

THE NEUROPSYCHOTHERAPIST

A man with a beard and short dark hair, wearing a black t-shirt, is shown in profile from the waist up, looking upwards and to the right. His arms are crossed. The background is a light blue and white abstract pattern of interconnected lines and dots, resembling a neural network or a complex web of connections. The overall tone is futuristic and intellectual.

COHERENCE

The Heart Connection
to Personal, Social and
Global Health

From the Editor

Our awareness of differentiated elements and aspects can sometimes blur our sense of the greater whole. Humans tend to be more aware of what is close or proximal. We are also more aware of things that might be a danger or threat as our attention hones in on the problem. There may be good reasons in the moment to be unaware of the bigger picture, but as Rollin McCraty points out, this is not good all the time. In “Coherence: The Heart Connection to Personal, Social and Global Health”, McCraty explores the concept and benefits of coherence and explains how, in essence, we do well to appreciate the relationship of the individual elements to the greater whole. McCraty has researched the use of HeartMath® to build and develop connection and integration of whole body systems, or coherence.



Richard Hill
Managing Editor

The principle of coherence expresses itself throughout this issue. Suzanne Podolski takes us into the courtroom and examines the way that neuroscience is being used in determining the mental state of the accused and degree of responsibility for their actions. Her case examples give us pause and leave me with the feeling that coherence has not been achieved quite yet. Podolski’s article is a bold step toward improving that.

We regularly present bite-sized segments of current neuropsychotherapy news—but what do we do with them? Our slightly longer Short Cut this month takes a step toward integrating a collection of research and finding the coherence between them, but there is always more that can be made of the information we bring to you. Another surprise is the article by David Treleaven from his forthcoming book *Trauma-Sensitive Mindfulness: Practices for Safe and Transformative Healing* (W. W. Norton & Co). He looks into the nature of mindfulness as a therapy for trauma victims and shows that it is necessary for us to be aware of both the benefits and potential dangers of mindfulness meditation. In another expression of global coherence, our Spotlight article this month shines on Egyptian psychiatrist, Dr. Sherif Darwish, whose speciality is addiction therapy. Dr. Darwish set up the Recovery Center in Alexandria, Egypt, to help recovered addicts who had nowhere to turn when discharged from hospital. He reminds us that the world is full of good-hearted practitioners and that our world is much larger than we might be aware.

In the light of seeking, exploring, and finding coherence, *The Neuropsychotherapist* offers opportunities for readers to create their own, personally meaningful whole, rather than just to see a set of isolated, albeit interesting, facts.

Richard Hill



THE NEUROPSYCHOTHERAPIST™

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Suzanne Podolski

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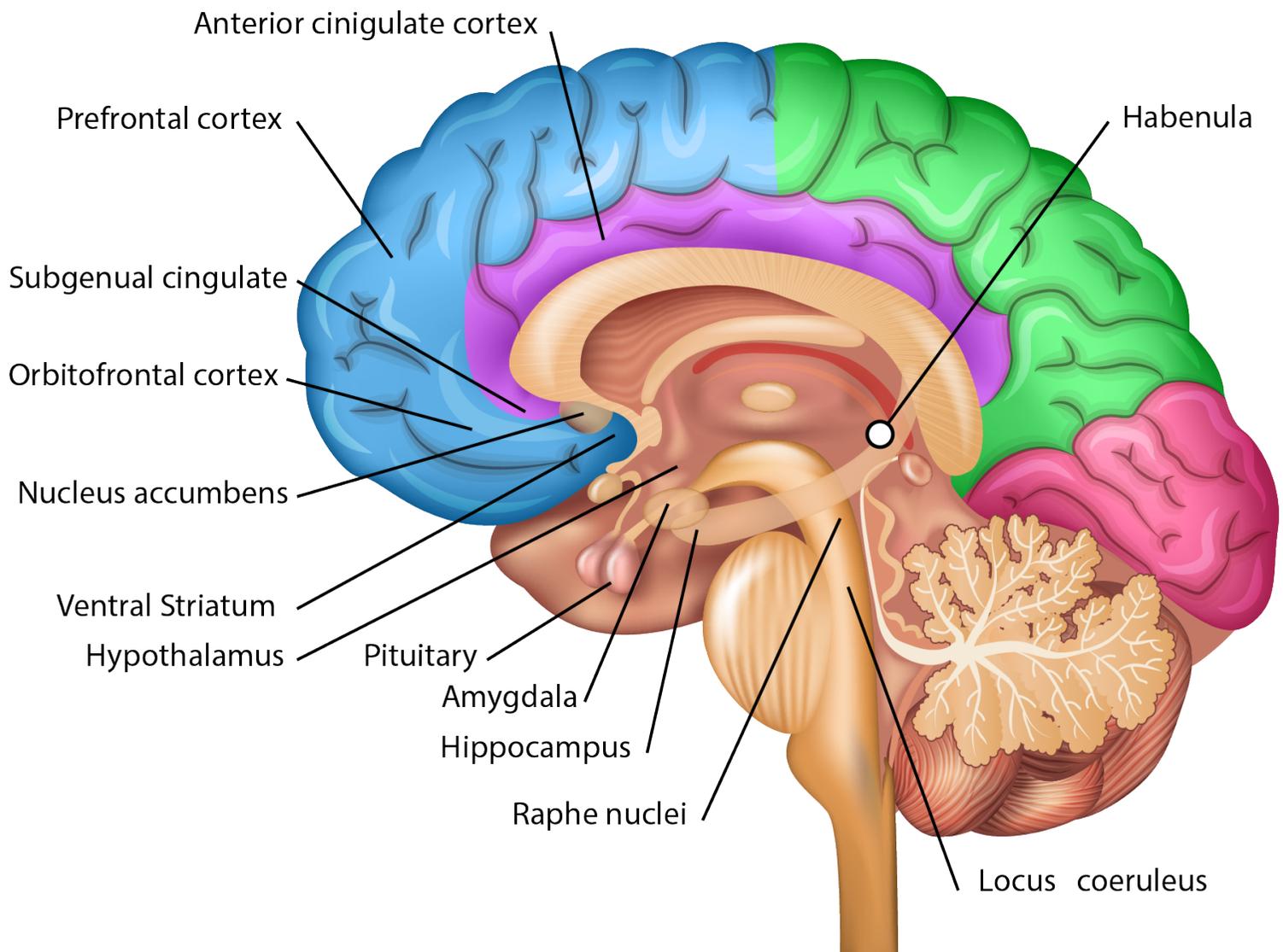
The habenula: An important brain region in depression, disappointment, and more

Richard Hill

Differentiating regions of the brain to determine their function and potential ways for beneficial manipulation is both a good thing and not so good. It's a good thing because we learn more about the possibilities that exist within the system of the brain. It's not such a good thing, however, when we use this information in a reductionist way and seek to isolate brain regions for predictable, cause-and-effect treatments. Having said that, one region of the brain that has an impact on depression is the *habenula*, from the Latin for "little rein" (based on its shape).

It is a very small region, located in the ventral midbrain, wedged between the stalk of the pineal

gland and the thalamus. At one time, the habenula was thought to be part of the stalk of the pineal gland, but it is now recognised as having its own properties with its own medial and lateral subregions. The lateral habenula receives inputs from the basal ganglia and limbic system and projects information and stimuli to the dopaminergic, serotonergic, and noradrenergic neurons of the midbrain, including the substantia nigra, the ventral tegmental area, the raphe nuclei, and the locus coeruleus. A number of studies over the past 20 years suggest that the habenula may be causally involved in the onset of depression, addiction, and other psychiatric illnesses.



The most recent work on the habenula is presented by Yan Yang and colleagues at Zhejiang University, Hangzhou, in the journal *Current Opinion in Neurobiology* (Yang, Wang, Hu, & Hu, 2018). Their paper, entitled “Lateral Habenula in the Pathophysiology of Depression”, continues the work of other researchers such as Namboodiri and colleagues (Namboodiri, Rodriguez-Romaguera, & Stuber, 2016), whose article in *Current Biology* is an excellent primer on the region, and Mathuru (2017).

An interesting possibility is the use of deep brain stimulation of the lateral habenula as a beneficial strategy for treating resistant depression. This was first hypothesised by Sartorius and Henn in 2007 and has been shown to have promise over the years, as described by Wang (2011), and Kim et al. (2016). It has, however, taken a decade to develop the practical research to validate the hypothesis. Even still, the habenula is still relatively unknown.

Alfred Kaye and David Ross (2017) suggest that the habenula is involved in the affective experience of “darkness, disappointment, and depression”. I find the inclusion of disappointment as an affective experience quite fascinating, as it signals several interesting implications for evolutionary development. Have human beings developed a specific mechanism for the experience of disappointment and, if so, how might this be helpful in how we manage the demands of daily experience?

We must always be careful not to over-read fMRI and MRI research that implicates the differentiated activity of a specific brain region. Because we use subtractive methods—where general or usual activity is subtracted from the before and after images to see where new or different activity is taking place—we risk losing sight of the complex system of activity. Having said that, it is interesting to contemplate the possibility that over evolutionary time it has been helpful to have a neurobiological differentiation for disappointment.

It is not hard to imagine that expectations, best intentions, and even the quest to satisfy essential needs such as food and shelter may not have worked out well; indeed, that they may not have worked out well quite often. We might speculate that if these regular disappointments were experienced as strong emotions played out in the limbic area, that may have been very debilitating, affecting the capacity of the individual to survive and reproduce.

By distinguishing disappointment from the sorts of emotional responses that might lead to depression or anxiety is an interesting evolutionary possibility.

Certainly, this is speculative, and perhaps even drifting into whimsy, but when we consider possibilities—and take great care to see them as possibilities, not realities—then we can stimulate our curiosity toward the humanistic frame of neurobiological discovery. It is not just about the facts, it is about how those facts enrich our sense of being human and the journey of humanity to be where we are today.

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RESEARCHERS MAP GENETIC ‘SWITCHES’ BEHIND HUMAN BRAIN EVOLUTION

UCLA researchers have developed the first map of gene regulation in human neurogenesis, the process by which neural stem cells turn into brain cells and the cerebral cortex expands in size. The scientists identified factors that govern the growth of our brains and, in some cases, set the stage for several brain disorders that appear later in life.

The human brain differs from that of mice and monkeys because of its large cerebral cortex. The organ’s most highly developed part, the cerebral cortex is responsible for thinking, perceiving and sophisticated communication. Scientists are just beginning to understand the molecular and cellular mechanisms that drive the growth of the human brain and the major role they play in human cognition.

Brain development is guided by the expression of genes in certain brain regions or cell types, as well as during specific time frames. Gene expression, the process by which the instructions in our DNA are converted into a functional product, such as a protein, is regulated at many levels by segments of DNA acting as on–off switches at key moments. But until now, there was no map that described the activity and location of these switches on a chromo-

some during neurogenesis.

Using a molecular biology technique called ATAC-seq, UCLA researchers mapped regions of the genome that are active during neurogenesis. They combined that data with gene expression data from those brain regions. The researchers also used previously published data about the folding patterns of chromosomes. Chromosomal folding patterns affect how genetic information is encoded. The combined data helped them identify regulatory elements for key genes in neurogenesis. One gene, called *EOMES/Tbr2*, when switched off, is associated with severe brain malformations.

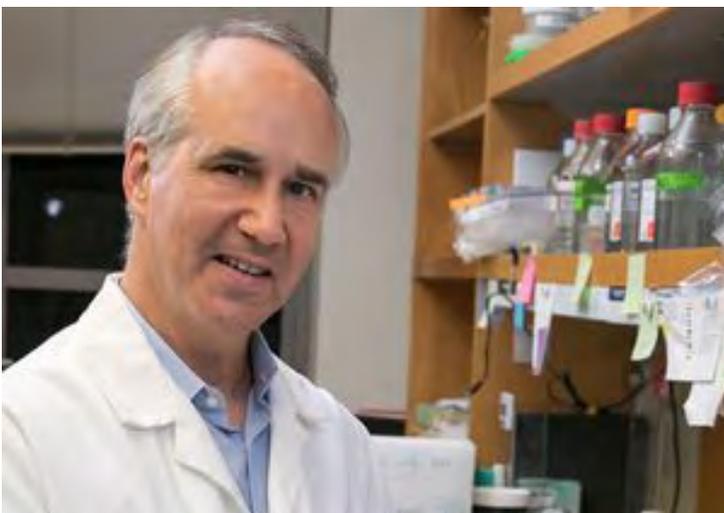
The researchers confirmed the roles of the targeted genes by using CRISPR technology, a technique by which pieces of DNA in the cells can be removed, to edit out a subset of regulatory switches and then assess their effect on gene expression and neurogenesis.

Researchers found that some psychiatric disorders that develop later in life, such as schizophrenia, depression, neuroticism and attention deficit hyperactivity disorder, known as ADHD, have their origins during the earliest stages of brain growth in the fetus. Even a person’s future intellectual capabilities are set in motion during neurogenesis, according to the researchers.

The researchers also discovered a major mechanism that accounts for the human cerebral cortex being larger than it is in non-human primates. They identified a genome sequence that alters expression of a fibroblast growth factor receptor that regulates important biological processes including cell multiplication and division, and that assigns specific tasks to cells. The genome sequence is more active in humans than in mouse and non-human primates, which helps explain why human brains are larger.

Source: [UCLA](#)

Study: [The Dynamic Landscape of Open Chromatin During Human Cortical Neurogenesis](#)



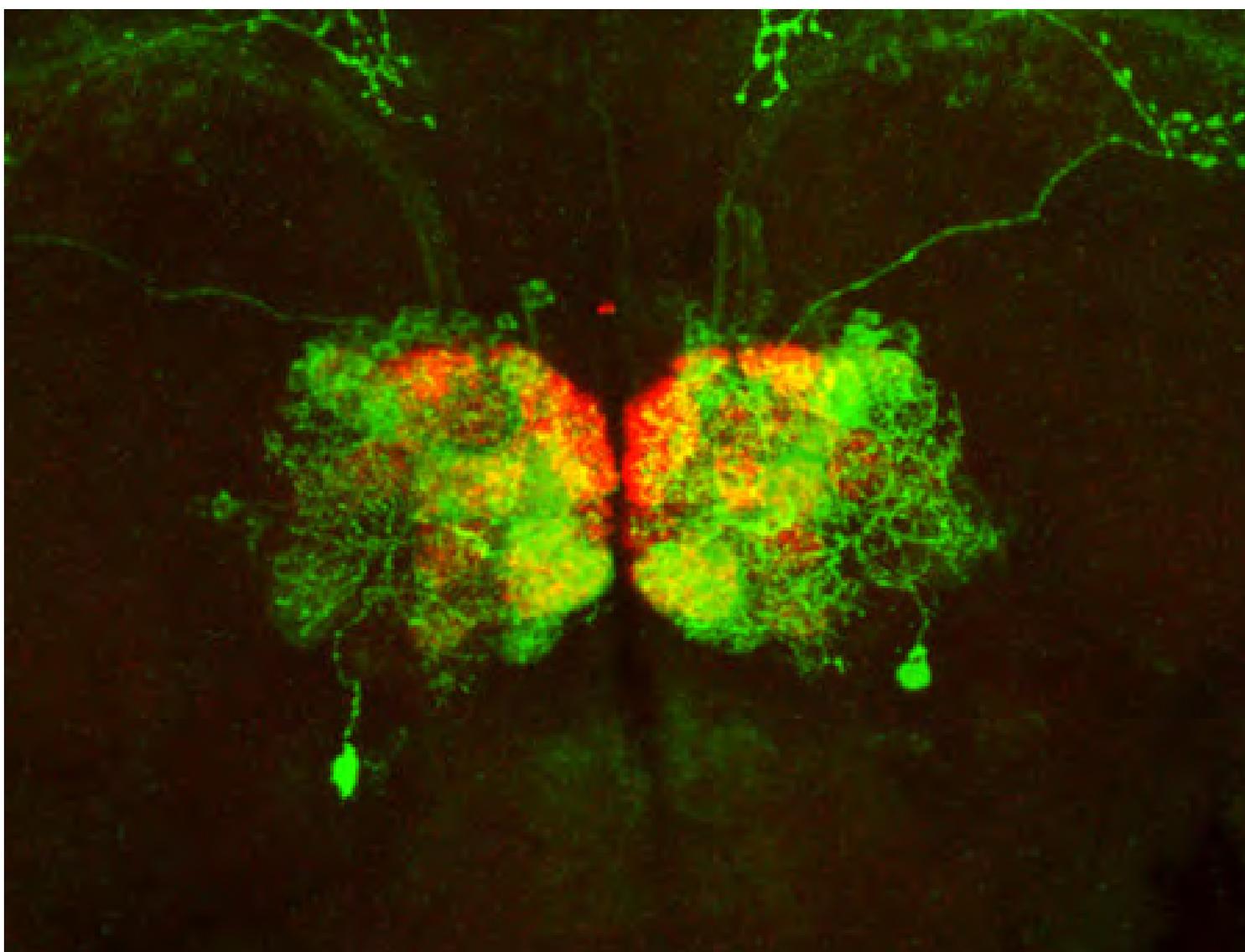
Dr. Daniel Geschwind. Image: UCLA Health

NEW TECHNOLOGY WILL CREATE BRAIN WIRING DIAGRAMS

The human brain is composed of billions of neurons wired together in intricate webs and communicating through electrical pulses and chemical signals. Although neuroscientists have made progress in understanding the brain's many functions—such as regulating sleep, storing memories, and making decisions—visualizing the entire “wiring diagram” of neural connections throughout a brain is not possible using currently avail-

able methods. But now, using *Drosophila* fruit flies, Caltech researchers have developed a method to easily see neural connections and the flow of communications in real time within living flies. The work is a step forward toward creating a map of the entire fly brain's many connections, which could help scientists understand the neural circuits within human brains as well.

“If an electrical engineer wants to understand how



The TRACT method allows for the identification of neurons connected by synapses in a brain circuit. This image shows the olfactory receptor neurons (red) activating the production of a green protein in their synaptically-connected downstream partners.

Credit: Courtesy of the Lois Laboratory

a computer works, the first thing that he or she would want to figure out is how the different components are wired to each other," says Caltech research professor Carlos Lois who is leading the study. "Similarly, we must know how neurons are wired together in order to understand how brains work."

When two neurons connect, they link together with a structure called a synapse, a space through which one neuron can send and receive electrical and chemical signals to or from another neuron. Even if multiple neurons are very close together, they need synapses to truly communicate.

The Lois laboratory has developed a method for tracing the flow of information across synapses, called TRACT (Transneuronal Control of Transcription). Using genetically engineered *Drosophila* fruit flies, TRACT allows researchers to observe which neurons are "talking" and which neurons are "listening" by prompting the connected neurons to produce glowing proteins.

With TRACT, when a neuron "talks"—or transmits a chemical or electrical signal across a synapse—it will also produce and send along a fluorescent protein that lights up both the talking neuron and its synapses with a particular color. Any neurons "listening" to the signal receive this protein, which binds to a so-called receptor molecule—genetically built-in by the researchers—on the receiving neuron's surface. The binding of the signal protein activates the receptor and triggers the neuron it's attached to in order to produce its own, differently colored fluorescent protein. In this way, communication between neurons becomes visible. Using a type of microscope that can peer through a thin window installed on the fly's head, the researchers can observe the colorful glow of neural connections in real time as the fly grows, moves, and experiences changes in its environment.

Many neurological and psychiatric conditions, such as autism and schizophrenia, are thought to be caused by altered connections between neurons. Using TRACT, scientists can monitor the neuronal connections in the brains of hundreds of flies each day, allowing them to make comparisons at different stages of development, between the sexes, and in flies that have genetic mutations. Thus, TRACT could be used to determine how different diseases perturb the connections within brain circuits. Additionally, because neural synapses change over time, TRACT allows the monitoring of synapse formation and destruction from day to day. Being able to see how and when neurons form or break synapses will be critical to understanding how the circuits in the brain assemble as the animal grows, and how they fall apart with age or disease.

TRACT can be localized to focus in on the wiring of any particular neural circuit of interest, such as those that control movement, hunger, or vision. Lois and his group tested their method by examining neurons within the well-understood olfactory circuit, the neurons responsible for the sense of smell. Their results confirmed existing data regarding this particular circuit's wiring diagram. In addition, they examined the circadian circuit, which is responsible for the waking and sleeping cycle, where they detected new possible synaptic connections.

TRACT, however, can do more than produce wiring diagrams. The transgenic flies can be genetically engineered so that the technique prompts receiving neurons to produce proteins that have a function, rather than colorful proteins that simply trace connections.

"We could use functional proteins to ask, 'What happens in the fly if I silence all the neurons that receive input from this one neuron?'" says Lois. "Or, conversely, 'What happens if I make the neurons that are connected to this neuron hyperactive?' Our technique not only allows us to create a wiring diagram of the brain, but also to genetically modify the function of neurons in a brain circuit."

Previous methods for examining neural connections were time consuming and labor intensive, involving thousands of thin slices of a brain reconstructed into a three-dimensional structure. A laboratory using these techniques could only yield a diagram for a single, small piece of fruit-fly brain per year. Additionally, these approaches could not be performed on living animals, making it impossible to see how neurons communicated in real time.

Because the TRACT method is completely genetically encoded, it is ideal for use in laboratory animals such as *Drosophila* and zebrafish; ultimately, Lois hopes to implement the technique in mice to enable the neural tracing of a mammalian brain. "TRACT is a new tool that will allow us to create wiring diagrams of brains and determine the function of connected neurons," he says. "This information will provide important clues towards understanding the complex workings of the human brain and its diseases."

Source: [Caltech](#) - Written by Lori Dajose

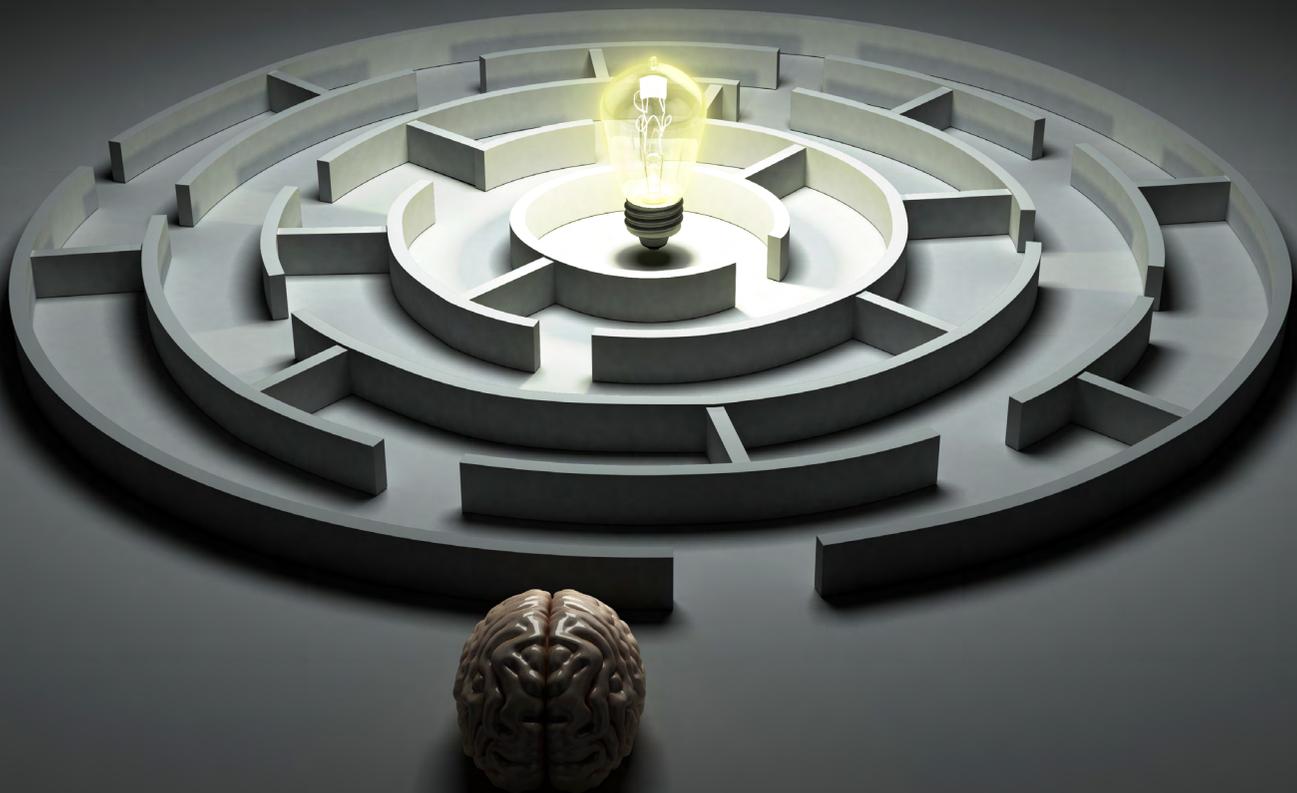
Paper: ["Tracing neuronal circuits in transgenic animals by transneuronal control of transcription \(TRACT\)."](#)

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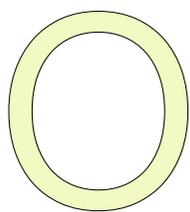
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Is Mindfulness Safe *for Trauma Survivors?* by David Treleaven





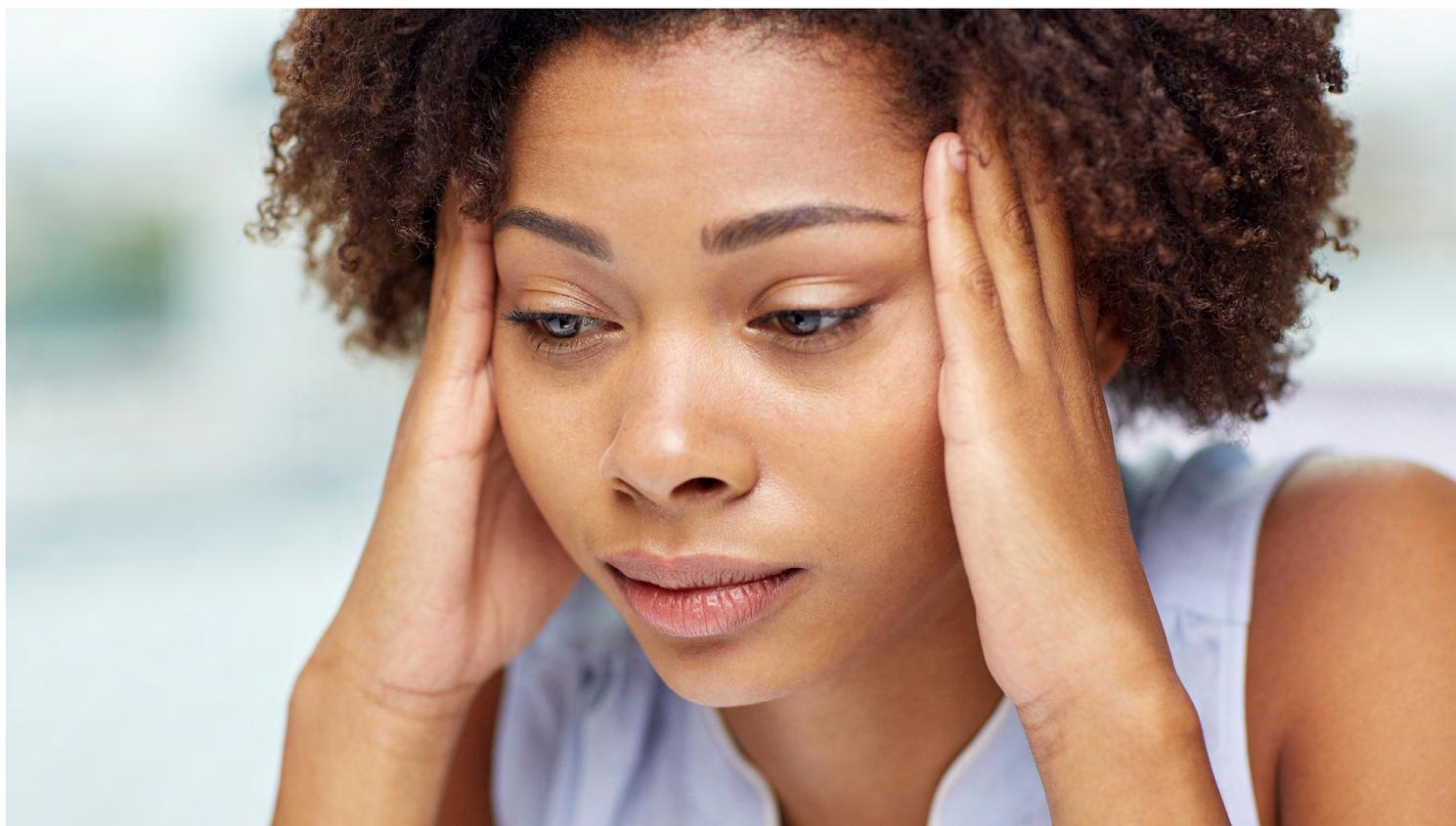
Over the past decade, I've researched the relationship between mindfulness meditation and trauma. Placed beside one another, mindfulness and trauma can seem like natural, even inevitable, allies. Both are concerned with the nature of suffering. Both are grounded in sensory experience. And while trauma creates stress, mindfulness has been shown to reduce it. In theory it seems that anyone who has experienced trauma could benefit from practicing mindfulness meditation. What could go wrong?

Plenty, it turns out. For people who've experienced trauma, mindfulness meditation can actually end up exacerbating symptoms of traumatic stress. When asked to pay focused, sustained attention to their internal experience, trauma survivors can find themselves overwhelmed by flashbacks and heightened emotional arousal. I've met survivors who, despite their best intentions, have ended up feeling disoriented, distressed and humiliated for somehow making things worse. The power of meditation thrusts survivors directly into the heart of wounds that often require more than mindful awareness to heal.

Yet mindfulness is also a valuable asset for trauma survivors. Mindfulness can enhance present-moment awareness, increase self-compassion, and strengthen a person's ability to self-regulate—all

important skills that support trauma recovery. The question for those of us who teach and utilize mindfulness is thus how we can help minimize the potential dangers of meditation to trauma survivors while simultaneously leveraging its potential benefits.

The answer I came to in my own work was a trauma-informed approach to mindfulness meditation. Mindfulness doesn't cause trauma—rather, it may uncover it—but the practice by which mindfulness is pursued can land trauma survivors in difficulty. To be "trauma-sensitive" means having a basic understanding of trauma in the context of one's work. A trauma-informed physician will ask for permission before touching a patient, for example; and a trauma-informed school counselor might ask a student whether they want the door open or closed during a session, and inquire about a comfortable sitting dis-



tance. With trauma-informed mindfulness, we apply this concept to mindfulness instruction. We can give people options about how they practice mindfulness, encouraging breaks and utilizing various anchors of attention. We can ensure we're trained in recognizing trauma symptoms, responding to them skillfully, and taking preemptive steps to ensure that people aren't re-traumatizing themselves under our guidance.

The potential risks of meditation, including for trauma survivors, have become increasingly well-known. At Brown University, a clinical neuroscientist by the name of Willoughby Britton started a project named the "[The Varieties of Contemplative Experience](#)", which, over several years, has examined the range of challenging experiences that can arise in the context of Buddhist meditation—experiences that can resemble psychological dissociation, depersonalization, and the re-experiencing of traumatic memories (Lindahl, Fisher, Cooper, Rosen, & Britton, 2017).

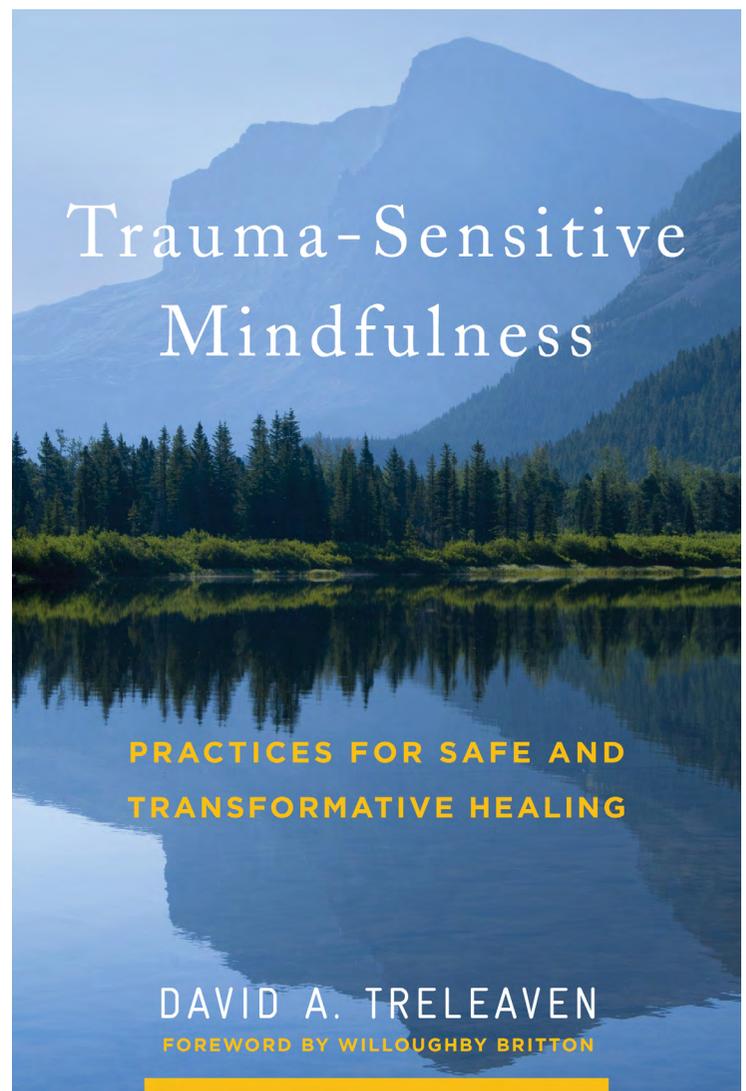
Ultimately, the need for trauma-sensitive mindfulness is a reflection of both odds and statistics. As many readers will know, the practice of mindfulness has exploded in popularity over the past decade and is now encouraged in a wide range of secular environments, including elementary and high schools, businesses, and hospitals. Yet, at the same time, the prevalence of trauma is extraordinarily high. The majority of us will be exposed to at least some type of traumatic event in our lifetime, and some of us will develop debilitating symptoms in its aftermath. What this means is that in any environment where mindfulness is being practiced, there's a high likelihood that someone will be struggling with traumatic stress.

Many who suffer under the weight of traumatic stress respond favorably to mindfulness meditation. But others may have a different experience, where the practice unintentionally lands them in more pain. Mindfulness practice doesn't need to work for everyone, but I've become convinced that certain modifications to meditation can support survivors, at the very least ensuring that they are not re-traumatizing themselves in practice. Mindfulness meditation isn't bad: it's powerful. And those of us offering it to others benefit when we continue exploring its risks and rewards.

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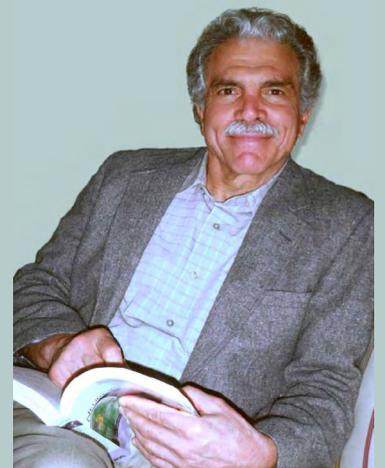
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COHERENCE

The Heart Connection to Personal, Social and Global Health

by Rollin McCraty



One of the most profound perspectives of 20th Century science is that the universe is wholly and enduringly interconnected and coherent.¹⁻³ Complex living systems, which includes human beings, are composed of numerous dynamic, interconnected networks of biological structures and processes. Coherence implies order, structure, harmony, and alignment within and amongst systems—whether in atoms, organisms, social groups, planets, or galaxies. Every whole has a relationship with and is a part of a greater whole, which is again part of something greater. In this context, nothing can be considered as separate, alone, or lacking relationships.

Most people appreciate the feeling of a harmonious state—the feeling of hearts, minds and bodies united in a state of wholeness. When we are in such states we typically feel connected not only to our deepest selves, but also to others, and even to the earth itself. We call this state of internal and external connectedness “coherence.” Can personal coherence be achieved by learning to more consistently self-regulate emotions? How is coherence directly associated with increased intuition and improved health and cognitive functioning? Most importantly, is coherence reflected in physiology and can it be objectively measured? Can we postulate that as increasing numbers of people add coherent energy to the global field, it helps strengthen and stabilize mutually beneficial feedback loops among human beings and with the earth itself?





Concept of Coherence

Coherence has come to be a term that embraces fields as diverse as quantum physics, cosmology, physiology, and brain and consciousness research. Coherence has several related definitions, all of which are applicable to the study of human physiology, social interactions, and global affairs. The most common dictionary definition is “the quality of being logically integrated, consistent, and intelligible,” as in a *coherent statement*.⁴ A related meaning is the logical, orderly, and aesthetically consistent relationship among parts.⁴ Coherence always implies correlations, connectedness, consistency, and efficient energy utilization. We refer to people’s speech or thoughts as coherent if the words fit together well and incoherent if they are uttering meaningless nonsense or presenting ideas that make no sense as a whole. Thus, coherence refers to wholeness and global order, where the whole is greater than the sum of its individual parts. In the example of organizing words into a coherent sentence, the meaning and purpose conveyed by the arrangement of the words is greater than the individual meaning of each word. For any system to produce a function, it must have the property of global coherence, and this is also true for our physical, mental, emotional, and social systems.

Coherence also describes the coupling and degree of synchronization between different oscillating systems operating at the same basic frequency. They can become either phase, or frequency, locked, as occurs between photons in a laser.⁵ Physicists call this cross-coherence. In physiology, cross-coherence occurs when one or more of the body's oscillatory systems, such as respiration, blood pressure and heart rhythms, become entrained and operate at the same frequency. Global coherence, however, can be achieved even when the parts are not at the same frequency. In complex, globally coherent systems, such as human beings, there are micro-level systems, molecular machines, protons and electrons, organs and glands each functioning autonomously, doing very different things at different rates yet all working together in a complex, harmoniously coordinated and synchronized manner. If this were not the case, it would be a chaotic free-for-all among the body's independent systems, rather than a coordinated federation of interdependent systems and functions. Biologist Mae Wan Ho suggested that coherence is the defining quality of living systems and accounts for their most characteristic properties, such as long range order and coordination, rapid and efficient energy transfer, and extreme sensitivity to specific signals.⁶

Many contemporary scientists believe that the underlying state of our physiological processes determines the quality and stability of the feelings and emotion we experience. The feelings we label as "positive" actually reflect body states in which "the regulation of life processes becomes efficient, or

even optimal, free-flowing and easy."⁷ Indeed, it appears that synchronized activity underlies conscious experience itself. For the brain and nervous system to function, the neural activity, which encodes information, must be stable and coordinated, and the various centers within the brain must be able to dynamically synchronize their activity in order for information to be smoothly processed and perceived.

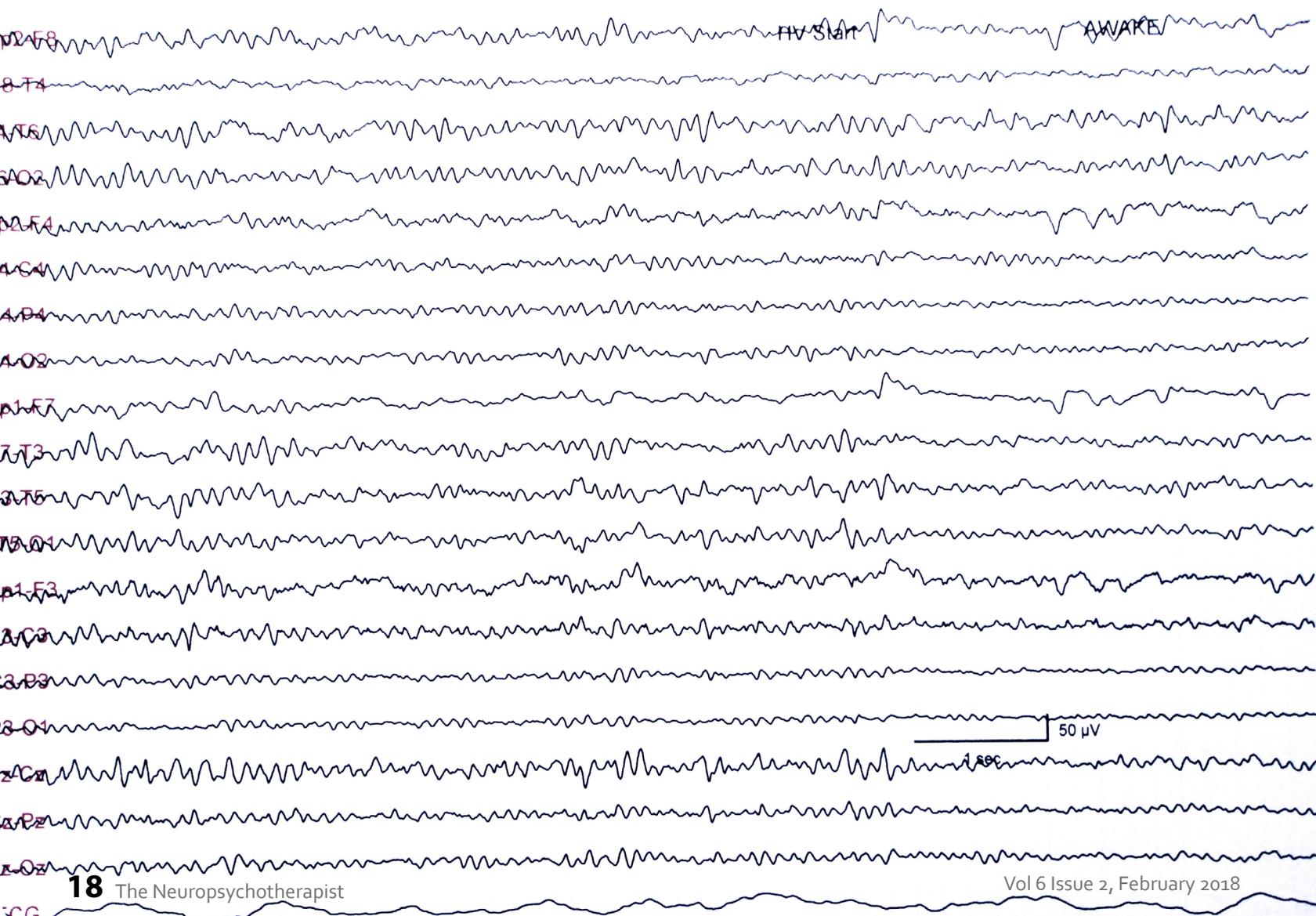
Our "coherent" perception of an object in the external world comes from millions of neurons involved in processing sensory information being globally coherent and self-organizing into a global conscious experience.⁸ It is estimated that 40% to 65% of all activities in the brain are phase-synchronized at any given time.⁹ Coherence, in this context, is a measure of the correlated activity between brain regions that is orchestrated from direct neural connections between the regions, common input from the thalamus, or other neocortical regions.¹⁰ Brain rhythms operate over a wide range of frequencies, yet most of these exhibit various degrees of synchronized activity with the heart, which has a much slower rhythm than the brain. For example, when heart rate increases, the activity and amplitude of the brainwaves also tend to increase. When the heart rhythm is coherent, as described below, there also tends to be an increase in heart-brain synchronization.¹² These are examples of a phase-amplitude relationship between macroscopic physiological rhythms, which reflect the constant intercommunication between different biological rhythms that take place in healthy organisms.⁶

The Coherent Heart Rhythm of Positive Emotions

Physiological coherence, the degree of order, harmony, and stability in the various rhythmic activities¹³, signifies a coherent system whose efficient or optimal function is directly related to the ease and flow in life processes. By contrast, an erratic, discordant pattern of activity denotes an incoherent system whose function reflects stress and inefficient utilization of energy in life processes. We have found that positive emotions such as appreciation and compassion are reflected in a heart rhythm pattern that is more coherent (Figure 1), as opposed to negative emotions such as anxiety, anger, and fear.^{12,15,17-21} The coherent state has been correlated with a general sense of well-being, and improvements in cognitive, social, and physical performance.^{13,22} Coherence tends to naturally emerge with the activation of heartfelt, positive emotions such as appreciation, compassion, care, and love. This suggests that such feelings increase the coherence and harmony in our energetic systems.¹⁹

It is important to note that although changes in heart rate often covary with emotions, our research has found that it is the pattern of the heart's rhythm that is primarily reflective of the emotional state, especially emotions that do not lead to large autonomic nervous system (ANS) activations or withdrawals.^{12,13,22} These changes in rhythmic patterns can be independent of heart rate; that is, one can have a coherent or incoherent pattern at higher or lower heart rates. Thus, it is the pattern of the rhythm (the ordering of changes in rate over time) rather than the rate (at any point in time) that is most directly related to emotional dynamics and physiological synchronization. Also, the coherent state is fundamentally different from a state of relaxation, which requires only a lowered heart rate and not necessarily a coherent rhythm.

Physiological coherence, also referred to as heart coherence, cardiac coherence, or resonance, is a functional mode measured by heart rate variability (HRV) analysis wherein a person's heart rhythm pattern becomes more ordered and sine wave-like



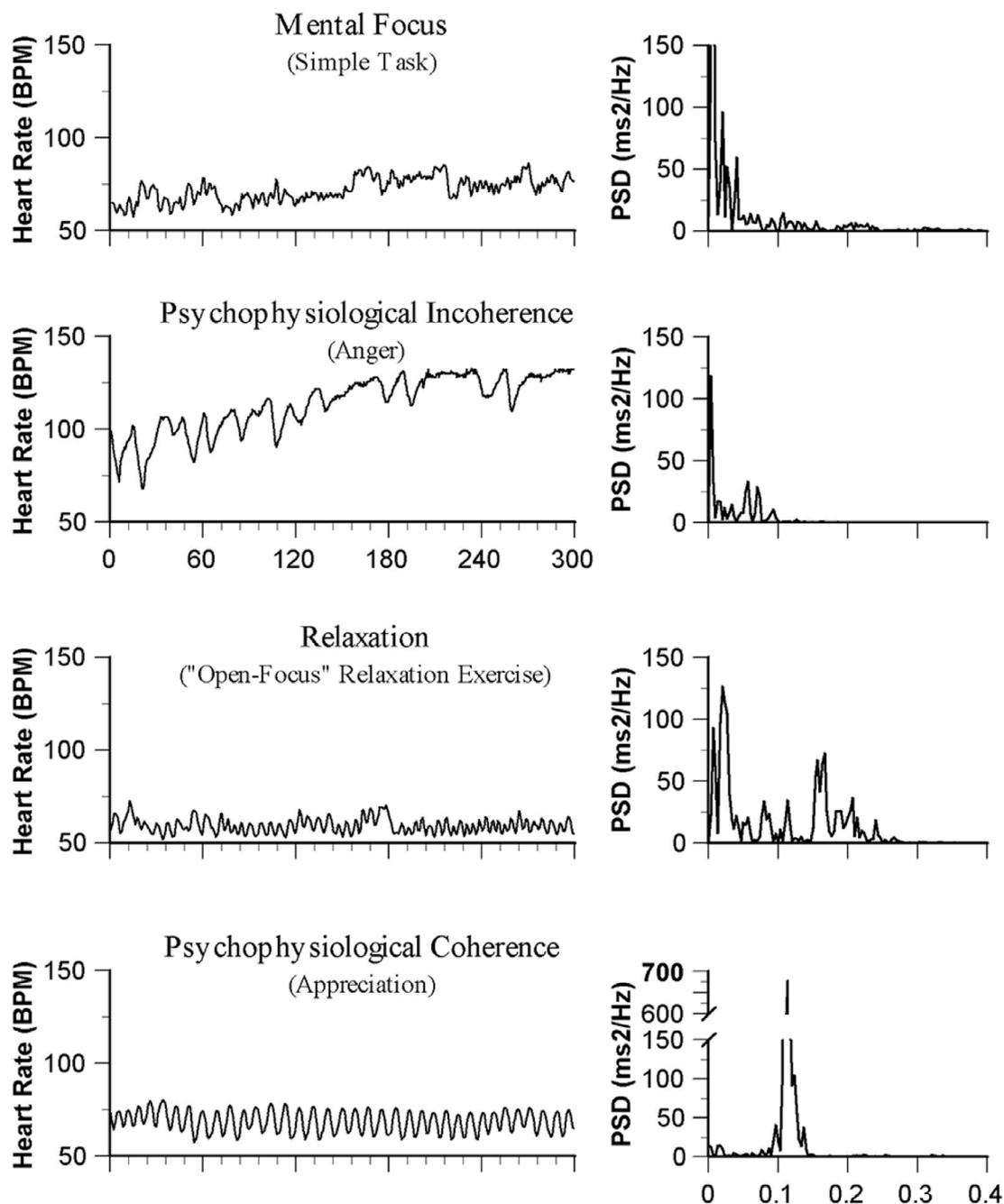


FIGURE 1 Emotions Are Reflected in Heart Rhythm Patterns.

The left-hand graphs are heart rate tachograms, which show beat-to-beat changes in heart rate. To the right are the heart rate variability (HRV) power spectral density (PSD) plots of the tachograms at left. The examples depicted are typical of the characteristic aspects of the more general patterns observed for each state. *Mental focus* is characterized by reduced HRV. Activity in all three frequency bands of the HRV power spectrum is present. Anger, an example of *Psychophysiological Incoherence*, characterized by a lower frequency, more disordered heart rhythm pattern, and increasing mean heart rate. As can be seen in the corresponding power spectrum to the right, the rhythm during anger is primarily in the very low frequency region, which is associated with sympathetic nervous system activity. *Relaxation* results in a higher-frequency, lower-amplitude rhythm, indicating reduced autonomic outflow. In this case, increased power in the high-frequency region of the power spectrum is observed, reflecting increased parasympathetic activity (the relaxation response). *Psychophysiological coherence*, which is associated with sustained positive emotions (in this example, appreciation), results in a highly ordered, sine wave-like heart rhythm pattern. As can be seen in the corresponding power spectrum, this psychophysiological mode is associated with a large, narrow peak in the low frequency region, centered around 0.1 Hz. Note the scale difference in the amplitude of the spectral peak during the coherence mode. This indicates system-wide resonance, increased synchronization between the sympathetic and parasympathetic branches of the nervous system, and entrainment between the heart rhythm pattern, respiration, and blood pressure rhythms. The coherence mode is also associated with increased parasympathetic activity, thus encompassing a key element of the relaxation response, yet it is physiologically distinct from relaxation because the system is oscillating at its resonant frequency, and there is increased harmony and synchronization in nervous system and heart-brain dynamics.

at a frequency of around 0.1 Hz (10-seconds).¹² The term physiological coherence embraces several related phenomena—auto-coherence, cross-coherence, synchronization, and resonance—all of which are associated with increased order, efficiency, and harmony in the functioning of the body’s systems. When one is in a coherent state, one experiences increased synchronization and resonance in higher-level brain systems and in the activity occurring in

the two branches of the ANS, as well as a shift in autonomic balance toward increased parasympathetic activity.

Psychologically, coherence reflects increased emotional and perceptual stability and alignment among the physical, cognitive, and emotional systems (Figure 2). In this regard, coherence and resilience are closely related as each has the quality of being both a process and an outcome as they rely

on physiological and psychological processes that create resilient outcomes. In addition, both are states rather than traits that vary over time as demands, circumstances, and level of maturity change.³³ Resilience is related to self-management and efficient utilization of energy resources across four domains: physical, emotional, mental, and spiritual (Figure 3). Physical resilience is basically reflected in physical flexibility, endurance, and strength; emotional resilience is reflected in one’s ability to self-regulate the degree of emotional flexibility, positive emotions, and relationships; mental resilience is reflected in our attention span, mental flexibility, an optimistic worldview, and ability to integrate multiple points of view; and spiritual resilience is typically associated with our commitment to core values, intuition, and tolerance of others’ values and beliefs. When we are in a coherent state, the increased physiological efficiency and alignment of the mental and emotional systems accumulates resilience (energy) across all four energetic domains. Having a high level of resilience is important not only for recovering from challenging situations but for preventing unnecessary stress reactions (frustration, impatience, anxiety) that deplete our physical and psychological resources.

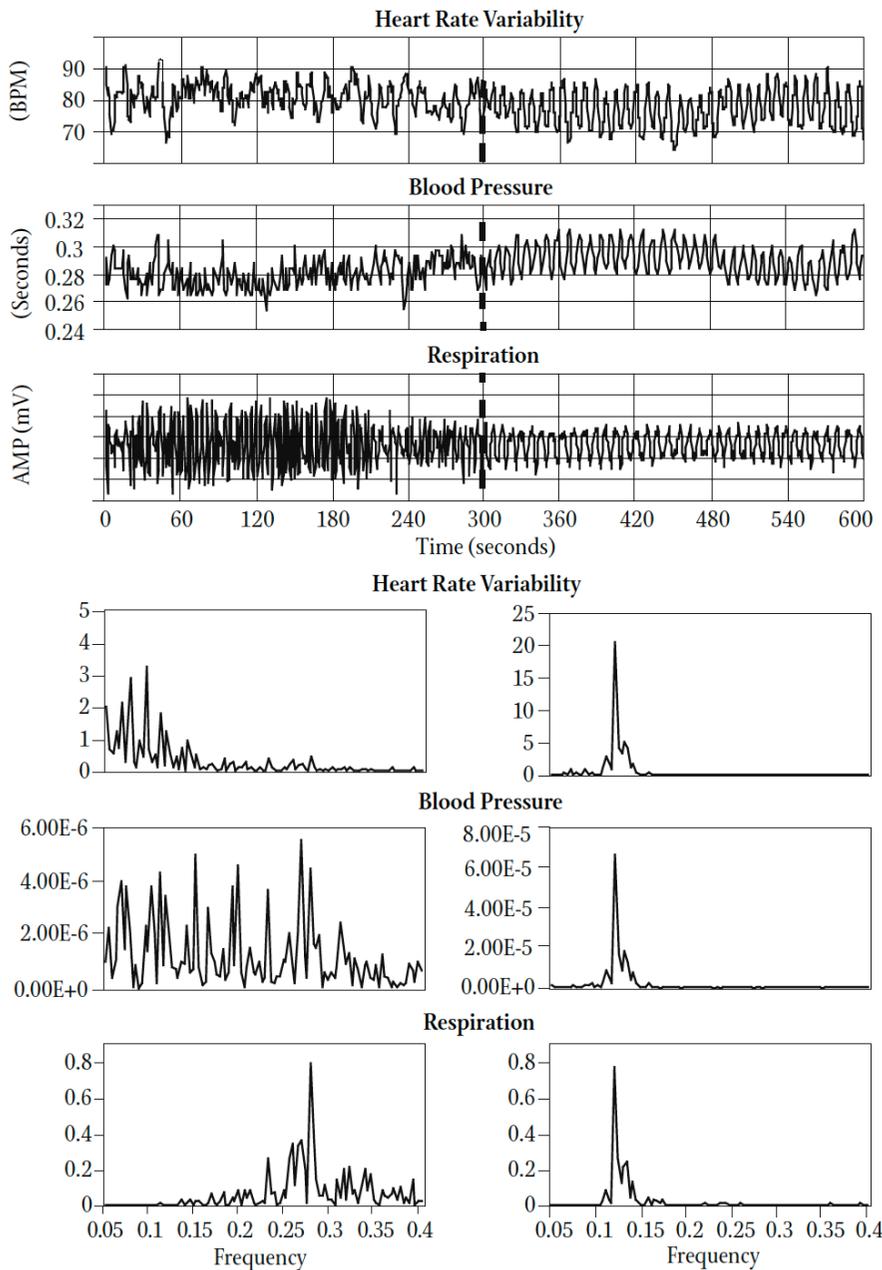


FIGURE 2 Entrainment

The top graphs show an individual’s heart rate variability, pulse transit time, and respiration rhythms over a 10-minute period. At the 300-second mark, the individual used the freeze-frame positive emotion refocusing technique, causing these three systems to come into entrainment. The bottom graphs show the frequency spectra of the same data on each side of the dotted line in the center of the top graph. Notice the graphs on the right show that all three systems have entrained to the same frequency.

Heart Rate Variability

The investigation of the heart's complex rhythms or what is now called heart rate variability¹¹ (HRV) began with the emergence of modern signal processing in the 1960s and 1970s, and has rapidly expanded in more recent times. The irregular behavior of the heartbeat is readily apparent when heart rate (HR) is examined on a beat-to-beat basis, but is overlooked when a mean value over time is calculated. These fluctuations in HR result from complex, nonlinear interactions among a number of different physiological systems. HRV is thus considered a measure of neurocardiac function that reflects heart–brain interactions and autonomic nervous system (ANS) dynamics.^{14,16}

An optimal level of HRV within an organism reflects healthy function and an inherent self-regulatory capacity, adaptability, or resilience.^{16,23-28} Too much instability, such as arrhythmias or nervous system chaos, is detrimental to efficient physiological functioning and energy utilization. However, too little variation indicates age-related system depletion, chronic stress, pathology, or inadequate functioning in various levels of self-regulatory control systems.^{11,29,30} The importance of HRV as an index of the functional status of physiological control systems was noted as far back as 1965 when it was found that fetal distress is preceded by reductions in HRV before any changes occur in HR itself.³² In the 1970s, reduced HRV was shown to predict autonomic neuropathy in diabetic patients before the onset of symptoms.³⁵⁻³⁷

Reduced HRV was also found to be a greater risk factor of death post–myocardial infarction than other known risk factors.³⁸ It has clearly been shown that HRV declines with age and age-adjusted values should be used in the context of risk prediction.³⁹ Age-adjusted HRV that is low has been confirmed as a strong, independent predictor of future health problems in both healthy people. Age-adjusted HRV correlates with all causes of mortality.^{40,88} In prospective studies reduced HRV has been the strongest independent predictor of the progression of coronary atherosclerosis.⁸⁹ A number of studies have shown that reduced HRV is associated with measures of inflammation in subjects with no apparent heart disease.⁹⁰

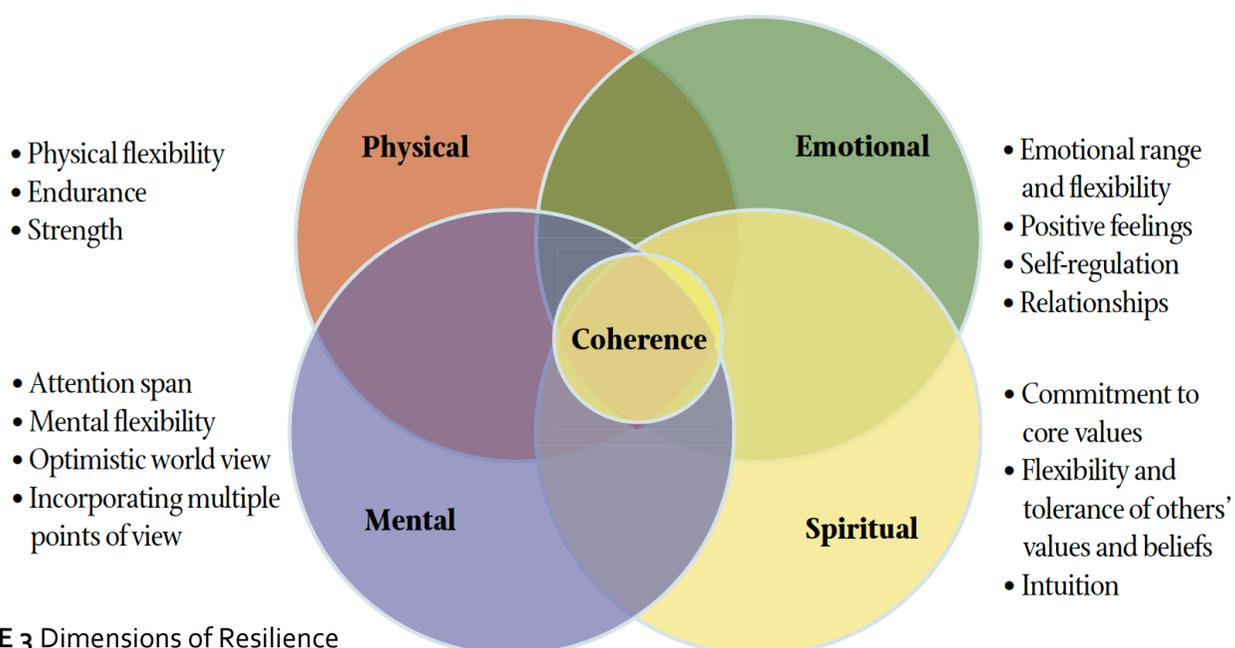


FIGURE 3 Dimensions of Resilience

Heart Rate Variability (HRV) Coherence

HRV is widely considered a measure of neurocardiac function that reflects heart-brain interactions and ANS dynamics. HRV is much more than an assessment of heart rate since it reflects the complex interactions of the heart with multiple body systems.¹² An optimal level of variability within an organism's key regulatory systems is critical to the inherent flexibility and adaptability or resilience that epitomizes healthy coherent function and well-being. While too much instability is detrimental to efficient physiological functioning and energy utilization, too little variation indicates depletion or pathology.³⁴ HRV is an important indicator of psychological resilience and behavioral flexibility as well as the ability to effectively adapt to changing social or environmental demands.⁴¹ Resting levels of HRV are associated with individual differences in cognitive performance on tasks requiring utilization of executive functions.⁴² Heart rhythm coherence is reflected in the HRV power spectrum as a large increase in power in the low-frequency (LF) band (typically around 0.1 Hz) and a decrease in power in the very low-frequency (VLF) and high-frequency (HF) bands.^{12, 22} A coherent heart rhythm can therefore be defined as a relatively harmonic (sine wave-like) signal with a very narrow, high-amplitude peak in the LF region of the HRV power spectrum with no major peaks in the VLF or HF regions. Coherence thus approximates the LF/(VLF + HF) ratio (Figure 1).¹³ More specifically, coherence is assessed by identifying the maximum peak in the 0.04-0.26 Hz range of the HRV power spectrum, calculating the integral in a window 0.030 Hz wide centered on the highest peak in that region, then calculating the total power of the entire spectrum.

Heart coherence is a highly efficient functional mode that is associated with efficient utilization of energy resources and numerous health-related benefits. These include:

1. resetting of baroreceptor sensitivity, which is related to short-term blood pressure control and increased respiratory efficiency⁴³;
2. increased vagal afferent traffic, which is involved in the inhibition of pain signals and sympathetic outflow⁴⁴;
3. increased cardiac output in conjunction with

increased efficiency in fluid exchange, filtration, and absorption between the capillaries and tissues⁴⁵;

4. increased ability of the cardiovascular system to adapt to circulatory requirements;
5. increased temporal synchronization of cells throughout the body⁴⁶; and
6. increased synchronization in the reciprocal activity of the branches of the ANS.¹²

Coherence results in increased system-wide energy efficiency and metabolic energy savings.⁴⁵⁻⁴⁷ Resonance is a coherence phenomenon that occurs in an oscillatory system when there is a large sudden increase in amplitude at a specific frequency. The frequency at which this large increase in amplitude occurs is defined as the resonance frequency of the system. Most mathematical models show that the resonance frequency of the human cardiovascular system is determined by the feedback loops between the heart and brain.^{48,49} In humans and in many animals, the resonance frequency of the system is approximately 0.1 Hz. We conclude that coherence and resonance are characteristic of the natural physiological state associated with heartfelt positive emotions.

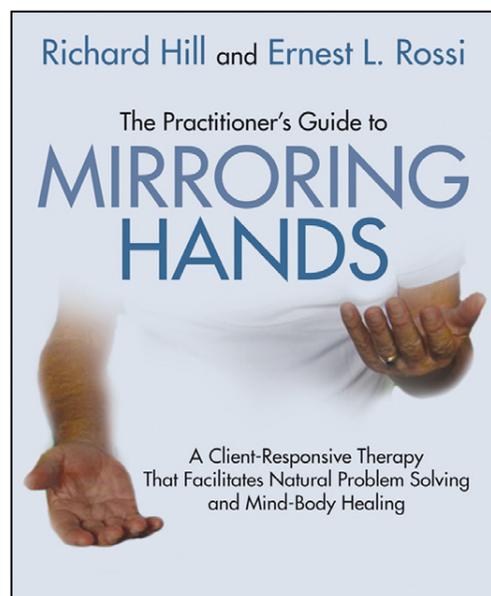
Intuition: The Central Role of the Heart

Emotions are felt within and can trigger behaviors, thoughts and other conscious and explicit activities. When we say, "heartfelt positive emotions," it is in the context of the interactive connectedness of the coherent system within. There is substantial evidence that the heart plays a unique role in synchronizing the activity across multiple systems and levels of organization.^{12,45,46} As the most powerful and consistent generator of rhythmic information patterns in the body, the heart is in continuous communication with the brain and body through multiple pathways: neurologically (through the ANS), biochemically (through hormones), biophysically (through pressure and sound waves), and energetically (through electromagnetic field interactions). The heart is uniquely well positioned to act as the "global coordinator" in the body's symphony of functions to bind and synchronize the system as a whole. Because of the extensiveness of its influence on physiological, cognitive, and emotional systems,

The Practitioner's Guide to Mirroring Hands

A client-responsive therapy that facilitates natural problem solving and mind-body healing

Richard Hill and Ernest L. Rossi



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December 2017

This is the first book dedicated to Ernest L. Rossi's Mirroring Hands therapeutic process. Mirroring Hands is a technique that emerged from Ernest L. Rossi's studies and experiences with Milton H. Erickson. It has its origins in hypnosis, but Mirroring Hands is an effective process for a wide range of mental health professionals who may not include or intend to include hypnosis in their practice. This book will appeal both to established therapists and to those new to psychotherapy and hypnotherapy and is intended to establish the Mirroring Hands process as a therapy for all practitioners. Rossi himself has described the technique as 'hypnosis without the hypnosis'.

The central focus of the book is the technique: it is a practitioner's guide. Mirroring Hands seeks to connect the client and the therapist to the natural flow, cycles and self-organising emergence that shift the client toward beneficial change. The authors show how the technique enables clients to unlock their problem solving and mind-body healing capacities and arrive at resolution in ways that many other therapies might not. The overall effect is to create an engaged connection and integration with the client's natural, best self.

The process begins with a state of focused attention, which is established by the client keenly observing their hands. The client is invited to look at their hands as though they had never seen them before. This is not to produce a deep hypnotic trance, but to create a mental state that is very different from just engaged conversation. Milton H. Erickson described it as a General Waking Trance. This form of focus and attention is similar to the state created during meditation and mindfulness.



Richard Hill, MA, MEd, MBMSc is acknowledged internationally as an expert in human dynamics, communications, the brain and the mind. He is an international lecturer and keynote speaker on the topics of neuroscience, psychosocial genomics, has developed special training courses for suicide prevention and is the originator of the Curiosity Approach. In addition to lectures to the psychological profession in Australia and the world, Richard has a strong engagement with the coaching and business community



Ernest L. Rossi, Ph.D. is a Diplomate in Clinical Psychology and the recipient of three Lifetime Achievement Awards for Outstanding Contributions to the Field of Psychotherapy. He is a Jungian Analyst, the Science Editor of *Psychological Perspectives* and the author, co-author and editor of more than 50 professional books and more than 170 peer reviewed scientific papers in the areas of neuroscience, psychotherapy, dreams, and therapeutic hypnosis that have been translated into a dozen languages. Rossi is internationally recognized as a polymath, a gifted psychotherapist, and teacher of innovative approaches to facilitating the creative process.

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the heart provides a central point of reference from which the dynamics of such processes can be regulated.

Although most discussions of the ANS focus on the efferent (descending) pathways, the afferent (ascending) nerves play a critical role in creating the heart rhythm and thus the coherent state. Although this fact is not well known, 85% to 90% of the nerves in the vagus nerve are afferents, and the cardiovascular afferents send signals to the brain to a much greater extent than other major organs.⁵⁰ Though it is generally known that these afferent signals have a regulatory influence on many aspects of the efferent signals that flow to the heart, blood vessels, and other glands and organs, it is less commonly appreciated that they also have profound effects on the higher brain centers. Cardiovascular afferents have numerous connections to such brain centers as the thalamus, hypothalamus, and amygdala, and they play an important role in determining emotional ex-

perience (Figure 4).^{12,44,50-53}

The heart is particularly sensitive and responsive to changes in a number of other psychophysiological systems, especially changes in the activity of either branch of the ANS. The heart's intrinsic network of sensory neurons enables it to detect and respond to variations in hormonal levels in the blood flow and efferent ANS signals.⁵⁴ In addition to functioning as a sophisticated information-processing and encoding center,⁵⁵ the heart is also an endocrine gland that produces and secretes hormones and neurotransmitters.⁵⁶⁻⁶⁰ J. Andrew Armour, a leading neurocardiologist, has suggested that the heart's extensive intrinsic nervous system is sufficiently sophisticated to qualify as a "heart brain" in its own right.⁶¹ Its complex circuitry enables it to sense, remember, self-regulate, and make decisions about cardiac control independent of the central nervous system.^{55,62}



Intuition

The root of the term intuition stem from the Latin word *in-tuir*, which can be translated as “looking, regarding, or knowing from within.” In a review article, Gerard Hodgkinson concludes that intuiting is a complex set of interrelated cognitive, affective, and somatic processes, in which there is no apparent intrusion of deliberate, rational thought. He also concludes that the considerable body of theory and research that has emerged over recent years clearly demonstrates that the construct of intuition has emerged as a legitimate subject of scientific inquiry that has important ramifications for education, personal, medical, and organizational decision-making, personnel selection and assessment, team dynamics, training, and organizational development.⁹¹ Another comprehensive review of the intuition literature defined intuition as “affectively charged judgments that arise through rapid, non-conscious, and holistic associations.”⁹⁴ Damasio also suggests that the outcomes of intuition can be experienced as a holistic “hunch” or “gut feel,” a sense of calling or overpowering certainty, and an awareness of a knowledge that is on the threshold of conscious perception^{101,118} Several authors have contended that intuition is an innate ability that all humans possess in one form or another and is arguably the most universal natural ability we possess. They also suggest that the capability to intuit could be regarded as an inherited unlearned gift.^{119,121} A common element also found in most discussions and definitions of intuition is that of affect or emotions.

Intuitions are felt, although they can be accompanied by cognitive content and perception of information. Emotions are the language of intuition and intuition offers a largely untapped resource to manage and uplift our emotions and consciousness. As pervasive and vital as they are in human growth and experience, emotions, and effective ways to self-regulate them, have long remained an enigma to science. Many common emotion regulation strategies operate on the assumption that all emotions follow thought and thus, by changing one’s thoughts, one should be able to gain control over one’s emotions. However, in the last decade, research in neuroscience has made it quite clear that intuition and emotional processes operate at a much higher speed than cognitive processes.¹²² In many cases, emotions occur independently of the cognitive system and can significantly bias or color the cognitive process and its output or decision.^{133,134}

Recent scientific understandings help clarify the role of the heart in emotional experience and effective approaches to self-regulation that involve shifting the rhythms of the heart, thereby allowing us to facilitate cognitive functioning and intuitive capacities. The question of how intuition, as an aspect of automatic functioning, is related to deliberate, conscious thought processes has long been the subject of debate. Research in the fields of cognitive and social psychology has resulted in the fairly well accepted dual-process theory, which posits that there is an intricate interaction between automatic unconscious processes and slower, conscious processes.¹³⁵ While it has been defined in a variety of ways, there is a good bit of consensus that at a basic level, the conscious state, or individual consciousness, can be understood as the awareness of one’s self and of one’s environment and the corresponding capacity for self-directed action which is informed by input provided through implicit and automatic processes.¹³⁶

The Intuitive Heart

Given the central role of the heart in creating coherence and positive emotions, it is not surprising that one of the strongest common threads uniting the views of diverse cultures and religious and spiritual traditions throughout human history has been the universal regard for the human heart as the source of love, wisdom, intuition, and positive emotions. Everyone is familiar with such expressions as “put your heart into it,” “learn it by heart,” “speak from your heart,” and “sing with all your heart”—all of which suggest that the heart is more than just a physical pump that sustains life. What such expressions reflect is something that might be called the “intuitive heart” or “spiritual heart.” The intuitive heart is what people have associated with their “inner voice” throughout history. Each year, more and more people are including the practice of “listening” to their hearts for inner guidance or to what some refer to as their “higher power”—a source of wisdom and intelligence. In research conducted in our laboratory, we found that coherence is of prime importance in connecting us with our intuitive inner guidance.^{63,64}

There is compelling evidence to suggest that the heart’s energy field (energetic heart) is coupled to a field of information that is not bound by the classic limits of time and space. This evidence comes from a rigorous experimental study that investigated the proposition that the body receives and processes information about a future event before the event actually happens.^{63,64} The study’s results provide surprising data showing that both the heart and brain receive and respond to pre-stimulus information about a future event. Even more tantalizing are indications that the heart receives intuitive information before the brain does and that the heart sends a different pattern of afferent signals to the brain, which modulates the frontal cortex. In addition, when study participants were in a positive emotion-driven coherent state prior to the experimental protocols, they were significantly more attuned to the information from the heart.⁶⁴ This suggests that the heart is directly coupled to a subtle energetic field of information that is entangled in and interacts with the multiplicity of energetic fields in which the body is embedded—including that of the quantum vacuum.

What is meant by terms such as the intuitive

heart or heart intelligence is that the energetic heart is coupled to a deeper part of oneself. Many call this their “higher power” inner guidance system, or their “higher capacities.” This is what the physicist David Bohm calls our implicate order and undivided wholeness.¹ When we are heart-centered and coherent, we have a tighter coupling and closer alignment with our deeper source of intuitive intelligence.⁶⁴ There is an increased flow of intuitive information that is communicated via the emotional energetic system to the mind and brain systems, resulting in a stronger connection with our “inner voice.” From this perspective, the practice of heart coherence offers increased ratios of access to the largely untapped potential for bringing our mental and emotional faculties into greater balance and self-directed control. Practicing shifting to a more coherent state increases intuitive awareness and leads to shifts in perception and worldviews from which better informed and more intelligent decisions can be made. This, in turn, has profound health and wellness benefits but can also help people more successfully make business decisions. In a study of repeat entrepreneurs, using electrophysiological measures of intuitive perception, shifts in autonomic system (HRV) activity which were predictive of the future outcome occurred 6 to 7 seconds before the actual outcome of the investment choice was known.⁶⁵

Establishing a New Baseline

Shifting a system into a more coherent mode requires effort and energy. The inertia of our well-established “baseline” modes creates resistance to change. However, there is also evidence that the ongoing practice of coherence-building techniques facilitates a repatterning of the neural architecture to establish coherence as a new, stable baseline. Self-regulation of emotions and stress responses then becomes increasingly familiar and, eventually, automatic.^{12,18,66} This makes it easier for individuals to maintain their “center,” which increases their mental and emotional flexibility and capacity to remain in charge of themselves, which is the essence of resilience. Such flexibility and resilience can dramatically reduce stress-related energy drains during day-to-day activities

and interactions, even in the midst of more stressful or challenging situations. The occurrence of such a repatterning process is supported by electrophysiological evidence demonstrating a greater frequency of spontaneous (without conscious practice) periods of heart rhythm coherence in individuals who have practiced coherence-building techniques.⁶⁷ In the HeartMath (HM) certification program for health-care professionals, one of the primary goals is helping patients establish a new physiological and psychological baseline of self-regulation and coherence. Without this baseline shift, it is extremely difficult, if not impossible, to achieve sustained behavioral change or, in patients with hypertension, reductions in blood pressure.

Increasing Coherence

Within each individual, the level of stress and degree of global and heart coherence fluctuate from day to day, as does the quality of thoughts and emotions.¹³ In varied ways, we all strive to increase ease and flow in our lives and decrease the chaos within and around us. Many are intuitively aware of the interconnections between our thoughts, emotions, and physical processes and make conscious efforts to increase personal, social, and global balance and coherence through such activities as prayer, meditation, and focused intentions. However, a good portion of people's meditation or prayer time is often spent trying to calm down, get focused, and quiet the mind, leaving little time and energy for reflective insight.

The accelerating pace of change, stress, and social incoherence in much of the world makes it difficult for many to maintain personal health, stay focused, and carry out their positive intentions. Effectively dealing with stress and establishing a new base-line involves learning to recognize and consciously shift the ongoing emotional undercurrents (judgment, negative projection, insecurity, worry) that create incoherence and waste energy and learning to increasingly replace these feelings with more positive, regenerative attitudes and perceptions. A series of tools and techniques, collectively known as the HM System, were developed by Doc Childre and his associates at the Institute of HeartMath to provide a systematic process that enables people to shift into the coherent state and increase their resilience and ability to better self-regulate stress and improve

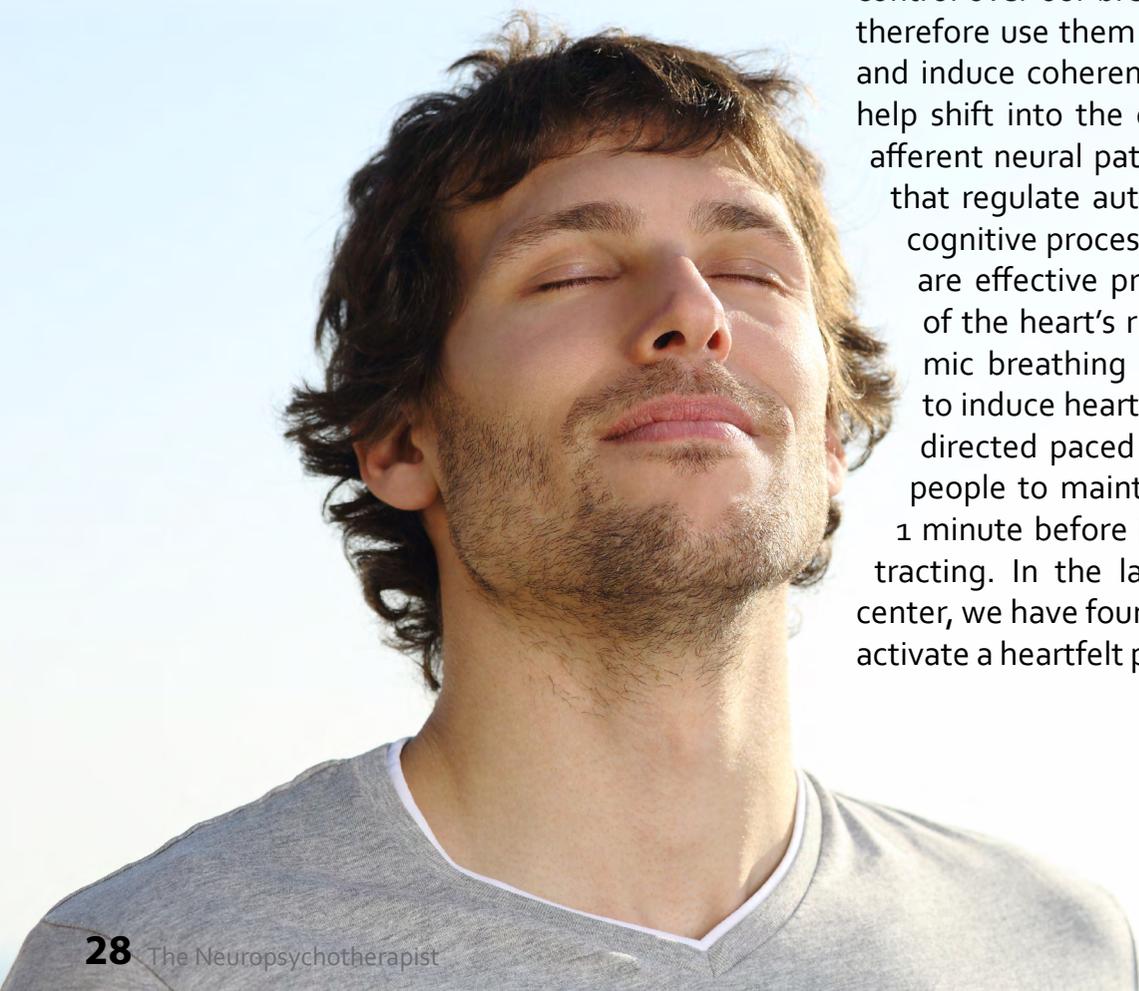


performance.⁶⁸⁻⁷⁰ Many of these techniques include the intentional generation of a heartfelt positive emotional state combined with a shift in attentional focus to the area of the heart (where many people subjectively experience positive emotions). This shift in feeling allows the coherence mode to emerge naturally and helps to reinforce the inherent associations between physiological coherence and positive feelings.

We have found self-regulation of emotional experience and increasing the ratio of positive to negative emotions to be a very effective approach to reducing stress and increasing coherence and resilience. The association between positive states and coherence was also illustrated in a study of Buddhist monks. While meditating on generating compassionate love, the monks tended to exhibit increased coherence. Another study found that more advanced Zen monks tended to have highly coherent heart rhythms in their resting state, while the novices did not.⁴⁷ This does not imply, however, that all meditation or relaxation approaches lead to coherence; as we and others have observed, approaches that focus attention to the mind in general do not induce coherence unless the state is driven by a focus on breathing at a 10-second rhythm. One study

found that a coherent rhythm could be induced by rhythmically reciting rosary or bead prayers and yoga mantras but not by random verbalization or breathing. This study also found that passively listening to music in which the tempo of the rhythm (rather than the style) was the main determinant inducing the coherent state. The authors of the study ascribed the mechanisms of these findings to the participants changing their breathing patterns to a rhythm of six cycles per minute. They concluded that the rhythm of mantras and rosary prayers were intentionally created to induce breathing patterns that induce coherent heart rhythms by people who had an intuitive understanding of the benefits of this inner rhythm.⁷¹ Although respiration can clearly be used to increase coherence at the physiological level,⁷² but given our findings that emotional shifts also lead to increased coherence independent of conscious shifts in breathing,^{13,22} it is also likely that prayers and mantras can induce coherence in ways beyond that of the breathing associated with their recital. It has also been shown that tensing the large muscles in the legs in a rhythmical manner at a 10-second rhythm can induce a coherent rhythm.⁷³

Paced breathing at a 10-second rhythm (0.1Hz) is a common approach to inducing a physiologically coherence state.⁷² This is because we have conscious control over our breathing rate and depth and can therefore use them to modulate the heart rhythm and induce coherence. When we use breathing to help shift into the coherent state, it changes the afferent neural patterns sent to the brain centers that regulate autonomic outflow, emotion, and cognitive processes.¹² Thus, breathing exercises are effective primarily due to the modulation of the heart's rhythmic patterns. While rhythmic breathing methods are an effective way to induce heart rhythm coherence, cognitively directed paced breathing is difficult for many people to maintain. Most can do so for about 1 minute before it becomes uncomfortably distracting. In the laboratory at the HM research center, we have found that when people are able to activate a heartfelt positive emotion rather than fo-



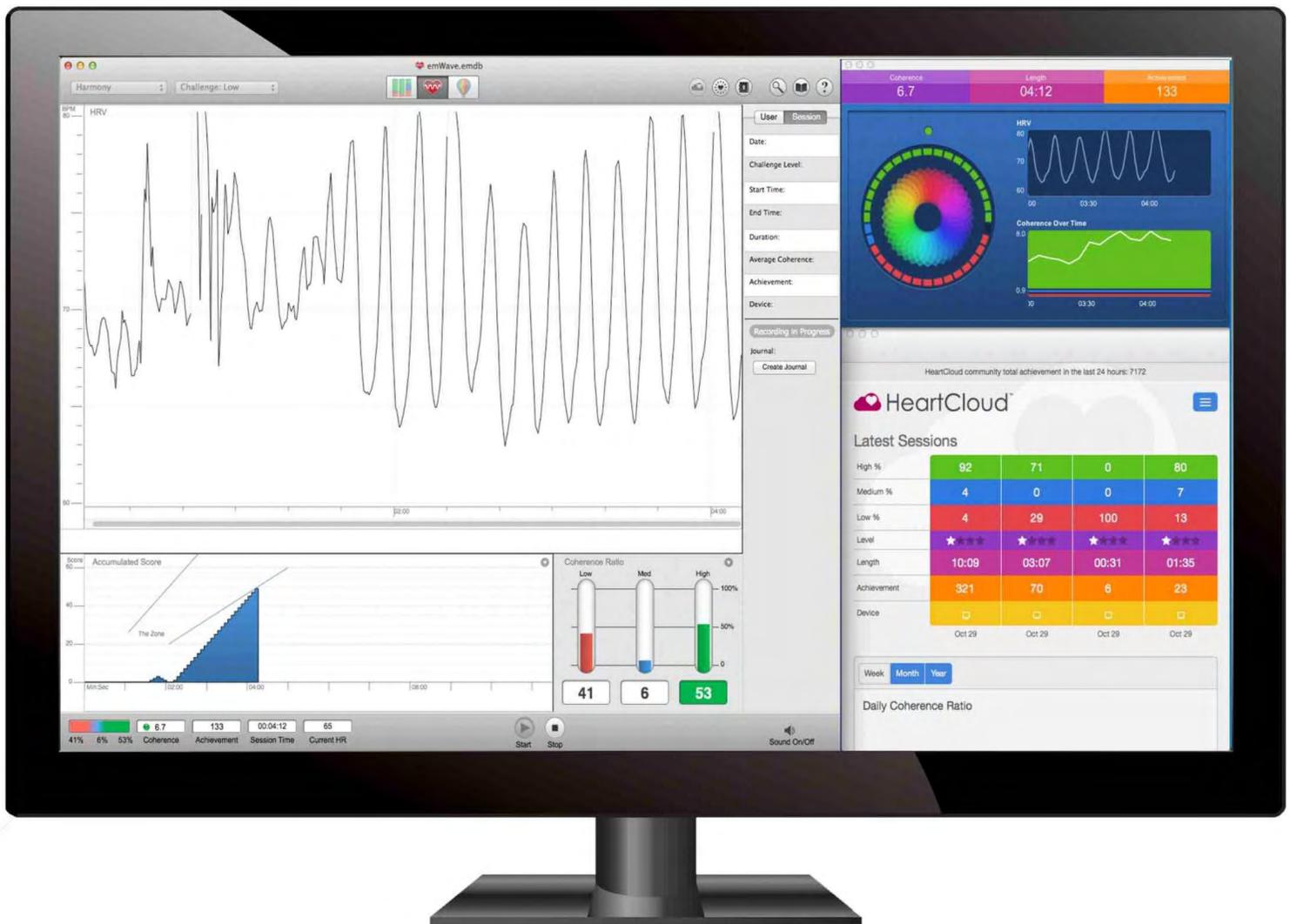
ocusing on a specific breathing rhythm, they typically enjoy the experience more and are able to maintain coherence for extended periods. However, some individuals, especially those who are first learning the self-regulation techniques, cannot make the shift into coherence by activation of a positive emotion alone. In these instances, paced breathing is an effective way to facilitate the shift, and for this reason, the HM techniques include a heart-focused breathing component combined with the activation of a positive feeling.

HRV Coherence Feedback Learning self-regulation skills can be facilitated with the use of heart rhythm coherence feedback monitors. A number of HRV coherence training systems are available and have become increasingly used in many health care, law enforcement, corporate, military, and educational settings. Most of the systems use a pulse sensor as a non-invasive measurement of the beat-to-beat heart rate. Two systems—the emWave Desktop available from HM and a system from Wild

Divine (San Diego, California)—display the heart rhythm in real time and record the level of heart rhythm coherence achieved. HM also offers a portable handheld device for home and mobile uses. HRV coherence or resonance feedback has been shown to significantly improve outcomes in a number of clinical populations with posttraumatic stress disorder (PTSD),^{74,75} depression,^{76,77} asthma,^{43,47,78,79} congestive heart failure,^{80,81} hypertension,⁶⁶ anxiety, fibromyalgia,⁸² and insomnia.⁸³

Coherence and Cognitive Performance: The Heart Rhythm Coherence Hypothesis

Over the years, we have received numerous reports that coherence training has improved performance in a wide range of cognitive capacities, both short- and long-term. These include tasks requiring eye-hand coordination, speed, and accuracy, and coordination in various sports as well as cognitive tasks involving executive functions associated with the frontal cortex, such as maintaining focus and



EmWave Pro by Hearmath

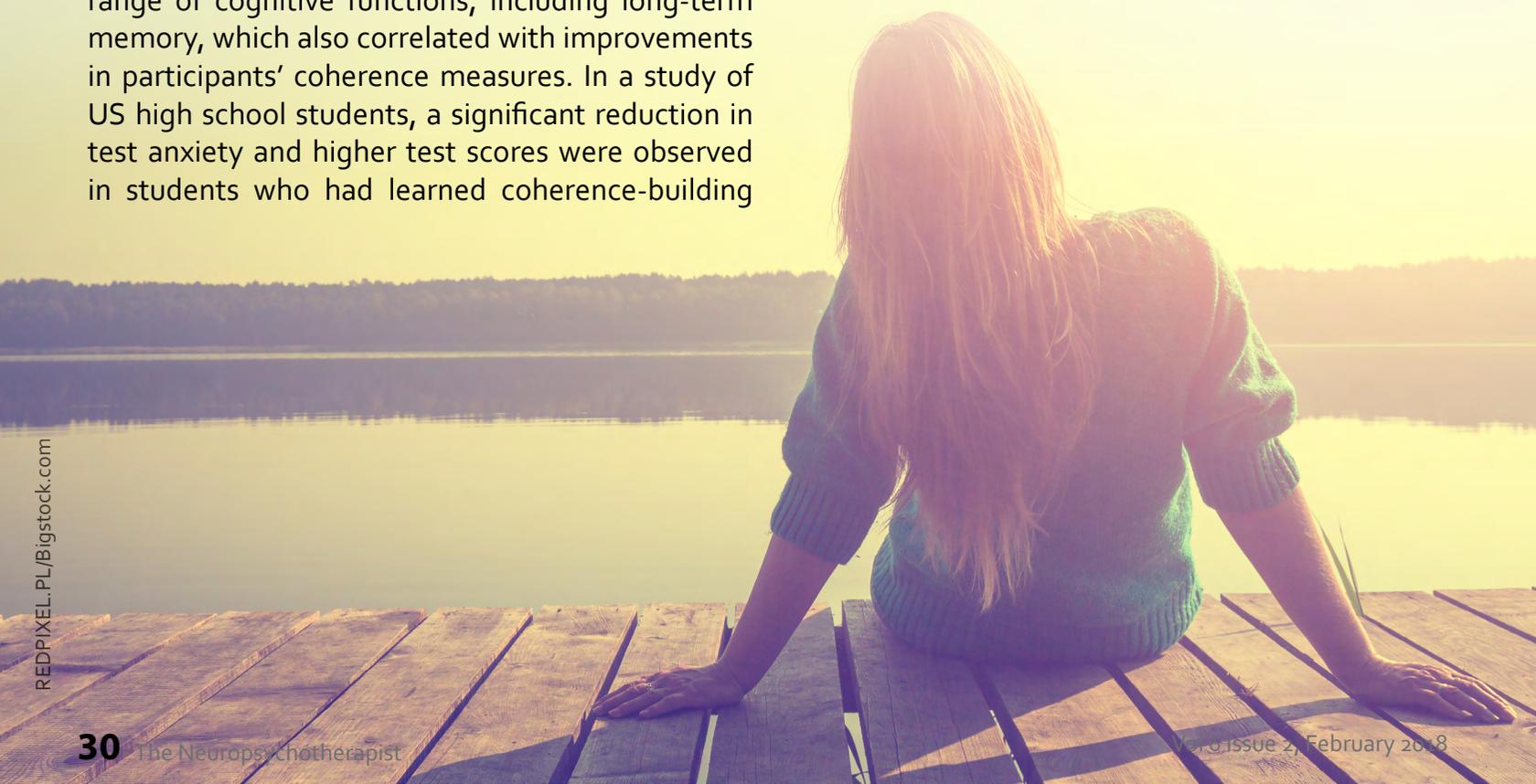
concentration, problem solving, self-regulation, and abstract thinking.

Some of the most seminal work on heart-brain interactions was conducted by John and Beatrice Lacey, who were the first to postulate a causal role of the cardiovascular system in modulating perceptual and sensory-motor performance.⁸⁴⁻⁸⁶ They suggested that the cardiovascular system modulates cortical functions via afferent input from the baroreceptors in the heart, aortic arch, and carotid arteries.^{84,87} The primary focus of their research was on the activity occurring within a single cardiac cycle, and although they were able to confirm that the heart's activity modulated cognitive performance, later studies produced inconsistent results. The inconsistency was resolved by Wölk and Velden at the University of Osnabrück in Germany, who showed that cognitive performance actually fluctuated across the entire cardiac cycle at a rhythm around 10 Hz. They updated the hypothesis by showing that the influence on cortical function was mediated via a synchronizing effect on the neurons in the thalamus, which in turn synchronizes global cortical activity. They also found that it is the pattern and stability (the rhythm) of the afferent input within the cardiac cycle, rather than the number of neural bursts, that are important.⁵⁵

A study conducted in the United Kingdom found that regular practice of the coherence-shifting techniques to self-regulate stress enhanced a broad range of cognitive functions, including long-term memory, which also correlated with improvements in participants' coherence measures. In a study of US high school students, a significant reduction in test anxiety and higher test scores were observed in students who had learned coherence-building

techniques.⁶⁷ In a UK study that directly assessed cognitive performance, there was a wide range of significant improvements in middle school students with clinically diagnosed attention-deficit hyperactivity disorder.⁹³ In another conducted at the Veterans Affairs facility in Columbia, South Carolina, with soldiers who had recently returned from Iraq and were diagnosed with PTSD, a relatively short period of coherence biofeedback training resulted in significant improvements in cognitive functions, especially in the ability to self-regulate and inhibit negative responses, which again correlated with coherence measures.⁹² It seems clear that the coherence mode promotes a calm, emotionally balanced yet alert and responsive state that is conducive to cognitive and task performance, including problem solving, decision making, and activities requiring perceptual acuity, attentional focus, coordination, and discrimination.

Health and Wellness Benefits of Coherence Interventions utilizing the HM self-regulation techniques and HRV coherence feedback technology to reduce stress have significantly improved key markers of health and wellness, including immune function,^{95,96} ANS function and balance,^{13,22} and significant reductions in stress hormones.⁹⁷ A study of California correctional officers with high workplace stress found reductions in total cholesterol, glucose, and both



An Issue of the Heart

The Neuropsychotherapist Special Issue

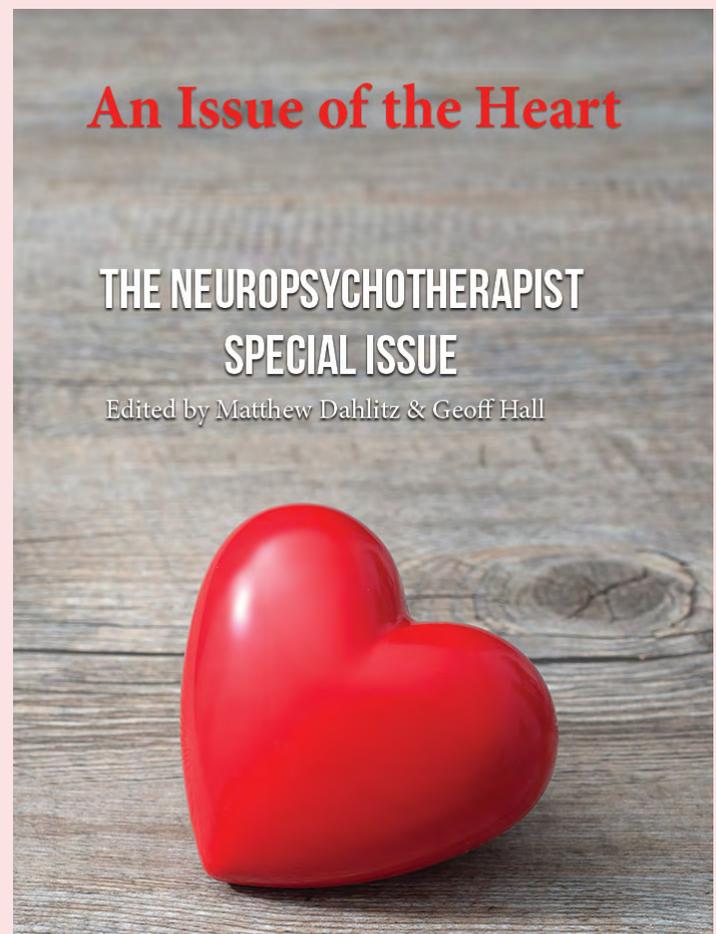
Edited by Matthew Dahlitz & Geoff Hall

A WONDER OF COMPLEXITY IS THE HUMAN BEING—something that continues to be a source of fascination and frustration for those of us who have set ourselves to understand human behaviour. This special issue focuses on the heart, an organ with a profound influence over our mental lives. We are all familiar with the heart in its classical biological role as pump circulating vital oxygenated blood through the body. But how many are versed in its neural and bioelectromagnetic influence upon our brains? Research has revealed the heart even radiates an influence on those around us via electromagnetic fields. In the past such claims might have been dismissed as mere New Age fancy, but with ever more sophisticated and sensitive instruments, formal studies in recent years have demonstrated that our bodies have amazing multidimensional fields of awareness and influence.

These findings about the heart continue to add weight to the argument that in the counselling room it is the therapist's unconditional positive regard, warmth, and personal coherence more than any technique that make for effective therapy. It makes one wonder what the focus of training should be for new therapists—will courses become more focused on students developing personal coherence, practising attitudes of genuine care and compassion, and understanding what they are radiating to clients from their hearts?

Neuropsychotherapy, and the multidisciplinary integration that it stands for, is part of an important paradigm shift in medicine. Likewise, the focus on matters heart–brain in this issue reflects an important shift of understanding in the broader field of health. The study of any one bodily system—even the central nervous system in the case of psychologists—leaves us in the dark on many levels for many phenomena. It is my hope that you will come to appreciate the wonderful, so often implicit influence the heart has on our emotions and relationships, and that we will become more conscious of being authentic and coherent—for our clients and also for ourselves.

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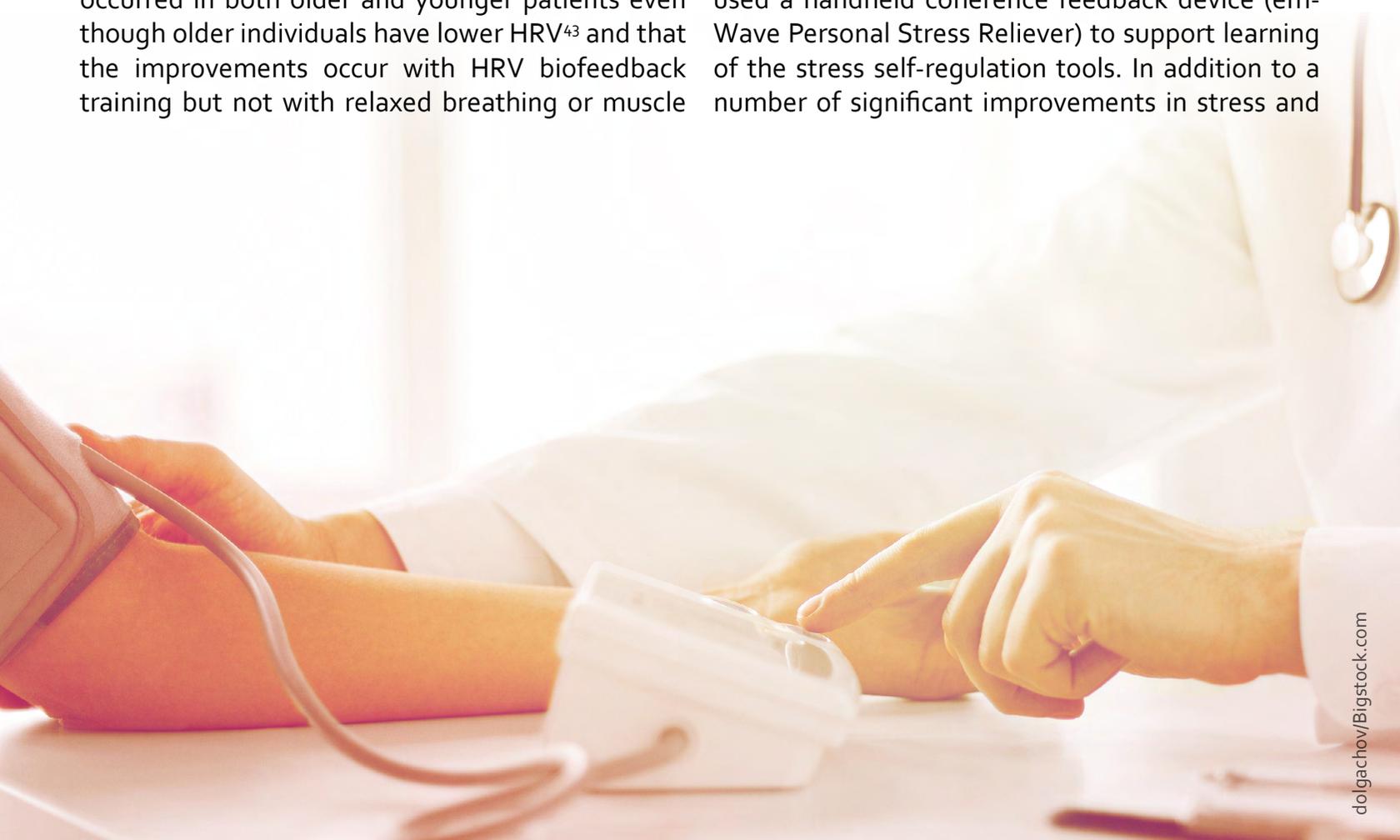


systolic and diastolic blood pressure (BP), as well as significant reductions in overall stress, anger, fatigue, and hostility resulting in projected savings in annual health care costs of \$1179 per employee.⁹⁸ Another workplace study of employees with a clinical diagnosis of hypertension showed significant reductions in BP and a wide range of stress measures.⁶⁶ A study conducted at Stanford University of patients with congestive heart failure showed significantly improved functional capacity and reduced depression,⁸¹ and a study of diabetes patients found improved overall quality of life and glycemic regulation, which correlated with use of the self-regulation techniques.⁹⁹

Psychophysiological Paul Lehrer, PhD, has shown that HRV feedback to facilitate a state of physiological coherence (which he calls “resonance”) resulted in lasting increases in baroreflex gain, independent of respiratory and cardiovascular changes.⁴⁷ In a large controlled study in patients with asthma, those using the HRV resonance training had improved lung function, decreased symptoms, and no asthma exacerbations and were able to reduce steroid medications.⁷⁹ In other studies, Lehrer demonstrated that the pulmonary function improvements occurred in both older and younger patients even though older individuals have lower HRV⁴³ and that the improvements occur with HRV biofeedback training but not with relaxed breathing or muscle

tension relaxation.¹⁰⁰

A number of significant outcomes were found in two recent workplace pilot studies of utility line workers and employees of an online travel company. These studies focused on reducing stress and metabolic syndrome risk factors with the HM self-regulation techniques combined with HRV coherence feedback. In both studies, there were significant reductions in organizational stress (life pressures, relational tensions, work-related stress); emotional stress (anxiety, depression, anger); and stress symptoms (fatigue, sleep headaches, etc) and significant increases in emotional vitality (emotional vitality, contentment, etc). In both studies, there were also reductions in the number of participants who were classified as having metabolic syndrome. In the utility company cohort, total cholesterol and low-density lipoprotein cholesterol were significantly reduced, and the travel company cohort had significant reductions in both systolic and diastolic BP and triglycerides (manuscript in preparation). In a study undertaken with pastors from the Reformed Church of America who were spread across the United States, a certified health coach taught the HM techniques in six phone sessions. Participants also used a handheld coherence feedback device (emWave Personal Stress Reliever) to support learning of the stress self-regulation tools. In addition to a number of significant improvements in stress and



well-being measures, an independent analysis of data revealed that the HM group showed an overall decrease in health care costs of 3.8% (resulting in an annual cost savings of \$585 per participant), while the control group had a 9% increase in health care costs. The largest reduction in costs was related to improvements in hypertension.¹⁰² In terms of healthier psychological and emotional functioning, significant reductions in stress, depression, anxiety, anger, hostility, burnout, and fatigue and increases in caring, contentment, gratitude, peacefulness, resilience, and vitality have been measured across diverse populations.^{81,103-107} Most people report that when they are in the coherent state, they experience a sense of connectedness with their heart intuition, greater clarity on troublesome issues, a reduction in inner “mental noise” associated with stress, and a deeper sense of well-being.

Coherence at the Social and Global Levels

Social coherence relates to pairs, family units, groups, or larger organizations in which a network of relationships exists among individuals who share common interests and objectives. Group coherence involves the same principles of global coherence described earlier in this article, but in this context it refers to the synchronized and harmonious order in the relationships between and among the individuals rather than the systems within the body. The principles, however, remain the same; in a coherent team, there is freedom for the individual members to do their part and thrive while maintaining cohesion and resonance within the group’s intent and goals. Conversely, when relations are discordant and social organization is incoherent, not only is optimal action not possible but psychosocial dysfunction and instabil-

ity are likely consequences.³¹ There are, of course, cycles and variations in the quality of family, team, or group coherence similar to variations in an individual’s coherence level, but coherence requires that group members are attuned and emotionally aligned so that the group’s energy is globally organized and regulated by the group as a whole.¹⁰⁸ Just as individual incoherence leads to pathologies within the individual, group incoherence leads to social pathologies—violence, abuse, terrorism, etc. There is a feedback loop between the individuals in any group and the group’s level of coherence. When individuals are not well self-regulated or are acting in only their own best interests without regard to others, it generates social incoherence. Stressful or discordant conditions in a given group act to increase emotional stress among its members. Unfortunately, social incoherence is characterized by a lack of unity, common purpose, peace, and harmony in or among families, neighbors, or employees in workplace environments.⁴⁹ Consequently, the need for mental and emotional self-management and high-quality social coherence is greater now than ever.



Basic Social Coherence

One of the main sources of stress and incoherence stems from communication problems with co-workers, family members, or teammates. When individuals maintain relationships over extended periods, a “surface level” of cooperation and harmony usually develops wherein people are basically civil and cooperative. This can be considered the basic functional level of coherence necessary for a group to endure and accomplish goals; however, in most groups, many of the individuals have anxieties, judgments, frustrations, and pre-conceptions of each other or other teams that remain unspoken and beneath the surface. These unsaid feelings are unconsciously communicated and create energetic separations or “closed hearts” and result in miscommunication and other relational problems. It has also become apparent that social incoherence not only influences the way we feel, relate, and communicate with one another, it also impacts physiological processes that directly affect health. Numerous studies have found that people undergoing social and cultural changes or living in situations characterized by social dis-organization, instability, isolation, or disconnectedness are at increased risk for acquiring many types of disease.¹⁰⁹⁻¹¹³ James Lynch, PhD, provides a sobering statistic on the impact of social isolation on individuals showing that loneli-

ness produces a greater risk for heart disease than smoking, obesity, lack of exercise, and excessive alcohol consumption combined.¹¹⁴ Numerous studies of diverse populations, cultures, age groups, and social strata have shown that individuals who are involved in close and meaningful relationships have significantly reduced mortality, reduced susceptibility to infectious and chronic disease, increased mortality, improved recovery from post-myocardial infarction, and improved outcomes in pregnancy and childbirth.¹¹⁵⁻¹¹⁷

There are times when an external event such as a natural disaster brings groups, neighborhoods, and communities to an increased level of cooperation care and compassion. Events such as these tend to open people’s hearts, bring people together, and lead them to give to and sacrifice for others. After experiencing such an event, people often are amazed at what they were able to accomplish and the lasting friendships and bonds that they forged. However, as time passes and normalcy returns. The community spirit that was ignited by a dramatic event fades as people revert to their familiar, comfortable operational baselines. But, organizations, teams, and communities hoping to increase cooperation and harmony do not have to wait for disaster to strike. Increasing numbers of hospitals, corporations, military units, schools, and athletic

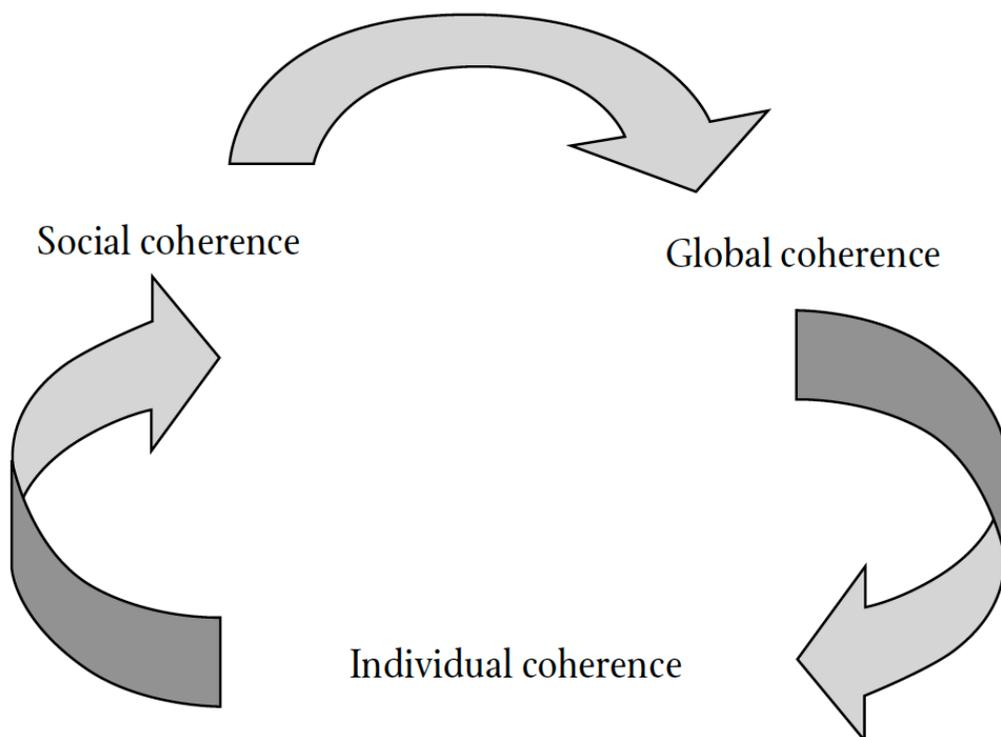


FIGURE 5

Increasing individual coherence leads to increasing social coherence, which in turn leads to increased global coherence in an iterative process. As individual and social coherence increase, there are numerous personal benefits in terms of improved health, well-being, and a broadened field of perception and numerous social benefits including improved communication and relationships. There are social coherence benefits to organizations hoping to improve actualization of their mission and impact.

teams are actively working toward increasing their group coherence. Such collective coherence is built by working first at the individual level. As individuals become more capable of self-management and establishing heart coherence, the group increases its collective coherence and can achieve its objectives more effectively (Figure 5).

The benefits of increasing coherence in education are evident from several studies. For example, a large multi-methods study involving 10th-grade students in two large California high schools found that a self-regulation skills and coherence training curriculum taught by teachers significantly reduced test anxiety and negative affect, emotional discord, and interactional difficulty while also significantly increasing positive class experience and elevating English and math test scores.¹²⁰ Students in this study were more aware of others' feelings and better able to avoid arguments and fights. The study also included a subsample of 140 students who were part of an electrophysiology study where their HRV was assessed. The results showed improvements across all HRV measures, indicating that the intervention group had learned how to better manage their emotions and to self-activate the coherence state under stressful conditions; in addition, these students had shifted their baseline, increasing HRV and HRV coherence even without conscious use of the self-regulation tools.⁶⁷

Global Coherence

This article began with the statement that the universe is enduringly coherent and interconnected and that every "whole" is a part of a greater whole. The article discussed the critical importance of coherent communication and order across levels of scale and time for healthy function—in fact, for the preconditions of life itself. Humans are embedded within social networks that exist on the earth, which is part of the solar system. Therefore, it should not be surprising that human physiological rhythms and global behaviors are synchronized with solar and geomagnetic activity.^{123,124} Historically, cultures such as the Egyptian, Hopi, ancient Indian, and ancient Chinese believed that the sun could influence their collective behavior. The first scientific evidence of this belief was provided by Alexander Tchijevsky, a Russian scientist who noticed that in World War I, more severe battles occurred during peak sunspot periods. He conducted a thorough study of global human history and constructed an Index of Mass Human Excitability dating back to 1749, which he then compared to the solar cycles over this time period (Figure 6).¹²⁵ Since his pioneering work, energetic influxes from solar and geomagnetic fields have been associated with numerous aspects of human health and wellness, both positive and negative.¹²⁴⁻¹²⁷ The scientific community and the media tend to focus on negative correlations, such as societal conflicts, crime, terrorism, traffic accidents,



mortality from heart attacks and strokes, etc. However, the greatest levels of human flourishing also occur during these cycles.¹²⁸

The Global Coherence Initiative (GCI www.glcoherence.org)¹³² is a science-based organization focused on examining the interactions between humans and the earth's energetic fields.¹²⁹ One of the project's hypotheses is that the earth's magnetic and geomagnetic fields created in the ionosphere in turn create bidirectional feed-forward and feedback loops with the collective emotional energy of humanity. More and more people are realizing that solar and universal energetic influxes are part of a natural cycle with potential benefits to humanity. Yet people have a responsibility for their own energy and how it can be used to create deeper connections and more caring interactions with others and with the earth itself, including all living entities.

There is substantial evidence of a global field effect when large numbers of people have similar emotional responses to events or organized global peace meditations. Research conducted by the Global Consciousness Project, which maintains a worldwide network of random number generators, has found that human emotionality affects the randomness of these electronic devices in a globally correlated manner.¹³⁰ One of the goals of GCI is to test the hypothesis that large numbers of people intentionally generating positive emotions from a heart-coherent state can modulate the earth's energetic and geomagnetic fields.¹³¹ If, as some contend, all living systems are indeed interconnected and communicate with each other via biological and electromagnetic fields, it stands to reason that humans can work together in a co-creative relationship to consciously increase

global coherence. This can only occur when enough individuals and social groups increase their coherence baseline and utilize that increased coherence in innovative problem solving and intuitive discernment for addressing social, environmental, and economic problems. In time, global coherence will be indicated by countries adopting a more coherent planetary view. At this level of scale, social and economic oppression, warfare, cultural intolerance, crime, and disregard for the environment can be addressed meaningfully and successfully.

Conclusion

Most people know what it feels like to be in harmonious state, the place where our hearts, minds, and bodies are united in a feeling of wholeness. We

speak of this variously as "the zone," "flow," "oneness," etc. When we are in this state, we feel connected not only to our deepest selves but to others—past, present, and future—and to all living plants and creatures and even to the cosmos itself. We call this state of internal and external connectedness "coherence." Increased personal coherence can be achieved as people learn to more consistently self-regulate their emotions from an intuitive, intelligent, and balanced inner reference.

When more individuals in families, workplaces, and communities increase and stabilize their coherence baselines, it can lead to increased social and global coherence, which is further stabilized through self-reinforcing feedback loops. Being responsible for and increasing our coherence baseline is not only reflected in our personal health and happiness but also in the global field environment, which helps strengthen a mutually beneficial feedback loop between human beings and the earth itself.



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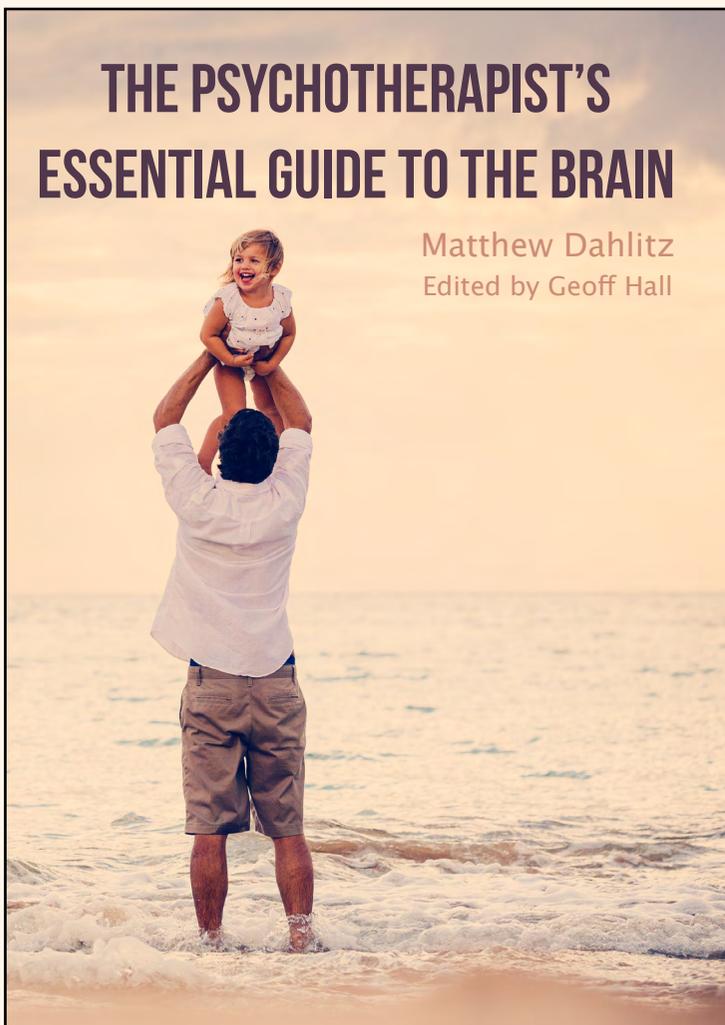
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THE PSYCHOTHERAPIST'S ESSENTIAL GUIDE TO THE BRAIN

The Psychotherapist's Essential Guide to the Brain is a 147-page, full-colour illustrated guide for psychotherapists describing the most relevant brain science for today's mental health professionals. Taken from the best of the series published in *The Neuropsychotherapist*, and completely revised, this book represents an easy to read guide for anyone working in the mental health arena.

"This book presents a thorough and clear introduction to the neuroscience that's essential to today's psychotherapist. Matt Dahlitz has done so much with The Neuropsychotherapist journal and this book takes a next step. It is an excellent resource. It truly is exactly what it says on the cover and provides engaging discussion on the pathology of oft-encountered disorders and their brain basis together with insights into how awareness of the neuroscience underpinning effective therapy can guide a therapist."

– Amazon UK Reviewer



"Beautifully illustrated and filled with cutting-edge understanding of the interface of brain, body, mind, mental illness and psychotherapy, I can highly recommend this book."

I feel I am pretty well-versed in neurobiology and yet this book had much to teach me, from the "default mode" in the brain to the complexities of approach and avoidance and the circuits at play in depression and OCD, I feel I have deepened my understandings of the neurological underpinnings of mental illness and how to engage these in psychotherapy. For the most part this book still remains the kind of reading that only "brain geeks" can truly love. That being said, brain amateurs who strive to become brain geeks will find the beautiful illustrations and clear explanations very useful guides on their path.

Dr. Michael Ocana, MD
Child and Adolescent Psychiatrist

Available from Amazon.com - [Read the preface here](#)

Neuroscience in Court: Your Behavior on Trial

By Suzanne Podolski



My autistic adult daughter stole from the gym we belong to. She went to the drinks cabinet, opened the door, and took a bottle of water on her way to the locker room. Is she guilty of stealing? Yes, physically she stole. However, law is about behavior and the state of mind when committing a crime. In the United States, before someone can be found guilty of a criminal offence, the prosecution must prove that the defendant's actions when committing the crime were voluntary or purposeful. Further, they must prove that the mental state of the defendant was clear and show that they had intent or knew the act was wrong yet purposely committed the crime. In my daughter's case, while it was her intent to get a drink, she didn't understand what stealing was then, nor do I believe she has the concept now. She didn't want to harm the gym by taking a \$1 bottle of water; she was thirsty. She knows we "buy" things in stores, and this was a new gym which she understood we had paid a membership for. She was with me when we signed up and scans her card every time we go. If I were to guess, she probably saw the cabinet as a big refrigerator for the members. What would happen if she was to have faced charges? She is severely autistic, so I would hope a prosecutor would see there was no intent. What about others with mental defects? This is where neuroscience is increasingly making its way into the courtroom, and not just for criminal cases.



Neuroscience and Expert Testimony

According to a recent article in *The Atlantic*, cases where neuroscience was used in the courts almost doubled between 2005 and 2012 (Miller, 2016), and the outcomes for defendants who relied on neuroscientific evidence were in general more favorable. Clearly, there is a growing need for neurotherapists as expert witnesses. The practice of neuropsychology focuses on the function of the brain as it relates to behavior and cognition, and expert witnesses are thus relied on to convey the limitations and interpretations of neuroscientific findings so that all parties (judges and jurors) can make appropriately informed decisions.

The application of neuroscientific data within the law is complex, however. The timing of neurological tests in relation to the crime can be an important factor. Knowing what section of the brain relates to what type of behavior is also an issue. The occipital lobe, for example, is associated with vision, but the relationship of brain structure and mental processes

is not so straightforward. If the majority of neuroscientific evidence is based on statistics and probabilities, proving how it relates to an individual in court is especially challenging. In the United Kingdom, the Royal Statistical Society has published a guide for neuroscience practitioners (see Aitken, Roberts, & Jackson, 2010) covering a range of topics relevant to court proceedings—such as the use of evidence (e.g., What is the question that the evidence purports to be addressing?) and reporting (e.g., Does the expert's report misleadingly stray into areas of guilt or innocence that should be left to the Court?).

The way that defense lawyers use neuroscience to mitigate or excuse criminal behavior is discussed by Kevin Davis in a recent article in *ABA Journal* (Davis, 2012) in relation to the events that led to the conviction of Christopher Tiegreen, a disabled man. Tiegreen was 16 years old when he suffered a head injury in a car accident. He had a damaged frontal lobe and sheared brain stem. After coming out of a coma, he became violent. He spent many years in various homes. One day, when he was 23,



he escaped from a home and attacked a woman and her infant child. His defense argued he was incompetent to stand trial. The state disagreed, and Tiegreen was required to stand trial. On appeal, the defense argued that the state's expert only administered the MacArthur Competence Assessment Tool (MacCAT) and did not administer the Fitness Interview Test—Revised (FIT-R), which his own expert had used. The court relied on the expert's testimony that the MacCAT was the gold standard and concluded that the state did not have to perform the FIT-R. The expert witness also commented that an individual with an IQ of 72 is not automatically incompetent to stand trial. Tiegreen's IQ was 72. Clearly, in this instance, the expert testimony did not help his case, and it was left up to the court ultimately to decide if Tiegreen was competent. He was eventually sentenced to 30 years in a state-run mental facility. (See <https://law.justia.com/cases/georgia/court-of-appeals/2012/a11a1818.html> for an account of Tiegreen's appeal.)

Some believe that neuroscience has no place in

the courtroom. Stephen J. Morse, Professor of Psychology and Law in Psychiatry, and associate director of the Center for Neuroscience and Society at the University of Pennsylvania, has argued that brains don't commit crimes—people do. He suggests that neuroscientific research and imaging techniques don't dictate competence and argues that neuroscience has added virtually nothing relevant to criminal law (Koebler, 2012). I disagree.

Neuroscientific Evidence Mitigates Sentencing

Duke University researcher, Nita Farahany, observed that neuroscience is primarily being used in the courtroom to mitigate punishment, and that defendants with a history of brain injury and trauma claim they have less control over their actions (Koebler, 2012). Hank Greely, director of the Center for Law and the Biosciences at Stanford, further noted that many such cases are appeals where defendants argue they had poor counsel after being convict-



ed—specifically, that they were disadvantaged for not getting a brain scan (Koebler, 2012). But does that argument work?

The case of David Scott Detrich, convicted of murder in the State of Arizona in 2010, is illustrative. Detrich picked up a woman, went back to her place, and then killed her. He was convicted and sentenced to death. He filed multiple appeals that centered around his mental state and how his defense council was ineffective. Why? He argued that they should have offered neuropsychological reports to mitigate sentencing. Detrich had been abused and neglected as a child and suffered as a result of alcohol abuse. The post-conviction court granted funding for a neuropsychological expert, Dr. Robert Briggs. In the report, Dr. Briggs stated that Detrich's behavior "was not based on any consequence-driven thought process, but rather a leaned [sic] behavior that bypassed right or wrong" (*Detrich v. Ryan*, 2012, p. 4559). Dr. Briggs further explained that "an interaction between Detrich's emotional state and mild neuropsychological deficits likely caused a greater overall impairment in function" (p. 4560). Thus, the appellate court held that if Detrich's trial counsel had sought the assistance of a neuropsychological expert, it would have offered much greater mitigating weight.

I was abused as a child, mentally, emotionally, physically, and sexually. Yes, I have gone to therapy and struggle with anger. At the end of the day, however, I know the difference between right and wrong and make a choice to be of good moral character. Is all mental anguish or disability controllable?

My Brain Made Me Do It

Brain scans were first used to mitigate sentencing in the early '90s. It was the highly publicized 1991 case of Herbert Weinstein that paved the way for the brain defense. Weinstein confessed to killing his wife, but his attorney pleaded not guilty on his behalf due to mental disease or defect. Weinstein had a cyst on the brain that caused pressure on the temporal lobe, which he argued compromised his self-control. He wanted to present the PET (positron emission tomography) scans as evidence. This was new to the court. To link a defect to behavior based on scans—was it theory or fact? At the evidence motion hearing, the Judge applied the case

of *Frye v. United States* (1923). In that case, the court ruled:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

Once the scans were allowed to be admitted, the prosecutor offered a plea bargain. He argued: "If the jury saw the apparent 'hole' in Weinstein's brain, they might bring a verdict of not guilty by reason of insanity" (cited in Carr, 2017). The murder charge was reduced to manslaughter and the defendant served 7 years in prison. This was the first time that brain imagery was used by the defense. Has it worked in other cases?

Another example is that of a 40-year-old Virginia school teacher who was convicted of child molestation in 2002, but the day before sentencing he was diagnosed with a brain tumor. After the tumor was removed, his impulses diminished and eventually he went home to lead a normal life. Stephen Morse argues that it's important to distinguish between acting intentionally and acting rationally, and that there is always a reason why people act in a certain way—in this case the man felt an urge that he understood and did not resist (Koebler, 2012). If you don't act intentionally, however, you're not responsible. Deciding on this is the challenge for the courts.

Neuroscience and Pain

In personal injury cases, plaintiffs are awarded damages for pain and suffering. It's difficult to determine how many brain scans for pain have been used in such cases because most of them settle. Pain is generally rated on a scale of 1 to 10 (or a smiley face to a frown with tears for children or the speech-impaired), which is not very scientific. My autistic daughter doesn't have pain receptors. I have

chronic pain, yet my rate of pain may be drastically different from another's. There must be a better way to rate pain. How can one award damages on what can't be seen? Karen Davis, a neuroscientist at the University of Toronto, has noted there is an urgent need for a better, more objective measure of pain, since the effect of a wrong answer can be catastrophic (Reardon, 2015).

Dr. Vania Apkarian, who runs the Pain and Passions Lab at Northwestern University in Chicago, conducted a study where patients were scanned directly after a back injury and followed up with another scan a year later (Hashmi et al., 2013). Half of the participants were deemed to have suffered chronic pain: Apkarian could detect a shift in the pain signature in their brains, noting that the signal shifted from the insula, which is associated with acute pain, to the medial prefrontal cortex, which processes cognitive behavior, and the amygdala, which controls emotion. This indicates that the pain had become more internalized (Hashmi et al. 2013; see also Reardon, 2015). This work is in its very early stages, but it seems certain that sometime in the future we will be able to not only communicate pain, but also see it.

Neuroscience and Mental Impairment

The following case study is of a 55-year-old man, D.D., with a history of mental retardation, who filed for services with the Division of Developmental Disabilities in the state of New Jersey. He was denied on the basis that his IQ showed borderline intelligence (*D.D. v. New Jersey Division of Developmental Disabilities*, 2002). On appeal, Dr. Corinne Stella Frantz, a clinical psychologist and neuropsychologist, testified on D.D.'s behalf. After administering numerous psychological examinations she reported that his IQ was 74 and testified that D.D. should



be diagnosed as having mild mental retardation instead of borderline intelligence. (Her argument was based on the statistical concept of confidence intervals.) In her report, Dr. Frantz concluded:

D.D. suffers from a developmental disability dating back prior to the age of 21 and characterized by a pervasive, severe, and chronic cognitive disability which is most appropriately diagnosed as mild mental retardation and which has resulted in substantial functional limitations in four out of six areas of major life activity. These areas include: receptive/expressive language, learning, self-direction, and capacity for independent living and economic self-sufficiency. D.D.'s condition is most likely to continue indefinitely for the rest of his life.

The Superior Court of New Jersey, Appellate Division, agreed with Dr. Frantz and reversed the lower court's ruling. This case illustrates that neuroscience can shed light into impairment of the brain, but what about competency?

A Deeper Look at Competency

Not all court matters revolve around whether or not a person is competent to stand trial. Mental incompetency is not only hard to define, it is also hard to identify. In law, incapacity is just another way of saying "unable to make decisions". In the United States all adults are deemed competent unless declared otherwise in a court of law. How does this relate to neuroscience in court?

My firm once acted for a 25-year-old man who crashed his car into a ditch. No one was hurt. He lost consciousness but not for long. He was taken to hospital. The police report stated that the man had slurred speech, his eyes were watery, he was confused, and he smelled of alcohol. Prior to trying to get a warrant to take blood from him and test it for alcohol, he was asked if they could take blood. He agreed. He tested positive for alcohol above the normal limit and was charged with driving under the influence (DUI). In the hospital, he was diagnosed with level 3 concussion. The man hired an expert for his defense.



In a DUI the state must prove that a person was driving under the influence based on a breathalyzer test, blood test, and police observations. On this occasion no breath test was done. The defense then argued that when the defendant consented to having his blood taken, he was not competent due to his brain injury. He had suffered from seizures in the past and it would have been up to the police to obtain a warrant, which arguably they may or may not have been able to do. The court agreed. The expert further attested that all the behaviors that the defendant displayed could also be linked to the brain injury. Thus, the state was unable to prove beyond reasonable doubt that the defendant was under the influence at the time of his accident.

In another case on competency, a plaintiff had her settlement agreement reversed (*Wolkoff v. Villane, 1996*). Arlette Wolkoff claimed to have suffered a head injury due to the defendant's negligence. The clinical neuropsychologist retained by the plaintiff on her behalf submitted a report in which he claimed Wolkoff had suffered a cerebral injury and that, as a result, she would in the future

have difficulty coping with novel situations or situations in which learning is required. He further stated that the plaintiff's abstract thinking was impaired, hence she would also have difficulty with complex problem solving and decision making. On December 7, 1994, the day the case was called for trial, the attorneys for the parties negotiated a settlement. The next day, Wolkoff instructed her attorney to not accept the settlement, but he refused to do this. The plaintiff filed a motion to vacate settlement, which was denied. On appeal, she argued that because of her cognitive defects no settlement agreement was reached, and even assuming that there had been a settlement, the plaintiff was entitled to set aside the order of dismissal. The court held that the plaintiff proved that, at the time of the plenary hearing, there was relevant evidence regarding competency, including the testimony of the plaintiff and her medical and psychiatric and neuropsychological experts, and that when she approved the settlement, she was not competent to understand the proceedings or the business she was transacting.

While the above cases shed light on the good



that neuroscience can do in law, the law is still the law and remains predictably unpredictable. In the case of *Borstein v. Borstein* (2012), Arthur Bornstein had been in a car accident that left him disabled, and his wife later filed for divorce. At the divorce proceedings Bornstein agreed to the final order of judgment. Later, however, he filed to vacate the settlement and the divorce. He was denied a trial. On appeal, in support of his motion, he submitted reports from several doctors who had treated or evaluated him for his cognitive difficulties, including a neuropsychologist. The neuropsychologist said that Bornstein was unlikely to have understood the full ramifications of his divorce or its possible effects, although this opinion was disputed by the court. Furthermore, the psychological tests were not in line with the time of the divorce—which I mentioned earlier was a factor to consider. In this case, the expert should have known that he needed to address the client's condition at the time of the divorce and that he should have understood the

language and processes of the court if he was to be an expert witness. Treating a patient is very different from testifying in court.

What is a Qualified Expert?

A neuroscientist in any field is not automatically deemed an expert. In the case of Beverly Adamson (*Adamson v. Rosario*, 1998), the court looked at the heart of what qualifications an expert in the field of neuropsychology should have. Adamson was injured in a car accident. Amongst her injuries, she claimed to be suffering from cognitive defects that resulted in a significant loss of current and future wages. The court agreed and awarded damages. In the appeal, the defendants argued that the expert witness, Dr. Wayne A. Gordon, was not qualified as an expert. In reply, the court noted:

Dr. Gordon is a Diplomate in Neuropsychology,



serves as the director of the Traumatic Brain Injury Program at Mount Sinai Hospital in New York City, and is a Professor of Rehabilitation Medicine at Mount Sinai, in which position he teaches both medical residents and graduate psychology students. Nothing . . . would preclude Dr. Gordon from testifying in the manner in which he did.

I have spoken with Dr. Gordon where he explained that the testimony of a neuropsychologist clarifies test findings and can explain how the day-to-day function of an individual may be impacted. He stressed that when choosing an expert in a criminal matter, they should be experienced with traumatic brain injury or other conditions such as ADD, depending on the condition—it's important to find the expert to match the condition. He also stressed that an expert should have years of experience and that an expert will be more effective if they can testify to a typical finding versus nontypical cases. To have board certification and relevant publications is also very important.

An expert must hold an independent license in the jurisdiction of the case being held in order to be able to conduct an independent medical exam. A neuroscience expert would therefore need to hold a license to practice psychology, medicine, or a related profession in that jurisdiction. An expert in neuroscience who testifies to brain function and/or behavior can be a neurologist, psychologist, psychiatrist, naturopathic physician, licensed clinical social worker, chiropractor, registered clinical counselor, or a medical doctor. Once the attorney can determine the argument (i.e., the disorder) in the case (e.g., post-traumatic stress disorder, depression, closed head injury), they can find a relevant expert. In the case of my daughter, a neurodevelopmental physician to attest to the autism and degree of autism or an expert on memory loss would be needed.

A Growing Need for Experts

It is predicted that more experts in neuroscience will be needed. Whether it is criminal defendants who need brain scans to mitigate or dismiss their behavior, or plaintiffs who need to be compensated for loss of memory and cognitive function, neuro-

science has a place in the courtroom. Due to the demand, some institutions are launching programs that bridge neuroscience and the law. The University of Wisconsin–Madison (UWM) has started a program in neuroscience and law; there is a similar program at Vanderbilt. "It seemed like a natural thing to do," says Pilar Ossorio, Professor of Law and Bioethics at UWM. "We want them to question the uses of neuroscience and to be able to create and design experiments in neuroscience that can help us answer some of these questions with the law. These are all questions that are fundamental to the law and up to now have been based on commonsense assumptions about the legal system" (Davis, 2012).

In the case of Tiegreen and, indeed, my daughter, neuroscience and the law need to find a way to look at the behavior, the individual, the damaged brain and the emotionally suppressed person. In personal injury cases there is an established legal doctrine known as the "eggshell plaintiff" rule, which, in the law of torts, means that the courts must take the mentally disabled or damaged as they are—the autism, or the bad brain, is on trial. This isn't to excuse or mitigate crime but to take the person as they are and develop a plan that is just for everyone.

Neuroscience and the Law

Neuroscientist David Eagleman director at Baylor College of Medicine's Initiative on Neuroscience and the Law, has expressed insight into this (quoted in Davis, 2012):

The brain is an enormously complicated system, and there are a vast number of factors that influence who you are and how you behave. . . . People become who they are from a complex interaction of their genes and all of their experiences—from what happens in the womb to the neighborhood they grow up in, and to the culture in which they're embedded. . . . Having special court systems, mental health courts, and recognizing the importance of mental health issues is where we need to go.

Perhaps there will come a time when we have special courts and new laws that better serve the autistic, brain-damaged, or post-traumatic stress

victim. I would like to see this in my lifetime as I see my daughter age and the adults she interacts with in group homes. Tiegreen's mother is quoted as saying: "I grasp the concept that he committed a crime, but what are our options? Where does he go?" (Davis, 2012). She adds: "This is a kid who grew up in a nice, middle-class home, but in a lot of ways, he's not my son. He used to be so loving. His brain is so screwed up."

That young man will spend the rest of his life in a mental prison. The irony of it is that he was already imprisoned: he was trapped in a body and his mind was gone.

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SPOTLIGHT ON SHERIF DARWISH

Psychiatrist and founder of the Recovery Center, Alexandria, Egypt.

Introduction to Dr. Sherif Darwish by Richard Hill

I first met Dr. Sherif Darwish at a conference in Switzerland, in 2010. We spoke about a difficult case and have continued our connection to this day. Dr. Darwish is based in Alexandria, Egypt. He is a champion for those troubled by addiction. When he found that recovered addicts, after discharge from the hospital, had nowhere to find ongoing help, he opened the Recovery Center. This centre has become a fundamental element in the battle against addiction in Egypt.

Before Dr. Darwish tells his story, I want to share what I consider one of the most uplifting and insightful stories from the Recovery Center. During the political upheaval of the Egyptian Spring, Sherif told me that the police disappeared, leaving only the military who were not concerned with general law and order, and local neighbourhoods organised their own checkpoints to help protect their local communities. Unfortunately, the loss of law enforcement was an open door to drug merchants. Sherif could see that they were setting up near to the neighbourhood checkpoints, and the whole situation seemed to spell a recipe for disaster. To his surprise, none of the recovered addicts from the Recovery Center relapsed. When he finally asked them what this was all about, the universal answer could be summarised as, "We did not relapse because what we were doing to protect our families and community was too important."

I invite you to contemplate that sentiment as you read about this wonderful doctor.

NPT: *What was the path that brought you to psychiatry? And where did you begin your residency?*

SD: My first target as a specialty was cardiology. In a very strange incident of fate, all my papers were lost in the Ministry of Health and I had to apply for another job. At that point I decided to shift to psychiatry.

An important motivation was the hospital where I would be training. Mamoura Hospital for Psychiatry and Addiction is the largest Ministry of Health hospital in northern Egypt. There are about 1,000 psychiatry and addiction inpatient beds and an outpatient clinic that covers some 400 patients per day. I still remember my first day when I stood in the middle of the very long corridor of the wards and how intimidating it was. Yet, in less than a year, I was playing football with the patients and having friendly conversations with them. This taught me much more than any textbook.

My passion for psychiatry grew day after day. I could see it clearly. Every person is different, and managing each case is like taking a journey in human experiences and lives. It is not only challenging on the professional level but also very nourishing on the personal level.

NPT: *Why did you start the Recovery Center? What is your experience working with addicts and recovered addicts?*

SD: Unfortunately, our country has a very big problem with drug addiction. When I first chose to work with addicts, treatment was ineffective, the relapse rate was very high, Narcotics Anonymous (NA) meetings were not popular, and unethical practices were everywhere.

In 2003, when I first decided to work on addiction treatment as a subspecialty, I felt that the stigma of addiction was a problem and addiction treatments were largely ineffective.

Working closely with addicts and listening to their stories and experiences made me believe that people, when they are given a true second chance and treatment, can re-

ally change.

I believe it is our responsibility as therapists to provide patients with good therapy and really believe they can change. This empowers them and helps them achieve abstinence. Using, or not using, drugs is just a symptom of the bigger problem of dependency. Working with people to stop their drug-taking without them also changing their way of thinking and their own lives will always result in relapses.

Although this makes our job much harder, it also makes it much more rewarding. The community we have built grows day by day, and this allows us to support more people and promote the idea of recovery and true change. Many of our patients have their own families now, and they consider us very much a part of these families.

NPT: *In your experience has an understanding of neurobiology helped you in your practice/ research?*

SD: The understanding of neurobiology and linking it to the practice of psychotherapy and rehabilitation has been very helpful. It helps us make more sense of what is happening in the patient, and also helps us to see ahead. This allows us to explain to the patients what to expect next, how they are going to feel, and explain their behaviour in a scientific way. One of the most enjoyable groups is when I share a simplified explanation of a neurobiological theory. The participants usually reflect on the theory and explain their own behaviours and feelings, and this process helps me to develop a very deep understanding of the neurobiology.

From a medical perspective, neurobiology raises questions that need to be answered. Can we track the progress of the patients by functional imaging? Can we do brain stimulation that can potentiate the executive functions? Is there a neurobiological abnormality that hinders the learning capabilities of these patients? These are some of the questions that I would like to find answers to through neurobiological studies.

NPT: *Can you tell us about theories and philoso-*

phies that have most impacted your work?

SD: I come from a cognitive background. Five years ago I started training and understanding object relation therapy. My dynamic therapy supervisor always tells me that one needs to have a general theory about the origin of mental illnesses. Hers is that mental illness manifests when one loses faith in the good quality of human relationships. This understanding has added a lot to my practice, and I now have my own philosophy towards mental illness. I believe that people start to suffer when they cannot accept their personal limitations and weaknesses. This pushes them to blame themselves as in depression, or blame the world as in paranoid schizophrenia, or use drugs to cover their limitations, and so on. Through therapy I always try to make people accept their limitations and embrace them. The work of Brené Brown on vulnerability has had an important impact on my understanding of how we suffer a lot.

NPT: *What are you working in currently?*

SD: Currently I am working on several different projects. We are opening our new branch of the Recovery Center, and this is taking a lot of my effort. Secondly, I am leading a small team to make Arabic infographics for psychoeducation for the public. Thirdly, we are in the middle of a year-long addiction treatment course in Alexandria, Egypt. And lastly, I am trying to write a book about some of the insights and understanding I have gained about the process of change in relation to addictive behaviour and patterns of interpersonal relationships.

NPT: *If there was one thing you would like to impart to a new psychiatrist or psychotherapist, what would it be?*

SD: I think the first thing is a great saying from one of my mentors: "Therapy is the therapist." Understanding and mastering the techniques of therapy is a great thing, but the core of therapeutic power comes from you as a therapist. You impact your patient more than any technique. It is your soul that heals theirs. Your attention, your presence,

your moves, your attitude, your readings and culture, and even your stories, are your real power. Your relationship with your client is the bridge that he or she will cross to regain faith in their relationships with the world.

This means that healing ourselves is a non-negotiable condition before you can effectively heal others. You always need a clear mirror in order to be empathic and reflect your patient's thoughts and emotions.

Psychotherapy is a very powerful and strong tool, yet it can also be a very dangerous one. When you are skilled enough, you can really change people's lives, sometimes with a sentence, so we must be careful where we are going and where we are taking our patients. Finally, always see God in your practice. Nothing comes by chance. Slips of the tongue and other small things that happen in the patient's life can give meaning to things. Observe these things carefully and link them to both the therapy and the neurobiology. This will give you a deeper understanding towards your practice and your clients, and even to the world.

NPT: *What's ahead for the next 12 months?*

SD: I have a dream that 2018 will be my year for international experience. I am looking forward to two main goals. The first is to obtain work experience in the United Kingdom or in Australia for a period of time. I feel I need to learn more and to explore more about practices outside of Egypt. I would like to propose some kind of a roundtable discussion on practice dilemmas around the world and share our experiences and stories of treatment. My other goal for this year is to establish partnerships between the Recovery Center, which is an Egyptian, Middle Eastern treatment centre that comes from an Arabic, Egyptian, Islamic culture, and other western treatment centres that have different cultural perspectives.

Links to Dr Darwish:

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