

SCIENCE of BREATHING by Dr Patricia GERBARG

CATHERINE SPANN: Dr. Patricia Gerbarg is an assistant clinical professor in psychiatry at New York Medical College. Her research focuses on mind-body practices for reducing the effects of stress and trauma, particularly in survivors of mass disasters experiencing stress-related medical illnesses. She's coauthored over 40 scientific articles, book chapters, and health books on complementary and integrative treatment, including one book called *The Healing Power of Breath*, and another called *How to Use Herbs, Nutrients, and Yoga in Mental Health Care*.

DR. PATRICIA GERBARG: ...Breath is something that we have found in every practice and particularly breathing with awareness of the breath and changes in breath patterns. In yoga you have Hatha Pranayama. Well, you'll find breathing practices in Qigong and tai ji and they're used in Africa and Hawaii. The kahunas used them. So anywhere you look, absolutely. Now because we are medical doctors and we have to communicate with the medical profession and with researchers, we found that the best way for us to communicate is to use their language, to use medical language, scientific language and to remove any elements that link the practices to a particular religion or country. So we've taken all the breathing practices and we've given them a modern scientific name; **voluntarily regulated breathing practices or VRBPs for short**. So if I have to go and give a scientific lecture, instead of Pranayama and everybody's eyes glaze over, I say voluntarily regulated breathing practices. So it just makes for a language that we can use to communicate.

CS: So they're more comfortable with that kind of language.

PG: It's not only that, but they'll take it more seriously because it's "scientific."

PG: One of the things we're trying to do is to **understand how these ancient practices affect the mind and the body and the neurophysiology in modern scientific terms**. So it's not just to make a better impression, but also we really do need a scientific language if we're going to go ahead and use science to better understand and even enhance the effectiveness of the practices. Because we've found that we can actually do that, and now more and more brain studies are being done and so on. It not only legitimizes the importance of these practices, but **it gives us a way to better understand how to use them and how to make them even more effective**.

CS: What brought you to this study of breath?

PG: ...I had a very traditional medical training at Harvard Medical School and in psychiatry also there. And then I went on and became a psychoanalyst through the Boston Psychoanalyst Institute, so you can't get a more traditional training than that. And with that background, I practiced what's called conventional psychiatry for many years using psychotherapy, medication, etc. It was actually my husband, Dr. Brown, whom I hope you'll interview another day, who introduced me to mind-body practices and specifically breathing practices. Now it's almost 20 years ago. I was very reluctant, very skeptical, which helps me understand my colleagues because that's how they start out. But when he finally got me to try the breathing, I was truly shocked. I did not expect it to have such powerful effects on me and also on the people around me that I observed. So that really piqued my curiosity because I thought there have to be explanations for this in scientific terms that I can understand and explain to my colleagues. And that really began my whole exploration of this field. And since then, I've been continuously amazed at how many health benefits the practices have. And I see people over many, many years.

In scientific studies, they might study people for 6 weeks, occasionally for 6 months. But I've seen many of my patients I've seen for 30 years the same people over time. And so you really get to see the changes that occur, and it's very much convinced me of the importance of doing this. And in our disaster relief work, we see people change and feel so much better. And then we see them a year later and we see that the benefits have not only remained in place, but they've gotten even better. So as a physician and healer, to me, the most important thing is enabling

people to become well optimally as best they can. I wanted to have this for my patients and really for everyone.

CS: So are your patients generally open to the breathing practices?

PG: You know, it's varied over time. It's really variable. More and more people are open to them. I offer the breathing practices when I feel it's appropriate and tell people quite clearly what the benefits are of the breathing and compare that to, they may be asking for a medication for anxiety say, they come in they say, I need Xanax. I have anxiety. And I say, well, I understand that. But before we go into Xanax, let me also talk to you about other options. So we go over the pros and cons of Xanax, what's good about it, what's bad about it. Why I don't like to write prescriptions for it, which I try very much not to do. And if they're amenable, then I'll teach them right then and there some breathing in the office. And usually they finish learning it— it takes about 20 minutes— and they say, I don't remember ever feeling this relaxed. And I say well, you did this for yourself. You don't need a pill. That happens a lot in my practice.

CS: And not only is it so—positive results happen so quickly, but it's free.

PG: Absolutely. They don't have to worry about their prescription plan. And also, you know I tell them plain out. I don't care what the media tells you, every one of these medications like **benzodiazepines, Xanax, Klonopin**, all of them are going to be habituating. And many people are susceptible to **addiction**. There are **withdrawal effects**, and now we're discovering that people who are on them for decades, **they're having an acceleration of the incidence of dementia**. So if you can avoid these, what used to be thought as harmless anti-anxiety meds, if there's an alternative, consider it very seriously.

CS: So I'm guessing you work with sort of a diverse set of patients and perhaps a diverse set of populations in your research practices. Can you talk about how the practices span across these different populations?

PG: By populations, do you mean diagnostic groups?

CS: Yes.

PG: OK, so in our practices, we see people with a wide range of diagnoses. Most of the people who come to me have— and by the way, very few patients in real life have only one problem. Now, unlike what studies say, most of the people who come to me are under stress. Number one, that's absolutely the common denominator. Everybody's under stress. And that could be from all the things that cause you all stress. So they often have some kind of anxiety disorder, a depression disorder, many of them have mood disorders like bipolar spectrum disorders. A lot of them, in addition, may have attention deficit disorder. Many of the patients I see have post-traumatic stress disorder from either childhood trauma or trauma later in their lives. A lot of them have what I call medical post-traumatic stress disorder where they've had some horrible medical problem, **the illness and treatments are traumatic**. So mostly I see trauma. People have had some kind of trauma, bipolar mood, and anxiety depression. In my practice, I don't see a lot of patients with psychotic disorders anymore because it's mostly an outpatient practice. And I only see adults.

CS: So that's in terms of individuals who have been diagnosed, would you recommend these practices for the general population as far as a coping technique or even a preventative strategy for mental health?

PG: Absolutely. And I think that's really important. They're very helpful as integrated, but I don't use so much complementary and alternative anymore. We're trying to get people to think about it more as integrated treatment where we use some standard treatments, some standard psychotherapies, maybe a little bit of medication if we have to, and then we combine and integrate it with herbs, nutrients, and mind-body practices. So I try to integrate it into the treatment of as many of my patients as are interested and willing to do so. I will offer it as an

option. In terms of the general public, I think you don't have to have a psychiatric diagnosis to be under stress. And even if you handle stress well, you could still benefit because people who handle stress well, and I would put myself in that category, maybe you put yourself too. People who handle a lot and deal with a lot of stress and deal with emergencies and are calm in the storm [inaudible], that kind of person who's used to dealing with stress, we don't even notice how it's affecting us. We don't know until maybe we get a problem, physically or something else happens. But we are absorbing the stress for other people. We're helping others, we're absorbing stress. And caregivers' stress is more and more being recognized. Whatever job you have you're being subjected to stress all the time, to demands, to needs. You're trying to help people. You're trying to please people. You're trying to deal with difficult people. You have pressures. You have to earn money. You have to give time to your family. There are so many things. And then you turn on the TV to relax and what do you get? More stress. So we don't even realize, we've become almost dull. We don't notice, but it is affecting us. And it's a major cause of most of the illnesses that we see.

We tend to see the effects a little bit later in life as the stress accumulates. So when you're in your 20s, you may not even notice any of this. **But by the time you're in your late 30s or 40s, you're starting to develop various medical illnesses that are stress driven.** So absolutely in terms of short and long-term health.

The other thing I find, and we could call this healthy people or people who don't have a diagnosis, **many people without a diagnosis come to our training centre workshops.** We get a lot of people who are therapists and health care providers. And we get a lot of people from the general public. Nothing is 100%, but most people feel afterwards that they feel better, they feel calmer. They're less likely to overreact to situations, and many people tell us that **their relationships are better**, and that people tell them that they like them better and they like [inaudible]. They don't always know why, but it seems like things change.

The other thing, in particular with the breathing practices, is that they are very good for cardiorespiratory health. They increase the capacity of the lungs, and this is very good for any kind of sports activity or functioning at high altitudes. It prevents high altitude sickness if you do a particular kind of breathing. So people who are interested in peak performance would find particularly **coherent breathing** which we'll be talking about more as we go on, will enhance the endurance. And **you have to expend less energy to breathe and get plenty of oxygen in your system.** And the other thing we're finding is that it **improves cognitive function.** So if we're talking about better problem solving, things like that, we've actually seen that it improves cognitive function. And it's very helpful, for example, for students who are under stress, test taking, when people tend to get anxious and clam up, those kinds of situations, performance arts. So really, I can't think of anyone who wouldn't find this to be a useful approach.

PG: Even children. And we've worked with children as young as three. We have special programs for children that are being developed and are being used and tried out. Kids love it. They learn it faster than the grownups, and they make it their own and they have fun with it. So that's a whole other area.

CS: Yes, my graduate work was in developmental psychology, and I had as part of my research study young children practicing mindfulness meditation, and parents were just shocked. Who is that kid sitting there doing it. They don't believe their eyes.

PG: Well, we have taught this to kids who come from very difficult home situations, areas that are very economically depressed, a lot of behavior issues, neglect abuse issues. And the children love it because they're able to find a way to **bring to themselves a sense of peace and calm, even if their environment is chaotic.** And they're also able to use it to control their anger so they don't have to go and punch somebody. That can actually control it. And in one of the schools, one of the 7th grade teachers told me that they have all these kids they call *runners*. So when conflict occurs or there's trouble, they just run out of school and are lost for the day. And she said teaching them the breathing, these kids didn't have to run. They were able to just do their breathing, calm down, and not panic. So it has a lot of applications.

CS: I just want to hear more from you about this **relationship between the vagus nerve and breathing.**

PG: **The stress response system has several components, the autonomic system and the hypothalamic-pituitary-adrenal axis, the cortisol control system.** The autonomic nervous system has 2 branches. One is the sympathetic system and that's the part that is the action system, so that activates us to get things we want or to run away and avoid things we don't want. And that governs the fight or flight reactions. So when there's stress or we perceive a threat of any kind, that system can go into action. And we need it to. **The problem is that in today's world, we have so many sources of stress that it tends to overactivate the sympathetic system and it doesn't seem to come down to baseline.**

The parasympathetic system is the branch of the autonomic nervous system that counteracts that. So the sympathetic system speeds the heart, the parasympathetic system slows it down once the danger has passed so that our bodies can rest, calm down, and we can restore our energy reserves and repair the damage that was done when we were in a sympathetic state.

The sympathetic state burns a lot of energy and generates a lot of free radicals, which cause damage throughout the body. So the body has ways to deal with that, and the parasympathetic system is one of the main ways, that is the anti-inflammatory, calming, energy restoring part of the system.

In the last, I would say now 15 or 20 years, new functions have been discovered that we did not know before, that **the parasympathetic system is not just counteracting the sympathetic system, it's actually the part of the nervous system that's very involved in emotion regulation as well as feelings of love and bonding. It's very much involved in how we perceive the world, the judgments we make, our decisions and how we feel about ourselves.** The main pathway of the vagus nerve that runs between the brain and the body, these are the vagal nerves. They come out of the brainstem and go down throughout the body and branching into all the different internal tissues.

So these nerves carry messages from the brain to the body and from the body back up to the brain. So this is really the **mind-body connector**, a major one. And what we're looking at when we ask the question, well, how is it that if you do breathing (and we're going to talk specifically about something we call **coherent breathing**, which is breathing around 5 or 6 breaths per minute with **equal inhalation and exhalation** and to do the breathing really, really gently so you're not pushing the air out and you're not pulling it in, it's very soft and gentle), well if you breathe that way, and you change the way you're breathing, then you're **changing the messages that go from your respiratory system through the vagus nerve up to the brain.** The body sends messages to the brain and those messages affect how we think and how we feel, every millisecond, even though we're not aware of it. **If you change the pattern of breathing, you change the messages going to the brain.**

Now the messages from the respiratory system are very important to the brain, because we know it's the most vital function. So if anything goes wrong with our breathing, all of our attention, all of our capacity has to focus on restoring our breathing within 3 or 4 minutes or we're dead. So those messages have top priority as far as the brain's concerned and survival. And if you can change it in such a way, if you change your breathing in such a way as to send a message that tells the brain, you know what? Conditions are safe. You don't have to be defensive. You can calm down. You can allow your system to restore. You can be close to people. You can trust and be vulnerable and relate, and you can love **and bond. You can hug** someone and be still. You don't have to run away. You don't have to fight. Well, that would be a very wonderful message to be able to send to the brain.

Breathing is the only autonomic function that we can control voluntarily. The other functions, like digestion and heart rate, we can't just control them, but with breathing we can. So that gives us a portal. **Breathing is the portal that we can go directly into the core nervous system of the body and we can send a message.** We can send the messages we want to send to

our brains in order to have a positive effect on how we're thinking and feeling. If you've ever been really frightened and anxious and you tell yourself with your mind, you say, "calm down, there's nothing to be afraid of. You're overreacting." The chances are that's not going to work. So by using the body instead, we circumvent all of the thinking and worrying process, we go directly to the core regulatory centres of the brain and tell them a message that they understand, which is from the respiratory system. And that's why we think this is so powerful and works so quickly, because we're using the brain's own internal communication system.

CS: So can you talk just a little bit more on the **breath and heart connection**. So what happens when we breathe in to our heart rate?

PG: Well there's a reflex. There are reflex connections. There are many connections between the heart and the respiratory system. **And every time we breathe in, our heart rate speeds up a little bit. And every time we breathe out, our heart rate slows down a bit** because when you breathe in, you're kind of activating the sympathetic branch, and when you breathe out, you're activating the parasympathetic branch, which tends to slow the heart down. And we call this **normal respiratory sinus arrhythmia**, that little change depending on if you are breathing in and out. And we take advantage of that reflex when we use different breathing practices. Also, when we do scientific research, it's important because if our goal is to quiet the sympathetic system and activate and bring up the parasympathetic system, we need a way to know that we've actually achieved that. **And there's now a way to do it very simply using electrocardiogram with heart beat.** If you can measure that difference between the link between each beat when you're breathing and breathing out, you can calculate from a mathematical formula that will tell you, "yes, you now have more parasympathetic action going on than before." So we have people breathe at 5 breaths per minute for some period of time, and we can literally see that their heart rate variability or **respiratory sinus arrhythmia**, they are similar, have improved. So if you have a higher heart rate variability or higher respiratory sinus arrhythmia, it means you have more parasympathetic activity. And it also means that your whole cardiovascular system is more flexible and more adaptable to different conditions.

CS: So does that relate back to what you're saying about our feelings of closeness with others and our bonding, our emotional regulation? Does it relate back to that?

PG: Well, that actually has more to do with the evolution of the autonomic system and its development. According to **polyvagal theory** (Stephen Porges), **we still retain parts of the reptilian autonomic system** in our nervous system. And then they're been higher when we became mammals and so forth. There are higher levels. So **the lowest level is the reptilian system. The later development is the sympathetic system and parasympathetic system** and those fibers in the parasympathetic system were not myelinated. **And the most recent evolutionary development in mammals was the myelination of some of the fibers in the parasympathetic pathways.** So we have **both myelinated and unmyelinated fibers in our parasympathetic system.** Now it turns out that **those myelinated fibers**, the highest evolution which you see the most in primates and humans, those are the ones that are **responsible for the behaviors that I'm talking about**, which means you **need to be able to use that part of your system in order to be close to others and to co-regulate** because our physiology is developed through co-regulation.

When, for example the mother holds a baby close to her body, her physiology and the baby's are co-regulating, and that happens over many years for healthy development of the autonomic nervous system. So that when the child is old enough to go off on their own, they have the **capacity to soothe themselves and they have a robust and healthy autonomic system.** Now if **there's early trauma or neglect that's significant**, it interferes with that healthy development. These are the systems that we're working with.

We found that using the coherent breathing, what we are seeing and we haven't totally proven this yet, but our most recent development of our theory is that, doing this, because we know that it strengthens the activity of the parasympathetic system, will help us to be able to use our sympathetic system when we need to for real situations of stress, where you have to either fight

or run away. But it will help us to shut that off when we're finished and to shift back into what we call the Green Zone, which is where we feel safe, where we can be relaxed, and we can be close to people and bond.

Because when you're in that sympathetic mode, you can't do that. Your system is just geared to fight or go after or run away. **And the problem is how do we get back to the safety zone?** This is the problem that veterans have, because **when you're in war or in training, you have to function in the sympathetic zone to survive.** And when you do that from month after month and year after year and then you come home, your system cannot switch back into civilian mode where you can be relaxed and feel safe and calm and be close to your loved ones. And that's what I hear over and over, that people from the military have this problem. They can't feel close and bonded and loved with their families when they return. It breaks their hearts because they want to. So this helps them to make the transition back to the Green Zone.

And for those of us who have a lot of stress, it would enable us, for example, you have a horrible day at work and you come home and you kick the furniture and grouse at your partner and you just can't deal with your kids. You go in your room and do 20 minutes of coherent breathing and you come out and be able to enjoy your family and be close to them. It dissolves the effects of the stress. So there are many places in our lives where we could use this. And even at work. We **teach people eventually how to do it with their eyes open. So then you use it anywhere.** If you're experiencing stress at work or in a meeting, you can just sit there breathing at 5 breaths per minute and nobody knows you're doing it, so it's totally private. And you can use it whenever you need to. That's one of the beauties of it.

CS: You were practicing this coherent breathing in order to activate this parasympathetic system, which not only calms our bodies, it calms our thoughts, calms our emotions, and that sort of thing, which can then enable us to eventually have better relationships, to be able to pay attention to those around us rather than be caught in our own sympathetic state.

PG: We've found that **if you activate the vagus system, this myelinated system, it reduces defensive reactions and it activates the social engagement system,** speaking as a neurologist type what we're looking at.

CS: So do you find either in your research or just as an anecdote in your personal practice, is there any relationship with constantly being pinged with information that may send us into this sympathetic state. Can you shed any light on that, on how?

PG: I think people really need to think about that, **because our systems want excitement and stimulation.** That's what our mind wants, **but our bodies need regular rhythms and downtime and rest. And our hearts need closeness and bonding and love. So you need a balance in your life.** We're constantly plugged into media. **If you're a junkie for really stimulating hard-hitting entertainment and you're plugged in constantly, you have to realize that you are over-stimulating your system and over-activating your sympathetic system. And although it keeps your attention and it's exciting and it's fun, when it's out of balance, it's long-range not going to have good effects.** So I think people do need to rethink how plugged in they are. Because if you want to be plugged in, part of the time you should plug into perhaps a paced program that will help you breathe slowly, relax your system or maybe waterfall sounds or something. Your system does need periods of calm and relaxation, so we have to think of that.

CS: I would say, I guess at minimum if we can learn these breathing techniques, if we can't do away with our technology, if we can't do away with our phone right in that moment, we may at least have the breathing practices to use.

PG: Absolutely. And the other thing is you can do them when you have downtime. You can do them when you're on a commuter train. They don't have to take a lot of time away. **And if you learn to do them with your eyes open,** you can do them while you're working and your brain will be fine. The reason we chose this particular rate is because if you breathe faster, it's more activating. If you breathe a lot slower, it's more calming but it also is more sedating, kind of

makes you fuzzy brain. So we picked the zone where you would get optimal alertness and sharpness and at the same time optimal calmness and relaxation together. So it's kind of a sweet spot.

CS: how does breathing at 5 breaths a minute compare to other breath practices, such as the 4-7-8 breath?

PG: We looked at a lot of different patterns, because **there are actually four phases of the breath. There's inhale, pause, exhale, pause, and you can manipulate any of those four phases in any combination.** So for instance, we do teach inhale 4, hold 4, exhale 6, hold 2. That's another form that we like to use. So each of those does have different effects. Now we focused on the coherent breathing for a number of reasons. One, because it's very simple, easy to teach, and if people have to count when they're breathing like you're counting in your mind, breathe in, 2, 3, 4. Hold 2, 3, 4. Breathe out whatever number it is. As soon as you start counting, it's an intellectual function and that's sympathetically stimulating. So we don't want people to count. That's why we encourage people to get some sort of paced breathing track or app so that they can just listen to the tone and completely turn off their intellectual counting brain while they're doing it because it will be more effective. In terms of what you're talking about, there are different effects.

But again, we found that this particular balance—and I have to say, people like new things, different things, fancy things. They don't want to do the same old, same old simple thing. And so it's almost like a commercial thing now with people coming up with new techniques, breathe in for 4. Hold for 3. Breathe out for 8, breathe out for 6. And a lot of it is nonsense, honestly. It's not more effective, because we looked at all these many different forms. And we looked at what's going to create the most simple, the most profound benefit in the shortest period of time. And this is what we found worked best. Plus it's the simplest. You don't have to be engaged in all this counting.

CS: So do you offer that, the recording anywhere? Is that open to individuals?

PG: The recording is on the book, *The Healing Power of the Breath* actually has a practice CD with it. So read about and do the practices. And that chime track is on the tracks in the book. But it originally came from Stephen Elliott, and his website is coherence.com. So he created that, and he's given us permission to use it. If you go to his website, right on the home page, he says where you can download that particular two-bell track at 5 breaths per minute. Now people can also get a lot of iPhone apps that are available now for paced breathing. So if you just Google around, you can listen and find one that has tones that you like. You might like a tone. You might like a waterfall. Whatever it is, the ocean sound. You can pick your sounds, and you can set them for different rates.

So there are some people who find it difficult or challenging to start at 5 breaths per minute for a variety of reasons. For example, older people may have a lot of arthritis that makes it harder for them to expand their chest wall, and for them, they may be more comfortable at 6 breaths per minute and that's fine. Some people have so much tension and anxiety that they literally cannot relax their chest muscles enough initially to breathe at 5 breaths per minute. So they may need to start at 6 and after a couple of months they can go down. In our book, we have chime tracks at 5 and 6 to give people the option, because the most important thing when doing the breathing is that you feel relaxed and not stressed by the breathing itself in any way.

So in the book, we talk a lot about different situations. Maybe you have a respiratory condition or asthma, how to adjust the breathing for different medical conditions and how to use it for different problems in life, whether they're diagnoses or just different life issues lots of examples of how to do that are in the book.

And fortunately, it's been translated now into many languages, and I understand you have an international audience. So the book is currently available in French, in Chinese. It was published in Taiwan, lot of people from there read it. It's just come out in Portuguese. We're waiting. It's going to be coming out in Spanish, Japanese, South Korean. It may already be out in Dutch, I have to check. And I believe we may even get it out in Romanian.

So it's kind of spreading around the world because it is something that people from any culture can understand and accept. People from all religions who worked with refugees in shelters in Berlin, refugees from many different Middle East countries. Men, women, children, they all benefited from it. Worked with populations in Africa and Haiti and many different cultures. This is so fundamental and basic that anybody can do it and benefit from it.

PG: We really want to get this out. And I do want to say, if people are interested in teaching this to others or using it in their work, please get more training and information because most people who have no issues can do this quite easily just from getting the book and teaching themselves. But it's always good to get more training as to how to use it without causing problems in people who have some issues.