

# Features

## The Relaxation Response: Yoga Therapy Meets Physiology

By Maggie Reagh

It's Sunday, finally time to relax from a busy week as a university instructor and yoga therapist. My day starts with a trip to Buntzen Lake near Vancouver for a picnic with colleagues. After lunch, I come home for an afternoon nap in my zero-gravity chair. I finally feel ready to put pen to paper, having satiated my body and rested my mind. This is the typical way people relax: we rest, digest, and engage socially. But how do yogis relax, and how does it work physiologically?

### Relaxing through Positioning the Body

From a yogic perspective, when we do standing poses like *tadasana* (mountain pose), we ground our energy from head to feet by stimulating the *apana vayu* (the downward flow of energy). The same can be said of inversions and semi-inversions, such as shoulder stand, downward-facing dog, and standing forward bends where the head is lower than the heart. We experience the same grounding effect by bringing our bodies closer to the earth in supine and restorative poses. What was up (*udana*) comes down (*apana*). With this dramatic shift from standing with our heads in the clouds to bowing to the earth, we quickly experience the relaxation response.

When I started studying the physiology behind the practices we use as yoga therapists to help clients dealing with stress, anxiety, and chronic pain, it was heartening to learn that just changing the position of the body could offer my clients some quick relief. The most important principle I learned was that by putting the head lower than the heart in inversions and semi-inversions, we become more relaxed.<sup>1,2</sup>

As Carol-Ann Courneya, PhD, a University of British Columbia cardiovascular physiologist, explained to Yoga Therapy International yoga therapist trainees, "In the event that a positional change results in an increase in blood pressure or a perceived increase in blood pressure in the carotid sinus or aortic baroreceptors, the physiological response is to stimulate the parasympathetic nerves to lower the heart rate. It may well be with inversions that increased blood flow causes the (now)



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dependent parts of the body, i.e., head and neck, to experience a temporary increase in blood pressure, resulting in a slower heart rate."<sup>1</sup> Inverted and even supine poses, therefore, may create a parasympathetic vagal response via the baroreceptor reflex.<sup>2</sup> As my Iyengar yoga teacher used to say, "Have a headache? Legs-up-the-wall. Have a fight with your boyfriend? Legs-up-the-wall. Exhausted? Legs-up-the-wall." Any time we bring the head lower than the heart through inversions or semi-inversions, we can instantly reduce our stress, anxiety, and pain levels by promoting relaxation.

Another positional way we can do this might be by compressing the digestive tract through forward bends or rotational twists.<sup>1</sup> These poses are postulated to bring us into the relaxation response by compressing the vagus nerve in the gut and by changing the blood flow in the body, which activates the baroreceptors to create blood pressure homeostasis. Stephanie Shorter, PhD, also suggests, "you can mechanically stimulate the vagus nerves by pressure and movement."<sup>3</sup> My own review of the literature indicates a need for more evidence to verify how this works when compressing the gut. The current research mainly focuses on stimula-

tion of the cervical end of the vagus nerve, not at the other end found in the digestive system.<sup>4,5</sup> Hopefully, more research will verify what yogis experience: when we compress the gut, we feel more relaxed, even when the head is not lower than the heart.

### Relaxing through Lengthening the Breath

From Patanjali's Yoga Sutras (1:34), we know that when we lengthen the breath and hold it after exhale, the mind becomes clear of its *antarayas* (obstacles). Patanjali also asks us to cultivate a breath that is long and subtle (11:51), as this leads to the uncovering of our natural luminosity (11:52). We also experience this when working with *ujjayi* (victorious) or *brahmari* (bee) pranayamas or even by chanting and singing. Brahmari, in fact, is said to activate not only the throat but also the digestive tract, so perhaps the whole vagus (parasympathetic) nerve is being stimulated with bee breathing. We are able to lengthen our breath further and stimulate our throat chakra when making these yogic sounds.

Evidence is growing in support of breath-based approaches to yoga asana and pranayama practices that work with five and a half to six breaths per minute.<sup>5,7</sup> This means that each breath is around 10 seconds long (5 seconds of inhalation and 5 seconds exhalation). The research also suggests that this ratio improves both heart rate variability (HRV) and vagal tone.<sup>6</sup> HRV essentially measures the gaps between heartbeats as we inhale and exhale. A healthy heart rate increases as we inhale and decreases as we exhale, leading to the desirable high HRV.<sup>3</sup> Increased vagal tone is also a predictor of better health, as it measures how well our nervous systems can downregulate the sympathetic response (fight-or-flight reaction) by activating the vagal parasympathetic nervous system (rest-and-digest response).<sup>8</sup> By lengthening the breath to around 5 seconds on inhale and 5 seconds on exhale, our nervous systems become more balanced; we become more resilient to the inevitable stressors of life and more able to respond with the equanimity (*upeksha*) of a yogi.

Stimulating the throat through bee or victorious breathing is said to activate the

cervical branch of the ventral vagus nerve, running from the throat, face, and ears to the lungs, heart, and diaphragm in the front (ventral) body. Arielle Schwartz, PhD, claims, “The vagus nerve passes through by the vocal cords and the inner ear and the vibrations of humming is a free and easy way to influence your nervous system states.”<sup>9</sup> This stimulation leads to downregulation of the sympathetic nervous system by activating the ventral vagus nerve’s parasympathetic response. There is also a link between vagus nerve stimulation and massaging the carotid arteries of the neck, a practice that causes the carotid sinus baroreceptors to slow the heart rate and lower the blood pressure by activating the relaxation response.<sup>4,5</sup> All of this research also points to encouraging a parasympathetic response by stimulating the ventral vagus nerve with neck movement. Yogis like Nathamuni<sup>10</sup> say that neck movement and *jalandhara bandha* (chin lock) block *udana vayu* (upward-moving energy, perhaps in some ways analogous to the sympathetic response) and encourage *apana vayu* (downward-moving energy, perhaps aligned with the parasympathetic response). More research is needed to verify this yoga-based supposition.

### Relaxing through Stilling the Mind

Mindful movement during a breath-based approach to asana allows a focus on the length and sound of the breath as well as on the pauses between the inhales and exhales. Observing the natural breath while holding poses longer serves the same function and prepares us to meditate. By practicing being present and detaching from distractions (see Yoga Sutra I:12), we make conscious what is normally unconscious. The automatic breath becomes intentional, and the wandering unconscious mind becomes still. We may visualize and feel with our interoception (sense of the inner body) grounding images related to earth and water: sitting in the center of a mountain, standing on the earth, or lying in water. These *bhavanas* (inwardly felt visualizations) help us to embody the grounding qualities of these earthy objects of meditation.

Through meditation and mindfulness practices, the gray matter in the insula and sensory regions of the brain increases, as does that in the prefrontal cortex.<sup>11</sup> In a 2015 talk, Harvard neuroscientist Sara Lazar, PhD, spoke of four regions of the brain that thicken and strengthen with the regular mental exercise of meditation: the posterior cingulate cortex (lessens mind wandering), the left hippocampus

(involved in cognitive processes and emotional regulation), the temporoparietal junction (increases compassion), and the pons (a part of the brainstem that produces regulatory neurotransmitters). Finally, the part of the brain responsible for anxiety, fear, and stress—the amygdala—gets smaller in those with mindfulness practices.<sup>11</sup>

### A Balanced Nervous System

Ultimately, from a psychophysiological perspective, we seek balance between our sympathetic and parasympathetic nervous systems. From a yogic perspective, we seek to balance the length and quality of our inhales and exhales, our left and right *nadis* (energy channels), and our three *gunas* (states of being): *tamas* (confusion), *rajas* (frenzy), and *sattva* (harmony).

#### *Sthira Sukham Asanam (Yoga Sutra II:46)*

May we find the balance between stability and flexibility in our asana (postural) practice.

May we practice being present and grounded (*asa-*) in the body, breath, and mind so that we can become stable without becoming stuck (*sthira*), and flexible without becoming flakey (*sukham*).

May we become attentive without tension (*sthira*) and relaxed without laziness (*sukham*).

According to Yoga Sutra II:18–20, the mind’s three qualities become balanced as the heaviness of *tamas* becomes *sthita* (stability) and the hyperactivity of *rajas* becomes *kriya* (skillful action), leading to *sattva* and *prakasha* (luminosity and clarity) so that the light of the soul can shine through this relaxed yet stable mind.

### Final Reflection: Yoga Therapy Meets Physiology

By bringing the head lower than the heart in partial and full inversions and lying on the ground in supine poses, we are able to downregulate our sympathetic mobilization response and encourage an adaptive parasympathetic relaxation response. The same may be true of any asana that compresses the digestive tract below the diaphragm—such as in seated forward bends or rotated twists—stimulating the dorsal vagus nerve and baroreceptor response to blood-flow changes. In addition, by lengthening the breath to around six respirations per minute, we can improve our HRV and parasympathetic vagal tone. Finally, during mindfulness meditation practices, portions of our brains

thicken and strengthen, presumably leading to increased mental concentration, emotional regulation, and heartfelt compassion, in addition to less stress, fear, and anxiety.

Learning how to harness this powerful relaxation response through yogic practices focused on body, breath, or mind may be our first step toward experiencing this deeper awakening called yoga. **YTT**

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