Chapter 1
Psychophysiological Effects and the Applications of Yoga Breathing Practices

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ABSTRACT

Yoga is an ancient practice that originated in India and aims at purifying the mind for spiritual progress. In modern times yoga is widely practiced for general health and well-being as well as for therapeutic reasons. Voluntary breath regulation or pranayama has been given significant importance in traditional texts as well as by yoga masters. Research has shown beneficial effects of yoga breathing practices or pranayamas on neurocognitive, metabolic, respiratory, and autonomic functions, which are discussed in the chapter. The chapter also discusses the applications of these practices for the management of various clinical conditions as well as for alleviating psychological problems associated with particular illnesses. The beneficial effects of yoga breathing practices demonstrate the importance of these safe and cost effective non-pharmacological interventions for general health as well as for prevention and management of various diseases.

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INTRODUCTION

Yoga is an ancient science which originated thousands of years ago in India primarily for spiritual progress and self-enlightenment. Though the origin of yoga is difficult to trace, its presence can be found in the Indus valley civilization, one of the world's oldest known civilizations which dates more than nine thousand years back (Sarkar et al., 2016; Dhyansky, 1987). Archaeological seals, such as that of a deity sitting in a yoga-like position suggests that yoga may have been practiced at that time (Dhyansky, 1987). The written descriptions of yoga can be found in the Vedas which are among the oldest written texts (Bhavanani, 2012). Though the Vedas were not in the written form originally, the compilations today date from *Circa* 10000 B.C. (Bhavanani, 2012). The *Rigveda* contains a number of verses describing yoga as a practice to control the mind (Bhavanani, 2012). The *Atharvaveda* talks about *prana*, the vital energy and the *chakras,* the energy centers in the *pranic* body (Bloomfield, 1897). After this the sage Patanjali wrote the *yoga-sutras* in which he systematically and exclusively compiled the wisdom of yoga in the form of aphorisms (*Circa* 900 B.C.) (Miller, 1996). This work remains as the most fundamental manual for yoga scholars as well as for yoga enthusiasts in the present time. There are 196 aphorisms in four chapters which define yoga as a means of self-enlightenment through the course of eight limbs (Miller, 1996). This is also known as the eight-fold path or *astanga* yoga and consists of the ethical precepts (*yamas* and *niyamas*), physical postures (*asanas*), breathing practices (*pranayamas*), control of the senses (*pratyahara*), deep concentration (*dharana*), meditation (*dhyana*) and the highest state of consciousness (*samadhi*).

Out of the eight stages of yoga, voluntarily controlled breathing or *pranayama,* the fourth stage is the topic of this chapter. Etymologically, the word *pranayama* (in Sanskrit) means voluntarily slowing down and prolonging breathing. Ancient yoga masters realized the close connection between the breath and the mind hence these *pranayamas* or voluntarily regulated yoga breathing techniques are given special emphasis. This can be understood by a verse from the *Hatha Yoga Pradipika* (*Circa* 300 A.D.) which states "when the *prana* (used interchangeably with breath) is irregular, the *chitta* (mind) is unstable, when the *prana* is without movement the *chitta* is stable" (*Hatha Yoga Pradipika*, Chapter II, Verse 2) (Muktibodhananda, 2002).

The relationship between the breath pattern and health is well established (Lieber & Mohsenin, 1992). Apart from this, breathing has been associated with higher brain functions. Zelano and colleagues (2016) found brain activity to be synchronized with the act of breathing during voluntary breath regulation measured through the recordings of intracranial electroencephalography (iEEG) in patients with epilepsy. In a separate study by the same authors and reported in the same article, nasal inhalation was found to facilitate recognition of facial expressions and recall of the objects shown (Zelano et al., 2016). When participants were instructed to breathe through the mouth these effects were not seen. Hence breathing can influence the brain and this is modulated by several factors such as nasal versus mouth breathing, inhalation in relation to exhalation and the nostril which is patent.

In yoga the voluntary control of breathing involves one of the following aspects: change in the rate of breathing, change in the depth of breathing, manipulation of the nostril breathed through, including a period of breath holding and producing a sound during breathing. These alterations to the breathing pattern are the basis for various yoga breathing practices such as alternate nostril yoga breathing or *anulom-vilom pranayama*, bellows yoga breathing or *bhastrika pranayama*, high frequency yoga breathing or *kapalabhati pranayama,* as examples. The psychophysiological effects of these yoga breathing practices were discussed earlier (Telles & Singh, 2018) and are further elaborated here.