abdominal migraine with great success.

Elaine is a 13 year old female who had a history of periumbilical recurrent abdominal pain since a young age (several years) and who had completed extensive evaluations with specialists in neurology and gastroenterology with no specific findings. Evaluation at the integrative medicine clinic found her history to be consistent with a diagnosis of abdominal migraine. Results of laboratory and radiologic tests were all within normal limits and previous therapeutic interventions which included a food elimination diet and use a smooth muscle relaxant medication proved to be unhelpful. At the time of her visit, she reported (her parents concurred) having severe abdominal pain episodes several times per month, screaming and writhing in pain, necessitating several trips to the local emergency room which resulted in no definitive findings. Occasionally Elaine described experiencing a headache before, during or after the abdominal pain but this symptom is not consistent. In addition to the abdominal pain, she will occasionally experience concurrent symptoms of nausea and vomiting.

Elaine had been missing school several days per year on average because of this ongoing pain and this had increased recently. In addition, her family felt that her pain was beginning to affect the entire family's function. Pain episodes could last anywhere from a few hours to a few days at this point and nothing was providing Elaine with any consistent relief. Mental health

was otherwise noncontributory except to note a strong paternal family history for migraine.

Initial recommendations were made for a multimodality treatment approach that included low-dose SSRI coverage which was not started initially, self-regulation skills training to facilitate a lowered state of sympathetic nervous system arousal and some basic nutritional supplementation

At her first follow up visit one week later, Elaine had reported 2 severe abdominal pain episodes during the prior week. In fact, one had occurred while the family was out of town and they all ended up coming home early because of Elaine's pain symptoms. At this session, Elaine was taught to discriminate differences in relaxed versus aroused states of mind/body, and she was coached through basic progressive muscle relaxation and diaphragmatic breathing exercises and a practice plan was made.

At her second visit one week later, things were about the same. She was instructed in the relevance of peripheral temperature as a marker for stress and then the basics of mental imagery were reviewed.

At her third follow-up she noted the frequency and severity of events had slightly decreased. At that visit she was introduced to the emWave PC and the Quick Coherence technique. The use of skills that she had previously been practicing and mastering was discussed, showing how those skills helped with getting into the "zone". We reviewed home and school practice strategies.

By her fourth follow up things were continuing to improve and Elaine had only one severe episode in the previous 3 weeks. She was attending school every day which was a great improvement and was receiving A and B grades. She reported only one minor episode of pain in 4 weeks. Elaine described practicing 1-2 times each day for 5-10 minutes. We then worked on the idea of taking shorter more frequent "mini-breaks" for 1-2 minutes a time, several times each using the Quick Coherence technique.

At the fifth and sixth follow-ups each about 4 weeks apart she continued to do extremely well with minimal abdominal migraine episodes, regular school attendance and with her family also commenting about improvements noted in her mood. Elaine reports using the various self-regulation techniques on a regular basis and feeling quite confident in using them in both preventative and abortive modes.

2. Psychophysiologic Disorders

Introduction

Disorders that by definition include both a mind and body component are increasingly identified in primary care. Most commonly, the "mind" component includes stress and negative emotional experiences resulting in ANS imbalances which in turn mediate a plethora of "body" symptoms including pain, trouble sleeping, appetite changes, fatigue, dizziness and nausea to name a few. In many cases, excess, chronic, sympathetic nervous system over-arousal is particularly problematic and for certain conditions such as Irritable Bowel Syndrome and Tourette's, and can lead to flare ups of these conditions. Some of the more common psychophysiological disorders seen everyday in primary care offices include:

- Insomnia
- Cardiovascular rehab
- Functional GI disorders including irritable bowel syndrome
- Somatization/Somataform/Conversion Disorders (often manifest as somatic complaints such as abdominal pain, headache, etc.)
- Habits/Tics/Tourette's
- Hypertension

Psychophysiological Disorders Case Studies

Here are some case studies from a nurse at Allegheny Hospital in Pittsburgh, PA.

Author's Commentary: The following cases illustrate the use of the emWave PC and HeartMath techniques in patients with complex mind/body issues.

A. Jill, a 34 year old female with Multiple Sclerosis, Irritable Bowel Syndrome, and Hypertension of unknown etiology. Jill came to our center for symptom management of her Irritable Bowel Syndrome and associated stress and anxiety related to her declining health. Using the emWave PC, she became much more open and communicative. It was as though she was opening her heart for the first time. Her IBS symptoms became less bothersome, blood pressure decreased from 180/90 to 126/70. Having experienced these welcomed improvements, she recognized the self-healing ability that she possessed and recommitted to living her life to the fullest.

B. Karen, a 38 year old female with a long standing history of depression, anxiety and panic disorder. She was being seen for management of symptoms due to Irritable Bowel Syndrome. Karen was extremely receptive to learning to use the emWave PC and optimistic that it would be a useful tool. On the fourth

had made significant gains in her level of coherence. Karen's had finally achieved a modest gain of 4 percent of high coherence. Karen became tearful then sobbing uncontrollably then shared that she was overmedicating herself and she had suicidal ideations. She acknowledged for the first time that her life did have meaning and achieving this level of coherence was so cathartic for her. Following a hospitalization, Karen began to slowly engage with her family, care for her children, and integrate back into society.

C. Brent, a 45 year old male for anger management and anxiety. After 15 sessions with the emWave PC, he successfully achieved a medium level (eight percent) of entrainment. This provided confidence to Brent and he began to use the Quick Coherence technique whenever feelings of anger or anxiety arose. He accepted the suggestion to use the technique twice daily during times when there were no anger or anxiety. Upon his last visit Brent achieved a 30 percent high level of coherence. Several months later, he wrote a note expressing how calm and peaceful his life had become. He verbalized deep appreciation for all the blessings in his life.

3. Emotional/Behavioral Disorders

Introduction

Certain negative emotional states such as anxiety, anger and panic, include a component of over-arousal thereby triggering the "fight or flight" repertoire of physiological responses. Some of these existing emotional tendencies are additionally amplified by stress. When in an undesirable emotional state, many individuals then experience unwanted cognitive and behavioral phenomena that can lead to impaired performance and undesirable behavioral choices. If shifted to a more positive, balanced emotional state, many find that performance and behavioral control improves. The emWave PC has been used successfully with clients having emotional/behaviorial conditions, such as:

- Anxiety Disorders
- Depression
- Anger Management
- Emotional Lability
- Asperger's Syndrome
- Performance Anxiety
- Peak Performance Training
- ADHD

Emotional/Behavioral Disorders Case Study I: Clinical Psychology

The following information is provided by a licensed clinical social worker in private practice in Atlanta, Georgia.

I have a private psychotherapy practice in the Martin Luther King, Jr. National Historic Site in downtown Atlanta, Georgia. I also spend a day each week in an urban low cost clinic. I work with adults ranging in age from their early 20's into their 70's. In both practice settings most of my patients are city dwellers. They present with a spectrum of diagnoses ranging Generalized Anxiety Disorder to Complex PostTraumatic Stress Disorder. Some seek to resolve creative blocks limiting their art and others are seeking freedom from lives interrupted by intrusive recollections of a painful childhood. I introduce each of them to the emWave PC regardless of their presenting problem.

I usually present the emWave PC in this manner. I tell my patients that change, while sometimes desirable (and always inevitable) is nonetheless often contrary to the habitual nature of humans.

I explain that psychotherapy will often stir up memories and emotions and that part of their therapy will involve my teaching them some basic skills. These skills, in emotional self-regulating as practiced with the emWave PC, will help them to understand and manage these "periods" so they might make the best therapeutic use of them.

I want to teach my patients how to "soothe" and "ground" themselves. I help them learn that they can change their minds about a problem by using the emWave PC. They discover new ways to manage their emotions rather than feeling controlled by them. The emWave PC quickly and easily shows them the power of their own thoughts and the immediate effect they can have on their body. One goal of therapy, stated or not, is always to heal the past *in the present* and thereby free the future for new possibilities. The emWave PC is a valuable tool that helps my patients learn that they can change their minds.

I use the emWave PC in conjunction with these psychotherapeutic techniques:

1. Psychodynamic/Insight Oriented (talk) Therapy
2. Eye Movement Desensitization and Reprocessing (EMDR) I believe the emWave PC has many elements similar to EMDR. One primary similarity being the attention paid to multiple stimuli. Similarly, I think of the emWave PC as helping the user to "reprocess or rethink" ideas that may have gotten "stuck" due to strong emotion or dysfunctionally stored information. I suspect the emWave PC might have a similar effect on sub-clinical problems that professionally administered EMDR has on more florid clinical issues.
3. Peak Performance Enhancement

Emotional/Behavioral Disorders Case Study II: Anxiety in the Context of Burn Pain

Here is a case study from a recreation therapist at University of North Carolina hospital in Chapel Hill, NC, who points out that consistent practice, and helping patients move along the continuum from education to application, can result in burn patients learning to reduce stress and anxiety, expand coping skills, and improve autonomic nervous system functioning.

Author's Commentary: Burn injuries result in sequellae of events, often with profound physical, psychological, and emotional ramifications. Concomitant trauma on a psychological level frequently accompanies the physical trauma of the burn injury. Aside from the very significant pain issues, burn survivors often suffer from anxiety, PTSD, and/or depression. HeartMath techniques, and the emWave PC, offer patients a means for reducing the distress associated with post burn psychopathology and a method for influencing the pathophysiology.

In the burn population, researchers are interested in the psychopathological responses to burn injury. Psychological distress has been shown to affect the physical recovery process. Clearly, interventions designed to improve coping with the myriad of post burn issues are of significant interest. The HeartMath techniques offer a user-friendly format for integrating emotional aspects of coping with cognitive processing. For example, the emWave PC and Quick Coherence technique can be useful for engaging the patient in dialogue around trauma-associated distress while providing an appropriate avenue for focusing efforts to reduce the distress.

Two cornerstone HeartMath emotions, appreciation and gratitude, are effective building blocks for developing the much-needed coping skills. Burn patients often gravitate to this perspective naturally, and the attentive healthcare worker will often hear an expression of gratitude. This affords the opportunity to introduce a framework for skill development, such as the Quick Coherence technique. For example, patients often make a remark of gratitude, such as "I am thankful my burn wasn't worse" or in reference to spared body parts, survival, family support, etc. Depending upon the location of the burn, those with an available digit can benefit from the concrete learning opportunities associated with the emWave PC.

Although use of HeartMath technology is necessarily tailored to an individual's specific circumstance, common elements of progressive training can be identified. Following an introduction to HeartMath techniques, with an emphasis on the impact of both positive and negative emotions, specific skill development may continue. The point at which the technology of the emWave PC is introduced may vary. For those patients who are technologically inclined, or who may be drawn to the "game-like" nature of the program, it can be effectively introduced during the initial session. The immediate reduction in pain or anxiety that patients frequently report after use of the emWave PC is reinforcing, as patients often integrate the perception that they can teach themselves to feel better. Since many patients experiencing pain or anxiety also exhibit disordered breathing patterns, attention to breathing can aid patients in achieving coherence.

Patients who understandably become very focused on the situations surrounding their injury may require coaching to identify events in their life evocative of positive emotional experiences. Empowering patients to influence their physiology and sense of well being through use of the emWave PC is most effective when followed up with identifying potential situations for applying the new skill.

Application of HeartMath techniques can be useful during specific burn related events that typically increase pain or anxiety, such as wound-care, surgical interventions, or emotionally charged issues like facing family, friends, or classmates after a disfiguring burn injury. The following are a few examples of specific situational applications of the emWave PC.

A. Jen, a middle age woman with burns on over 40% of her body, was highly motivated to use the emWave PC program on a daily basis. She noticed that she "felt better" after spending time in a coherent state. This was significant, given her history of substance abuse, depression, and anxiety. During her 7-minute practice session, with the hot air balloon game, the soaring balloon dropped precipitously, then resumed it's previous height. In processing this event afterwards, the patient relayed flashing back to the events surrounding the fire, and being able to recover from the anxiety by focusing on the gratitude she felt for having saved a child's life before the fire ravaged the house.

B. Freddy, a teenager was extremely nervous prior to surgery, and was open to trying the emWave PC program during Recreational Therapy. The immediate success was evident, as his first request after returning to his room post-op was to use the emWave PC again because he wanted to feel better.

C. Scott, a 50 year old man, frustrated with many perceived annoyances of being hospitalized, applied the Quick Coherence technique, and used the emWave PC to change his perspective about many of his stressors. In one instance, after becoming frustrated

apply his heart intelligence to observe that "they don't know what's going on up here, they are just being concerned friends. I can let them know when a good time to call would be."

Emotional/Behavioral Disorders Case Study III: Girl with Generalized Anxiety Disorder

This case comes from a Pediatric Psychologist in Minneapolis, Minnesota.

Molly is a 9-year-old girl who has a significant history of anxiety and functional abdominal pain. Two years ago, at age 7, Molly and her parents began working with a pediatric psychologist. Initial interventions focused on developing Molly's self-regulation skills for management of stress, worries, fears and functional abdominal pain. Molly's therapy included a combination of parent coaching, play therapy, cognitive-behavioral therapy, and biofeedback training. Molly was quite successful in learning "belly breathing" and other age-appropriate relaxation techniques, including self-hypnosis, progressive muscle relaxation and positive self-talk. She improved her coping skills and was much more functional in managing stress and her feelings of anxiety.

Molly recently returned to the clinic, at age 9, for a follow-up session due to symptoms of anxiety and some sleep onset difficulty. Her parents felt that Molly's anxiety was interfering with her optimal functioning. She was having difficulty effectively using her self-regulation skills to modulate her feelings of stress and anxiety. Molly was then introduced to the emWave PC Stress Relief System as a tool to help with self-regulation and coherence training. We reviewed the concepts behind heart rate variability training and linked these skills with her breathing and other relaxation techniques.

On her first attempt, using the heart rhythm display screen, Molly did a beautiful job getting into the zone, with the use of diaphragmatic breathing. She obtained a high coherence level of 52%. We then added some new ideas about the use of positive emotion in terms of the Quick Coherence technique. Molly then used these techniques with the Rainbow game screen and obtained a high coherence level at 100%! We reviewed these new skills with Molly's mother and discussed a home practice program to help Molly achieve a state of high coherence to help with stress management. Molly found that with these new skills she was able to better manage stress and anxiety. Molly's parents commented that they had observed her having greater confidence in her ability to self-regulate at times of stress and emotional arousal.

4. Chronic Illness

Introduction

Evidence indicates that for many forms of chronic illness, the general dysregulation and drain of the illness experience can be reflected in decreased coherence. In addition, many individuals with chronic illness experience various forms of stress related to the chronic illness experience (academic, job, financial, social, physical) which can further amplify either core symptoms or related feelings of fatigue, malaise, etc. Feeling hopeless and or ineffective, these patients are also at risk of developing negative emotions which may further complicate things by promoting unhelpful neurohormal and immune events that can interfere with recovery.

There is new evidence that HRV training, breath control and engaging positive emotions may impact specific conditions such as airway reactivity in asthma, glycemic control in diabetes, blood flow in sickle cell anemia, and effect positive changes that promote immune function in conditions such as cancer and atopic dermatitis. It has long been acknowledged that although negative emotions and stress don't cause inflammatory bowel disease, they likely play a role in exacerbation and maintenance of symptoms for many. The emWave PC has been used successfully with patients have the following conditions:

- Asthma
- Cystic Fibrosis
- Fibromyalgia
- Cancer
- Atopic Dermatitis
- Type II DM
- DM I
- Sickle Cell Anemia
- Immune System dysfunction
- Crohns and Ulcerative Colitis

Children and adults with a variety of chronic illnesses often share the feeling of a sense of loss of control as part of the ongoing chronic illness experience. One of the benefits of using the emWave PC and the Quick Coherence technique is that these approaches give back some measure of control over the chronic illness and that alone has important therapeutic impact. Many patients greatly appreciate the ability to master a technique that allows for some self-management of symptoms commonly associated with chronic illness such as pain, stress and insomnia. In addition, because often times these patients are on multiple medications, adding an effective tool that is safe and non-pharmacological is particularly welcome.

Chronic Illness Case Study I: Asthma with vocal cord dysfunction

Author's Commentary: Over the past several years a number of studies have reviewed the pivotal role that emotional regulation (or lack thereof) can have on the clinical course of asthma and the frequency of exacerbations and need for hospitalizations. Mind/body techniques can be very helpful in modifying the course of asthma and in providing tools for individuals with asthma to better manage long-term health as well as acute events; in some cases reducing or eliminating the need for bronchodilating agents. Some children and teens with asthma develop other complicated breathing problems such as paradoxical vocal cord adduction, where the vocal cords inadvertently close during inspiration creating an uncomfortable feeling of tightness or shortness of breath which is not medication responsive. For most children who experience this, there is a psychophysiological state of inter-related phenomena that seem to bring this on, including stress as a common mediating factor.

Janelle was a 16 year old competitive figure skater referred by the pulmonology group with a diagnosis of asthma complicated recently by paradoxical vocal cord adduction (also called vocal cord dysfunction or VCD). Janelle was finding her daily practice and also performance at skating competitions was being affected by her experience of shortness of breath that was related to VCD and therefore not responsive to her usual asthma medications. This resulted in decreased stamina and had an impact on her ability to finish a full routine without becoming fatigued and short of breath. She felt "driven" to do well in figure skating, admitted to stress secondary to her strict schedule and was finding it less "fun" at times. Her goal was to compete successfully at a national level. She was also a straight "A" student in high school.

In reviewing the etiology of VCD we reviewed the basic sequence we think happens to most individuals that we see. First of all, increased levels of recurrent stress may lead to more thoracic breathing patterns and a tendency to "brace" or tighten the muscles in the upper body-shoulders, neck and even face. With these muscles being tighter, particularly at times of increased aerobic activity where you are breathing harder, a basic "dys-coordination" occurs whereby the tightened neck muscles and thoracic breathing contribute to a situation where the vocal cords inappropriately close (adduct) partially during inhalation causing resistance to air flow. This is experienced as tightness and shortness of breath. This feeling in turn may increase anxiety even "panic" feelings which can drive the cycle further in the wrong direction. This is commonly at first attributed to the underlying asthma which can be exacerbated by exercise. However, in the case of VCD, it is not medication responsive and requires an undoing of this habituated pattern of stress, muscle tightness, thoracic breathing and negative expectation and emotional "dysregulation" with symptoms of anxiety.

For Janelle, training in progressive muscle relaxation (with special attention being given to the shoulders, neck and face muscles) was combined with training in Quick Coherence/emWave PC/HRV techniques and resulted in an excellent impovement over a 12 week time frame. She was taught to practice diaphragmatic " heart focussed" breathing first in resting, sitting and standing positions, and then taught to breathe more comforatbly and fully with positive expectations while engaging in increasingly higher levels of aerobic demand (skating slowly at first and then gradually with more intensity). She was gradually able to breathe much more comfortably again while skating with increased confidence and improved performance. Daily use of the Quick Coherence technique and related stress management approaches were also suggested as a way to manage day-to-day background stress which was also felt to be a contributing factor.

Chronic Illness Case Study II: Dealing with the Long-term Sequellae of Cancer

Author's Commentary: Children, teens and adults with chronic illness experience significant emotional distress both in the acute phase but also in long term followup. Experience suggests that mind/body approaches can be very helpful as symptom management adjuncts for cancer patients with stress, pain, insomnia and nausea as well as emotional coping and indirectly promoting immune function through positive affect.

From a mental health perspective, cancer survivors may experience significant stressors as late sequellae of treatment and have a higher incidence of PTSD symptoms. In our practice, we have found that survivors of childhood cancer can struggle with PTSD, mood problems, survivor guilt, and chronic stress. Mind/body skills approaches which include emotional regulation and stress management are key tools for these individuals and provide a foundation for enhanced health and wellness as they move forward. This case nicely illustrates a number of these issues.

Steve is a 19-year-old first year college student who is a long-term cancer survivor. Steve has long term sequellae from his cancer which include depression, bedwetting, and insomnia, as well as experiences of multiple stresses from financial strains and interpersonal difficulties with family and peers. He

began working with both a behavioral pediatrician and a pediatric psychologist 2 years ago with a goal of enhancing overall functioning and improving stress management and overall coping skills. Steve found that anxiety and stress issues were contributing to ongoing problems with symptoms such as insomnia and emotional lability.

Early on in the course of treatment he was introduced to the emWave PC as well as the Quick Coherence technique. He then used the emWave PC at home for a period of six weeks. He utilized the emWave PC on his laptop computer every day for that period of time and developed an excellent ability to achieve a state of high coherence quickly and consistently. Despite ongoing stressors he found that using emotional self-regulation techniques he experienced a much greater ability to handle stress, was less moody and had better control of maintaining a positive affect. His problems with insomnia improved as well as his overall health status during this time. He also experienced improvements in his interpersonal relationships secondary to his enhanced ability to manage frustration and stress. He continues to use these strategies on a daily basis at college.

VI. Resources, Support and Legal

HeartMath's Health Professional Division

To contact HeartMath's Health Professional Division, call 1-800-450-9111 (U.S. or Canada); or Outside the U.S. or Canada: 831-338-8700.

Or email us at inquiry@heartmath.com

Or use our Contact Form online at www.heartmath.com/contactform.html and we'll respond to your inquiry quickly and confidentially.

Ordering HeartMath Products

To order HeartMath products online, please visit www.heartmathstore.com

By phone, call 1-800-450-9111 (U.S. or Canada); Outside the U.S. or Canada: 831-338-8700

To find out about our Product Reseller Opportunity online, go to www.heartmath.com/health/hpresllers.html or email us at inquiry@heartmath.com.

HeartMath LLC Company Information

HeartMath LLC, 14700 West Park Avenue, Boulder Creek, California 95006 USA
Phone: 1-800-450-9111 (U.S. or Canada); or Outside the U.S. or Canada: 1-831-338-8700
Fax: 1-831-338-9861

Customer Service or emWave PC Technical Support

Customer Service, call 1-800-450-9111 (U.S. or Canada); or Outside the U.S. or Canada: 1-831-338-8700

Technical Support, call 1-800-538-0984 (U.S. or Canada); or Outside the U.S. or Canada: 1-831-338-8700 or send an email to support@heartmath.com

Other Information

For more information about other HeartMath techniques, such as the Heart Lock-In® and Freeze-Frame® tools, it is suggested that the health professional read one of the HeartMath books, such as *Transforming Stress, Transforming Anxiety, Transforming Anger* or *The HeartMath Approach to Managing Hypertension*. These are available on the HeartMath web site at www.heartmathstore.com.

Additionally, further information about the research of the Institute of HeartMath may be found online at www.heartmath.org/research/.

Disclaimer

Use the emWave PC Stress Relief System and the exercises contained in the software as tools for individual balance, optimal performance and growth. Although this instrument and exercises are believed to be very safe and have potentially great benefit, no medical benefits or cures are expressed or implied. These programs and exercises are not to be used as, or used in lieu of, any course of medical or psychological treatment, but for research and educational purposes only.

None of the feedback or summary data provided in the software is to be interpreted as medically or psychologically diagnostic.

Finally, heart rate variability patterns differ widely from one person to another. There are no "right" or "wrong" patterns. The coherence scores in the programs and games are especially useful for comparing one's own progress in increasing the ability to maintain a physiologically coherent state with practice; they should not be compared between one individual and another.

Individuals with heart irregularities, such as atrial fibrillation or flutter or intense clusters of premature atrial contractions and children who are unable to sit still may be unable to use the emWave PC successfully.

The Authors

Timothy P. Culbert, M.D.
Tim Culbert M.D. is a board certified pediatrician and fellow of the American Academy of Pediatrics. He has also completed a specialty fellowship in developmental/behavioral pediatrics. Dr. Culbert is board certified in medical hypnosis, biofeedback, and also in holistic medicine. He currently serves as Medical Director for the Integrative Medicine and Cultural Care Program at Children's Hospitals and Clinics in Minneapolis/St. Paul. He teaches and publishes in the area of self-regulation skills training with children and adolescents.

Howard Martin
Howard Martin has thirty years of experience as a sociologist and educator. He is the co-author of *The HeartMath Solution* (Harper San Francisco 1999). Howard is one of the original leaders who helped Doc Childre found HeartMath. Howard is Executive Vice President of HeartMath, LLC where he oversees strategic development, alliances and the development of educational programs on the connection between emotions, health and learning.

Howard has conducted numerous trainings for scientists and executives and has taught programs in stress management and human performance enhancement to parents and teachers. He has also provided personal development seminars in over fifty cities on four continents and has delivered programs in occupational stress management and high performance training to Fortune 100 companies, government agencies and all four branches of the military.

Rollin McCraty, Ph.D.
Dr. McCraty is Director of Research, Institute of HeartMath and has advanced training in electrical systems engineering at the NASA Space Center in Huntsville, AL and at the University of Nebraska. His work includes the study of emotional physiology with a focus on the mechanisms by which positive emotions may promote health and optimal performance. Dr. McCraty is a Fellow of the American Institute of Stress, and a member of the International Neurocardiology Network, the American Autonomic Society, the Pavlovian Society and the Association for Applied Psychophysiology and Biofeedback.

In addition to forming the content of numerous keynotes and scientific presentations, the findings from Dr. McCraty's research have been published in journals such as the *American Journal of Cardiology, Stress Medicine, Biological Psychology and Integrative Physiological* and *Behavioral Science*.

Appendix A – Heart Rate Variability

By Rollin McCraty, Ph.D., Director of Research, Institute of HeartMath

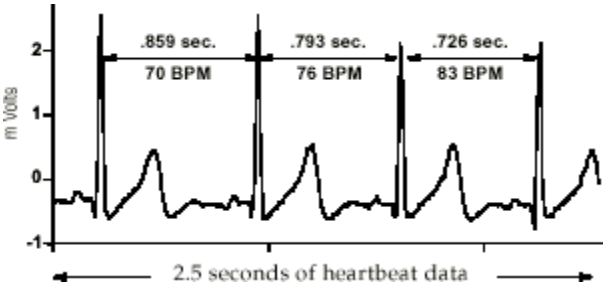
Heart Rate Variability: An Indicator of Autonomic Function and Physiological Coherence

The autonomic nervous system (ANS) is the portion of the nervous system that controls the body's visceral functions, including action of the heart, movement of the gastrointestinal tract and secretion by different glands, among many other vital activities. It is well known that mental and emotional states directly affect the ANS. Many of Institute of HeartMath's (IHM's) research studies have examined the influence of emotions on the ANS utilizing the analysis of heart rate variability, or heart rhythms, which serves as a dynamic window into autonomic function and balance. While the rhythmic beating of the heart at rest was once believed to be monotonously regular, we now know that the rhythm of a healthy heart under resting conditions is actually surprisingly irregular. These moment-to-moment variations in heart rate are easily overlooked when average heart rate is calculated. Heart rate variability (HRV), derived from the electrocardiogram (ECG), is a measurement of these naturally occurring, beat-to-beat changes in heart rate.

Systems-oriented models propose that HRV is an important indicator of both physiological resiliency and behavioral flexibility, reflecting the individual's capacity to adapt effectively to stress and environmental demands. It has become apparent that while a large degree of instability is detrimental to efficient physiological functioning, too little variation can also be pathological. An optimal level of variability within an organism's key regulatory systems is critical to the inherent flexibility and adaptability that epitomize healthy function. This principle is aptly illustrated by a simple analogy: just as the shifting stance of a tennis player about to receive a serve may facilitate swift adaptation, in healthy individuals, the heart remains similarly responsive and resilient, primed and ready to react when needed.

The normal variability in heart rate is due to the synergistic action of the two branches of the ANS, which act in balance through neural, mechanical, humoral and other physiological mechanisms to maintain cardiovascular parameters in their optimal ranges and to permit appropriate reactions to changing external or internal conditions. In a healthy individual, thus, the heart rate estimated at any given time represents the net effect of the parasympathetic (vagus) nerves, which slow heart rate, and the sympathetic nerves, which accelerate it. These changes are influenced by emotions, thoughts and physical exercise. Our changing heart rhythms affect not only the heart but also the brain's ability to process information, including decision-making, problem-solving and creativity. They also directly affect how we feel. Thus, the study of heart rate variability is a powerful, objective and noninvasive tool to explore the dynamic interactions between physiological, mental, emotional and behavioral processes.

The mathematical transformation (Fast Fourier Transform) of HRV data into power spectral density (PSD) is used to discriminate and quantify sympathetic and parasympathetic activity and total autonomic nervous system activity. Power spectral analysis reduces the HRV signal into its constituent frequency components and quantifies the relative power of these components.



Heart rate variability is a measure of the beat-to-beat changes in heart rate.

- Thoughts and even subtle emotions influence the activity and balance of the autonomic nervous system (ANS).
- The ANS interacts with our digestive, cardiovascular, immune and hormonal systems.
- Negative reactions create disorder and imbalance in the ANS.
- Positive feelings such as appreciation create increased order and balance in the ANS, resulting in increased hormonal and immune system balance and more efficient brain function.

(Excerpted from Science of the Heart, available at: http://www.heartmathstore.com)

Appendix B – Psychophysiological Coherence

By Rollin McCraty, Ph.D., Director of Research, Institute of HeartMath

Physiological Coherence

Institute of HeartMath's research has elucidated a clear and definable mode of physiological function that their researchers call physiological coherence. This mode is associated with a sine wave-like pattern in the heart rhythms, a shift in autonomic balance towards increased parasympathetic activity, increased heart-brain synchronization and entrainment between diverse physiological systems. In this mode, the body's systems function with a high degree of efficiency and harmony, and natural regenerative processes are facilitated. Although physiological coherence is a natural human state which can occur spontaneously, sustained episodes are generally rare. While specific rhythmic breathing methods may induce coherence and entrainment for brief periods, our research indicates that individuals can maintain extended periods of physiological coherence through actively self-generating positive emotions. Using a positive emotion to drive the coherent mode allows it to emerge naturally, and results in changes in the patterns of afferent information flowing from the heart to the respiratory and other brain centers. This, in turn, makes it easier to sustain the positive emotional state and coherent mode for longer periods, even during challenging situations.

Psychophysiological Coherence

When the physiological coherence mode is driven by a positive emotional state, we call it psychophysiological coherence. This state is associated with sustained positive emotion and a high degree of mental and emotional stability. In states of psychophysiological coherence, there is increased synchronization and harmony between the cognitive, emotional and physiological systems, resulting in efficient and harmonious functioning of the whole. As we will see in subsequent sections, studies conducted across diverse populations have linked the capacity to self-generate and sustain psychophysiologically coherent states at will with numerous benefits. Observed outcomes include: reduced stress, anxiety and depression; decreased burnout and fatigue; enhanced immunity and hormonal balance; improved cognitive performance and enhanced learning; increased organizational effectiveness; and health improvements in a number of clinical populations.

Psychophysiological coherence is a state associated with:

- Sustained positive emotion
- High degree of mental and emotional stability
- Constructive integration of the cognitive and emotional systems
- Increased synchronization and harmony between the cognitive, emotional and physiological systems

In brief, IHM's research studies show that different emotional states are associated with different physiological information patterns that are transmitted to the brain and throughout the body. When an individual is under stress or experiencing negative emotions such as frustration, anger and anxiety, heart rhythms become less coherent and more erratic, indicating less synchronization in the reciprocal action that ensues between the parasympathetic and sympathetic branches of the autonomic nervous system. This desynchronization in the ANS, if sustained, taxes the nervous system and bodily organs, impeding the efficient flow of information throughout the body. On the other hand, sustained positive emotions, such as appreciation, love or care, lead to increased heart rhythm coherence, greater synchronization between the activity of the two branches of the ANS and a shift in ANS balance toward increased parasympathetic activity.

Further, we show that when the heart generates a coherent signal, it has a much greater impact on other biological oscillatory systems than when it is generating an incoherent or chaotic signal. When functioning in a coherent mode, the heart pulls other biological oscillators into synchronization with its rhythms, thus leading to entrainment of these systems. The entrainment mode is an example of a physiological state in which there is increased coherence between multiple oscillating systems and also within each system.

In sum, our findings essentially underscore what people have intuitively known for some time: Positive emotions not only feel better subjectively, but tend to increase synchronization of the body's systems, thereby enhancing energy and enabling us to function with greater efficiency and effectiveness.

Footnotes

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14700 West Park Avenue
Boulder Creek, CA 95006
1-800-450-9111 • 1-831-338-8700 (Outside U.S. and Canada)
www.heartmath.com

2090-0507