CHAPTER 21

Breathing Techniques in Psychiatric Treatment

Stress, Anxiety, Depression, Attention, Relationships, Trauma, and Mass Disasters

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Breath is the bridge which connects life to consciousness, which unites your body to your thoughts.

Thích Nhất Hạnh

Imbalances of the autonomic nervous system underlie and exacerbate stress-related conditions, including anxiety disorders, posttraumatic stress disorder (PTSD), depression, substance abuse, attention-deficit/hyperactivity disorder (ADHD), and behavioral disorders of childhood. The vagaries of the autonomic nervous system drive oxidative damage, inflammation, aging, and the progression of stress-related medical conditions. Restoring sympathovagal balance and resiliency is fundamental to treatment of most disorders seen in psychiatric, pediatric, and general medical practices. The most efficient way to balance the sympathetic and parasympathetic branches of the autonomic nervous system is through voluntarily regulated breathing practices (VRBPs).

Chanting is one of the most ancient breath-regulating practices, used by religious and tribal leaders to calm the mind and strengthen the sense of communal bonding. Shamans and medicine men knew how to use the breath to promote healing and to induce altered states of mind. Warriors developed intense breath practices to focus their minds; to enhance situational awareness, endurance, and strength; to endure

painful wounds; and to heal themselves. Awareness or mindfulness of breath is fundamental to Buddhist meditation, yoga, qigong, and other mind-body traditions. Mind-body practices are being developed with specific VRBPs that can be integrated into all mental health treatment modalities and settings. Properly done VRBPs cause very few adverse effects, even in elderly or ill patients, and cost very little. They can be easily taught, are nonstigmatizing, and are accepted across diverse cultures.

In this chapter, we review simple, safe, effective VRBPs that can relieve anxiety and improve emotion regulation, cognitive function, performance, behavior, and relationships. For more extensive discussion and references, see Brown and Gerbarg 2012a; Brown et al. 2013; Gerbarg and Brown 2016a; Gerbarg et al. 2011; and Streeter et al. 2012.

Neurophysiology of Voluntarily Regulated Breathing Practices and Polyvagal Theory

Breath and emotion are bidirectional. Each emotional state is associated with a particular breathing pattern. By consciously changing the pattern of breath, one can shift emotional states (Philippot et al. 2002). In Chapter 20, "Polyvagal Theory and the Social Engagement System," Porges and Carter explained the role of the vagus nerves in bidirectional mind-body communication. *Polyvagal theory* describes afferent parasympathetic nervous system pathways that transmit interoceptive information from visceral organs to the brain. Afferent information from the respiratory system provides an enormous amount of data from millions of receptors (e.g., each alveolus contains three types of stretch receptors); bronchial, laryngeal, pharyngeal, and nasal passages; baroreceptors; chemoreceptors (registering changes in pO_2 and pCO_2); and receptors in the diaphragm, thoracic cavity, and chest wall. Every millisecond, respiratory information streams up vagal pathways to brain stem nuclei and from there to central nervous system networks regulating emotion, perception, cognitive processing, and behavior (see Figure 21–1) (Brown and Gerbarg 2005; 2016a; Brown et al. 2009).

Evidence indicates that slow breathing practices (through vagal afferents) could reduce overactivity in the amygdala, increase underactivity in prefrontal emotion regulatory centers, modulate hypothalamic-pituitary-adrenal function, increase levels of the inhibitory neurotransmitter γ-aminobutyric acid, stimulate oxytocin release, and improve cognitive function (Brown and Gerbarg 2012a; Brown et al. 2013; Gerbarg and Brown 2016a, 2016b; Streeter et al. 2012).

Voluntarily Regulated Breathing Practices

Respiratory sinus arrhythmia and heart rate variability are derived mathematically from the normal changes in the heart's beat-to-beat interval between inspiration and expiration (Lehrer and Gevirtz 2014). These changes reflect the flexibility of the cardiovascular system. High respiratory sinus arrhythmia and heart rate variability are associated with better health and longevity. Low respiratory sinus arrhythmia and

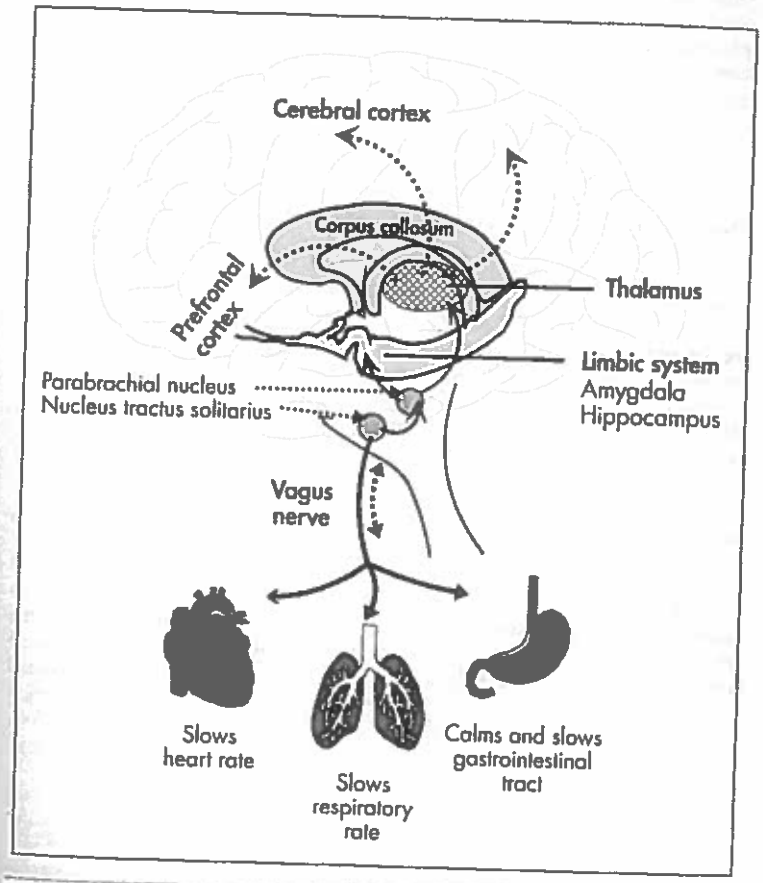

FIGURE 21–1. Bidirectional vagal nerve pathways.
Vagal afferent pathways transmit information from the lungs (and other organs) to brain stem nuclei (nucleus tractus solitarius and parabrachial nucleus). From these nuclei, pathways ascend to the limbic system (amygdala and hippocampus), hypothalamus, insular cortex, thalamus, and thalamocortical projections to prefrontal cortex and other areas of the cerebral cortex (Brown et al. 2009).

heart rate variability are associated with chronic stress, anxiety, panic disorder, PTSD, depression, and aging. The effects of paced breathing on respiratory sinus arrhythmia and heart rate variability have been well documented. For an average adult man, a respiratory rate of 15 cycles per minute (cpm) produces a small difference in heart rate of

about 4 beats per minute; at a rate of 5 cpm, the difference in heart rate increases to as much as 35–40 beats per minute in a very healthy man. For most adults, gentle breathing at 4.5–6 cpm increases heart rate variability, as indicated by heart rate variability high-frequency spectrum activity (Lehrer and Gevirtz 2014), leading to a calm state. Slow VRBPs are the most useful clinically because they can rapidly reduce the sympathetic overdrive associated with states of stress and anxiety while increasing parasympathetic activity. Studies show that slow VRBPs are associated with reduction in perceived stress, anxiety, and insomnia (Brown et al. 2013; Gerbarg and Brown 2016b).

Slow Voluntarily Regulated Breathing Practices

UNILATERAL AND ALTERNATE NOSTRIL BREATHING

Two forms of slow breathing are *unilateral nostril breathing* (UNB) and *alternate nostril breathing* (ANB). During UNB, one hand is held over the nose while the fingers close one nostril (either the right or the left). For ANB, the fingers alternate closing and opening the right and left nostrils. The duration of each phase of the breath cycle can be regulated. For a review of studies on unilateral nostril breathing and alternate nostril breathing, see Brown et al. (2013). In clinical practice, alternate nostril breathing can effectively calm someone who is very anxious; however, alternate nostril breathing may be impractical in some situations because it requires holding one hand over the nose, a conspicuous activity in public settings. In certain situations, such as combat, using one hand for alternate nostril breathing is not feasible, thus limiting the usefulness of these techniques.

QIGONG BREATH 4-4-6-2

Respiratory rates can be slowed by adjusting one or more of the four phases of the breath cycle: inhale, pause, exhale, pause. One well-known pattern is called *4-4-6-2* because each phase is counted: four on the inhale, four during a pause, six on the exhale, and two during a pause. Extending the expiratory phase increases parasympathetic activation. We have found it effective clinically in rapidly reducing anxiety, rage, and suicidal thoughts.

COHERENT BREATHING OR RESONANT BREATHING

Coherent breathing, also called *resonant breathing*, is gentle, natural breathing in and out through the nose with equal length of inspiration and expiration at a rate that optimizes sympathovagal balance (heart rate variability), between 4.5 and 6 cpm for adults. Performed without straining, coherent breathing creates a mental state of emotional calmness with mental alertness and enhanced cognitive processing (Brown and Gerbarg 2012a). Coherent breathing is easily taught to individuals or groups in about 20–30 minutes. Ideally, the eyes are closed to focus inward, and breath is paced with a recorded chime tone or other sound (e.g., ocean wave). Coherent breathing can be done with coordinated arm movements while standing, sitting, or supine.

BREATH MOVING

An advanced practice found in qigong and other traditions entails moving the breath and attention to different parts of the body in circuits, for example, closing the eyes

and imagining that as one breathes in, breath moves to the top of the head, and as one breathes out, breath moves to the base of the spine (see www.robertpeng.com). Breath moving combined with coherent breathing can be used in treating psychological conditions, physical injuries, and pain. In patients with severe asthma and other respiratory problems, breath moving is used to prevent transient bronchiolar constriction during slow breathing practices.

RESISTANCE BREATHING

Resistance breathing techniques create resistance to the flow of breath. For example, in ocean breath (*ujjayi*), slightly contracting pharyngeal muscles create a sound similar to the ocean while stimulating the vagus nerve and thus enhancing parasympathetic nervous system tone (Brown et al. 2013; Gerbarg and Brown 2016a). Chanting and singing are also resistance breathing in which vocal cord contractions create turbulence to air flow, resulting in sound. Bernardi et al. (2001) showed that chanting the Hail Mary prayer in Latin, breathing at 6 cpm, resulted in increased baroreflex sensitivity and vagal respiratory response.

Rapid, Forceful Breathing Practices or High-Frequency Breathing

Rapid, forceful breathing increases alertness, energy, and attention and includes "Ha" breath, bellows breath (*bhastrika*), and breath of fire (*kapalabhati*) (see review by Telles and Singh 2013). High-frequency breathing should be done only for a few minutes, interspersed with normal breathing and rest, to avoid hyperventilation effects, such as altered mental states. Contraindications include uncontrolled hypertension, seizure disorder, recent surgery, panic, PTSD, flashbacks, dissociative disorders, and respiratory conditions. Rapid, forceful breathing is contraindicated in bipolar disorder because activating practices can trigger hypomanic or manic symptoms, which may occur immediately or be delayed.

Ha breath uses sharp, moderately forceful inhalation and exhalation, and the sound "Ha" is made on the exhale. This activates and focuses the mind. It can be done at moderate rates between 15 and 20 cpm. For most people, Ha breath should be limited to 20 breaths per round with 60 seconds of rest between rounds for no more than 3 rounds.

Voluntarily Regulated Breathing Practices in Clinical Practice

Treatment of Anxiety Disorders, Stress, Insomnia, Posttraumatic Stress Disorder, and Depression

Stress-related and anxiety disorders respond well to slow VRBPs. A clinician can teach coherent breathing within 20 minutes by using a paced chime track on a compact disc or smartphone and instruct the patient to practice daily starting with 5–10 minutes and

increasing to 20 minutes, the minimal therapeutic dose. Very anxious patients may need 20 minutes twice a day until symptoms improve. Literature is available on therapeutic breathing practices and how to use them for a wide range of conditions (Brown and Gerbarg 2012a, 2012b). In the short term, coherent breathing can quiet the mind, reduce anxiety, and facilitate sleep. In the long term, daily practice improves autonomic system resiliency, emotion regulation, and social relationships. After 1 or 2 months of practice, patients can do coherent breathing with eyes open while engaged in everyday activities, because it can be done anywhere without anyone knowing that the patient is engaged in a calming, self-regulatory practice.

Slow VRBPs are particularly effective for alleviating symptoms of trauma- and stressor-related disorders such as PTSD: intrusive memories, avoidance, negative emotional states, hypervigilance, poor concentration, and sleep disturbance. Quiet but painful symptoms of trauma and military service are emotional numbing and disconnectedness, which distort family relationships and the sense of self. Slow VRBPs reduce defensive states and support social engagement and bonding (see Chapter 20). The following case illustrates how breathing practices may permanently restore the sense of meaningful connection to self and others.

> After serving for 2 years as a mental health specialist in Iraq, Nancy returned home to her husband with symptoms of posttraumatic stress. Unable to get help through the Department of Veterans Affairs system, she tried numerous forms of therapy, including eye movement desensitization and reprocessing and mindfulness-based cognitive-behavioral therapy. This enabled her to rationally observe and control her overreactions such that she could function, but she felt numb and emotionally disconnected.
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> Nancy felt well enough to start a family, and she became pregnant. But when her daughter was born, Nancy felt painfully detached, unable to experience a maternal bond. For 4 more years, she continued to search for relief, until she attended a 2-day Breath-Body-Mind (BBM) workshop with Dr. Richard P. Brown, during which she felt a fleeting sensation of wholeness. She began daily breath and movement practices and described the following effects: "I was able to calm my body and mind. I began to thrive. I began to feel life inside me after feeling disconnected and detached for so long. The love known only to my intellect began to fill my heart. For the first time, I was able to embrace my child and truly experience shared love and motherhood. For the first time, I felt profound, deep closeness with my husband, who had waited so long for us to bond. Tapping into my inner resources, I found new meaning and purpose. I have arrived and feel welcome home."

As with Nancy, many survivors of trauma, military service, and mass disasters experience permanent resolution of trauma-related symptoms through specific breath and movement practices (Carter et al. 2013; Descilo et al. 2010; Gerbarg 2008; Gerbarg and Brown 2011, 2012a; Gerbarg et al. 2014).

Studies of yoga programs with prominent regulated breathing components showing significant improvements in depression include five RCTs, one RCT dose-finding study, and two open pilot studies (Brown et al. 2013; Chu et al. 2017; Janakiramaiah et al. 2000; Sharma et al., in press; Streeter et al. 2017). For example, in an RCT of 26 women (BDI>14), those who participated in a 12-week yoga program (breathing exercises, yoga poses, and supine meditation/relaxation) showed increased parasympathetic tone and reduced depressive symptoms and perceived stress compared with

a control group (Chu et al. 2017). In another 12-week dose-finding RCT (Iyengar yoga and coherent breathing) of 30 depressed subjects randomly assigned to a high-dose group and a low-dose group, BDI-II scores declined significantly from screening (24.6±1.7) through week 12 for the high-dose group (−18.6±6.6, $p<0.001$) and from screening (27.7±2.1) to week 12 for the low-dose group (−17.7±9.3, $p<0.001$) (Streeter et al. 2017).

Children and Youth

Children respond well to breathing practices that can be used in classrooms and after-school programs. A few minutes of Ha breath can be used to focus attention quickly, or coherent breath at age-appropriate rates can be used to reduce anxiety and overreactivity (Brown and Gerbarg 2012a, 2012b; for information on children's programs, see www.breath-body-mind.com).

Mass Disasters

Short programs of breathing practices are being used for immediate and long-term relief of trauma from mass disasters worldwide. A small number of trainers can provide rapid emotional relief to vast numbers of survivors and can train local residents to continue teaching others. These interventions require no equipment or electricity and are low in cost (Brown and Gerbarg 2012a; Gerbarg et al. 2011; www.breath-body-mind.com; www.stws.org).

Stress-Related Medical Conditions

Mind-body treatments and VRBPs have the potential to ameliorate physical and psychological pathogenic processes contributing to stress-related conditions, such as inflammatory bowel disease (IBD), a disorder of immune response exacerbated by stress that can be life-threatening. In a double-blind, randomized controlled trial, 29 patients with IBD at the Cornell-Weill Medical Center IBD Center were randomly assigned to either a BBM workshop (breathing, movement, and open focus attention training; see Chapter 25, "Open Focus Training for Stress, Pain, and Psychosomatic Illness") or an educational seminar of equal duration (Gerbarg et al. 2015). Both groups continued their usual IBD treatments. The interventions required 9 hours during 2 days plus a 1-hour follow-up per week for 6 weeks, then once a month. At 6 months, the BBM group had significantly greater improvements on the Brief Symptom Inventory ($P=0.04$), Beck Anxiety Inventory ($P=0.03$), Beck Depression Inventory (BDI; $P=0.01$), IBD Questionnaire ($P=0.01$), Perceived Disability Scale ($P=0.001$), and Perceived Stress Questionnaire ($P=0.01$) compared with no significant change on any measure in the control group. The BBM group had significant reduction in measures of IBD symptoms and the inflammatory marker C-reactive protein ($P=0.01$) compared with no change in the control group. Slow VRBPs (coherent breathing), through vagal activation of the cholinergic anti-inflammatory pathway, may trigger anti-inflammatory cascades within the gastrointestinal tract and promote healing. This study validates the potential to heal numerous conditions by counteracting disease-promoting processes at both psychological and physical levels.

KEY POINTS

- Voluntarily regulated breathing practices (VRBPs), by restoring autonomic balance, can relieve symptoms of stress, anxiety, depression, and trauma.
- Intensive practice of specific VRBPs with movement and attention training can potentially resolve long-standing symptoms of trauma.
- VRBPs can improve attention and cognitive function.
- Coherent breathing is a low-risk, low-cost, effective intervention that can be easily integrated into mental health care, medical treatments, school programs, and disaster response.

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