

## Effects of pranayama on cardiovascular health

The Second International Yoga Day was celebrated on June 21, 2016, in a great fervor worldwide. People throughout the globe participated in this yoga day celebration enthusiastically. Although still there are some reservations from some quarters for the practice of yoga and they have apprehension that yoga may be made compulsory for all, yoga is never discriminatory. Therefore, emphasizing that yoga does not discriminate, the United Nations Secretary-General Ban Ki-moon in his message for the first International Yoga Day had stated that "...And yoga does not discriminate; to varying degrees, all people can practice, regardless of their relative strength, age or ability. I discovered this for myself on trying to do my first asana, a tree pose suited to beginners. It took a moment for me to gain my balance, but once I did, I appreciated the simple sense of satisfaction that yoga can bring." There was overwhelming support from all parts of the world for the International Yoga Day.

Yogic practices help in revamping all the systems: The physical, mental, and vital (energy) bodies.<sup>[1]</sup> Yoga is a pure science and offers very practical and systematically designed techniques of practice. Yoga endorses that to reach the highest level of super-consciousness, man has to attain the highest level of realization, which can be accomplished by living a life self-disciplined and with the development of the physical, mental, and vital bodies. In Hatha yoga, the body is stretched to the maximum through slow movements with which each posture is maintained, which is meant to increase body flexibility. As long as the body is supple, it remains young. Pranayama, the controlled and conscious breathing exercise is a curative measure against a variety of physical and mental ailments and increases one's immunity and resistance to diseases.

Yoga is very essential for present day human beings as the level of stress is high in social life. Yoga promotes relaxation of body and mind. In yoga relaxation techniques, the sympathetic discharge is inhibited and parasympathetic discharge is facilitated.<sup>[2]</sup> Thus, relaxation therapies in yoga such as meditation, yoga nidra, concentration on devotional songs or spiritual music, asanas for body relaxation such as shavasana, and pranayama ensure mind-body relaxation and facilitate sympathovagal homeostasis.<sup>[3]</sup> However, for achieving sympathovagal balance and maximum relaxation, emphasis is given more on pranayama (practice of controlled breathing exercises). Pranayama (prana + ayama) is the controlled breathing in which

the practitioner regulates his breathing (ayama) and concentrates on imbibing cosmic energy (prana) from the atmosphere through breathings.<sup>[1]</sup> In normal breathing, inspiration is longer and duration of expiration may be less than half of the inspiration. During inspiration, heart rate is more due to less vagal tone and during expiration heart rate is less due to more vagal tone (sinus arrhythmia). Taking advantage of this physiological phenomenon of sinus arrhythmia, yogis (yoga luminaries) had practiced pranayama as part of their natural living and lived healthily for centuries and attained a kind of immortality.

Pranayama is classified into two categories: Fast pranayamas and slow pranayamas.<sup>[1]</sup> In fast pranayamas such as kapalabhati, bhastrika, and bellows breathing, the respirations are faster but deep. In slow type of pranayamas, such as anulom-vilom (alternate nostril breathing), chandranadi (left nostril breathing), sitkari (cooling breaths), and bhramari (breathing with vibrations through ear), respirations are slower, deeper, and more prolonged with greater duration of expiration.<sup>[1]</sup> By reducing inspiration and lengthening expiration, the vagal nerve traffic is more strengthened. This improves the cardiac vagal modulation and increases vagal tone. Thus, heart rate is reduced and heart rate variability (HRV) is improved. It has also been explained that in slow pranayamas, gradual and graded increase in lung volume and rib cage increases nerve traffic from thoracic cage proprioceptors that strengthen vagal tone through the central limbic-hypothalamic influence of the sensory projections to thalamus and cortex.<sup>[4,5]</sup> Furthermore, it has been observed that such pranayamas augment cerebral blood flow and oxygenation that improves neuronal activities of the brain centers including those present in the limbic areas, hypothalamus, and medulla, and improve sympathovagal outflow.

It has been recently reported that improvement in vagal tone is not only essential for stable cardiovascular (CV) health but also essential for maintaining the fitness of the body as a whole, the integral health.<sup>[6]</sup> Slow pranayamic breathing has also been reported to reduce sympathetic activity and improve sympathovagal balance. The practice of fast pranayama and suryanadi pranayama (right nostril breathing) has been reported to increase sympathetic activity, and practice of chandranadi pranayama reported to decrease sympathetic activity.<sup>[7]</sup> Thus, pranayama is directly linked to autonomic activity, regulation of heart rate, and HRV. Decrease in heart rate physiologically by practice of yoga or exercise improves HRV. Although resting heart

rate can vary widely in normal healthy subjects ranging from 60 to 100 beats/min, tachycardia, especially heart rate >75/min, has been reported to decrease HRV, which is an established CV risk. Pranayama is very effective in reducing heart rate and CV risks, and in improving CV health.

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