

Yoga and Cardiovascular Health:  
Exploring Possible Benefits and  
Postulated MechanismsAnanda Balayogi Bhavanani<sup>1\*</sup><sup>1</sup>Deputy Director, Centre for Yoga Therapy, Education and Research (CYTER), Mahatma Gandhi Medical College and Research Institute (MGMCRI), India

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## Abstract

**Background:** Yoga as a mode of therapy has become extremely popular, and a great number of studies and systematic reviews offer scientific evidence of its potential in treating a wide range of psychosomatic conditions. Healthy life can be considered as a by-product of practicing yogic techniques since it has been observed that yoga practitioners are physically and mentally healthier and have better coping skills to stressors than the normal population.

**Aims and objective:** This review paper details some of the health promoting benefits of yoga with regard to cardiovascular health and discusses mechanisms for such beneficial physiological, biochemical and psychological effects. Psycho-neuro-endocrine changes including correction of Gamma Amino-Butyric Acid (GABA) activity, and parasympathetic activation coupled with decreased reactivity of sympathoadrenal system and Hypothalamo-Pituitary-Adrenal (HPA) axis are highlighted.

**Conclusion:** Though most studies and reviews suggest a number of areas where yoga may be beneficial for cardiovascular health, more research is required to establish these benefits conclusively. It is important to develop objective measures of various mind-body therapies and their techniques while including them in intervention trials. In conclusion, we can say that yoga has preventive, promotive as well as curative potential as an adjunct therapy and that a yogic lifestyle confers many advantages to the practitioner.

## Introduction

The popularity of yoga and its application as a therapy are increasing day by day all over the world. Yoga maharishi Dr. Swami Gitananda Giri Guru Maharaj, the visionary founder of Ananda Ashram at the International Centre for Yoga Education and Research (ICYER), Pondicherry, India (www.icyer.com) and one of the foremost authorities on Yoga in the past century exclaimed lucidly, "Yoga chikitsa is virtually as old as yoga itself, indeed, the return of mind that feels separated from the Universe in which it exists represents the first yoga therapy. Yoga chikitsa could be termed as man's first attempt at unitive understanding of mind-emotions-physical distress and is the oldest wholistic concept and therapy in the world." [1] Healthy life can be considered as a by-product of practicing yogic techniques since it has been observed that yoga practitioners are physically and mentally healthier and have better coping skills to stressors than the normal population. Knowledge of inexpensive, effective and easily administrable yogic techniques by health professionals will go a long way in helping us achieve the goal of the World Health Organization to provide "physical, mental, spiritual and social health" for all sections of human society.

When we recognize that cardiovascular disease is basically a lifestyle disorder, we realize that the holistic science of yoga considered by many as the best life style has a definite role in its prevention and management as well as rehabilitation [2]. Both modern medicine and yoga have sound scientific basis and are, therefore, natural allies. The addition of yoga as an adjunct therapy through integrative medicine enhances preventive, curative as well as rehabilitative potential of both systems. The holistic action of yoga can be explained on the basis of its ability to modulate autonomic functions, relieve stress, improve physiological functions including cardio-respiratory fitness and improve quality of life

## Research Findings

Many studies have tried to explore the mechanisms by which yoga modifies coronary artery disease risk factors. Ornish et al [2], Manchanda et al [3] and Yogendra et al [4] have conducted prospective, randomized and controlled trials on angiographically proven coronary artery disease patients with yoga intervention and demonstrated that yoga based lifestyle modification helps in regression of coronary lesions and improvement in myocardial perfusion. The effect of yogic lifestyle on some of the modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Manchanda et al reported that a yoga lifestyle retards progression / increases regression of coronary atherosclerosis in severe coronary artery disease. [3] They also found that it improves symptomatic status, functional class and risk factor profile. Another study by Bijlani et al concluded that even a short lifestyle modification and stress management education program could lead to favorable metabolic effects and reduces risk factors for cardiovascular disease and diabetes mellitus [5].

Comprehensive reviews by Innes et al have suggested that yoga reduces the cardiovascular risk profile by decreasing activation of sympatho-adrenal system and hypothalamic-pituitary-adrenal axis and also by promoting a feeling of wellbeing along with direct enhancement of parasympathetic activity [6-7]. They also suggested that yoga provides a positive source of social support that may also be one of the factors reducing risk for cardiovascular diseases. In fact all the studies reviewed by them suggested that yoga improves lipid profile, and as this is an important risk factor for heart disease, such a possibility needs further exploration in greater detail. Their 2005 review covered 70 eligible studies investigating the effects of yoga on risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga, and they reported that most had a reduction of systolic and/or diastolic pressure [6]. They however also noted that there were several noted potential biases and limitations that made it difficult to detect an effect specific to yoga.

The cardiovascular health promoting benefits of yoga have been studied in a literature review that reported significant improvements in overall cardiovascular endurance of young subjects who were given varying periods of yoga training [8]. Physical fitness increased as compared to other forms of exercise and longer duration of yoga practice produced better cardiopulmonary endurance. Another detailed review of yoga in cardiac health concluded that yoga is beneficial in the primary and secondary prevention of cardiovascular disease and that it can play a primary or a complementary role in this regard [9].

A recent retrospective review of clinical data to determine cardiovascular effects of a single yoga session in 1896 normal subjects as well as patients of different medical conditions at the Centre for Yoga Therapy, Education and Research (CYTER), in the Sri Balaji Vidyapeeth at Pondicherry, India showed healthy reductions in Heart Rate (HR), Blood Pressure (BP) and derived cardiovascular indices following a single yoga session. The magnitude of this reduction depended on the pre-existing medical condition as well as the yoga therapy protocol adopted. These changes were attributed to enhanced harmony of cardiac autonomic function as a result of coordinated breath-body work and mind-body relaxation due to yoga [10].

## Managing Stress

It is well established that stress weakens our immune system. Scientific research in recent times has shown that the physiological, psychological and biochemical effects of yoga are of an anti-stress nature. A majority of studies have described beneficial effects of yoga interventions in stress with an Agency for Healthcare Research and Quality (AHRQ) report stating that “Yoga helped reduce stress” [11]. Reductions in perceived stress following yoga are reported to be as effective as therapies such as relaxation, cognitive behavioral therapy and dance therapy.

Mechanisms postulated include the restoration of autonomic balance as well as an improvement in restorative, regenerative and rehabilitative capacities of the individual. A healthy inner sense of wellbeing produced by a life of yoga percolates down through the different levels of our existence from the higher to the lower levels producing health and wellbeing of a holistic nature. Streeter et al recently proposed a theory to explain the benefits of yoga practices in diverse, frequently co-morbid medical conditions based on the concept that yoga practices reduce allostatic load in stress response systems so that optimal homeostasis is restored [12]

They hypothesized that stress produces an:

- Imbalance of the autonomic nervous system with decreased parasympathetic and increased sympathetic activity,
- Under activity of the Gamma Amino-Butyric Acid (GABA) system, the primary inhibitory neurotransmitter system, and
- Increased allostatic load.

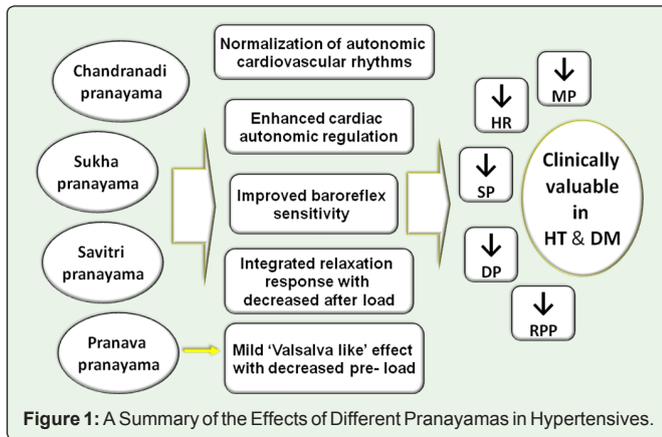
They further hypothesized that yoga-based practices i) correct under activity of the parasympathetic nervous system and GABA systems in part through stimulation of the vagus nerves, the main peripheral pathway of the parasympathetic nervous system, and ii) reduce allostatic load.

According to the theory proposed by them, decreased parasympathetic nervous system and GABA ergic activity that underlies stress-related disorders can be corrected by yoga practices resulting in amelioration of disease symptoms. A review by Bhavanani concluded that Heart Rate Variability (HRV) testing has a great role to play in our understanding of the intrinsic mechanisms behind such potential autonomic balancing effects of yoga [13] Innes et al had earlier postulated two interconnected pathways by which yoga reduces the risk of cardiovascular diseases through the mechanisms of parasympathetic activation coupled with decreased reactivity of sympathoadrenal system and Hypothalamo-Pituitary-Adrenal (HPA) axis [6].

## Possible Mechanisms

The BP lowering ability of yoga training has been documented by Patel and North, Datey *et al.*, Sundar *et al.* and Vijayalakshmi *et al.* [14-17]. Yoga training blunts exercise-induced increase in HR and BP [18]. while shavasana in particular has been found to reduce load on the heart by blunting sympathetic response [19]. Shavasana and pranayama have also been found to be beneficial in patients having premature ventricular complexes and palpitations [20]. Udupa *et al.*, [21]. Reported that pranayama training decreased basal sympathetic tone, increased basal parasympathetic activity and decreased load on the heart and such breathing exercises and relaxation training have been documented to have beneficial effects in patients with previous myocardial infarction [22].

Mechanisms for these changes have been suggested to be via improvement of baroreflex sensitivity and attenuation of sympathetic and rennin angiotensin activity following yoga training [23] Decreased BP, drug score and risk factors such as blood glucose, cholesterol and triglycerides as well as overall improvement in subjective well being and quality of life with reduced sympathetic activity and oxidant stress are some of the mechanism suggested for positive health promoting changes. It has been reported that Yoga improves



‘heart friendly’ status of lipid profile in peri and post menopausal patients with type 2 diabetes mellitus [24] and Damodaran *et al.*, [25]. Suggested that yoga can play an important role in risk modification for cardiovascular diseases. A systematic review by Yang [26-32] articles published between 1980 and 2007 found that yoga interventions are generally effective in reducing body weight, BP, glucose level and high cholesterol.

The comprehensive review by Innes and Vincent<sup>7</sup> found beneficial changes in several risk indices, including glucose tolerance, insulin sensitivity, lipid profile, anthropometric characteristics, BP, oxidative stress, coagulation profiles, sympathetic activation and pulmonary function, as well as improvement in specific clinical outcomes. They suggested that yoga may improve risk profiles in adults with non insulin dependent (NIDDM) and may have promise for the prevention and management of cardiovascular complications in this population.

Figure 1 depicts salient features of a series of studies at Pondicherry, India [24, 27-33] that have documented immediate effects of various pranayamas in hypertension where yoga has been shown to be an effective adjunct therapy. Different pranayamas were studied in patients of hypertension and postulated mechanisms behind Healthy Reductions in HR, Systolic Pressure (SP), diastolic pressure, mean pressure and BP indices such as rate-pressure product and double product were determined. Beneficial immediate results of sukha (inhalation = exhalation), savitri (6:3:6:3 rhythm for inhalation: held in: exhalation and held out breath) in sitting and supine positions, chandra nadi (exclusive left nostril breathing) and pranava pranayamas (using audible AUM chanting during prolonged sequential exhalation in sitting and supine positions) were reported. These changes were attributed to a normalization of autonomic cardiovascular rhythms as a result of increased vagal modulation and / or decreased sympathetic activity and improved baroreflex sensitivity along with an augmentation of endogenous nitric oxide production. The prolonged exhalation phase of pranava pranayama was hypothesized to mimic Valsalva maneuver resulting in decreased venous return, cardiac output and SP. These findings have potential therapeutic applications in day-to-day as well as clinical situations where BP needs to be brought down at the earliest. These simple and cost effective techniques may be added to the management protocol of hypertension in addition to regular medical management.

**Conclusion**

The majority of studies on yoga and cardiovascular health show positive trends and this augurs well for the future of healthcare in general and the use of yoga as part of integrative health care system in particular. The major benefits of yoga may occur due to its lifestyle components (healthy diet, activity, relaxation and positive attitude) as well as the psychosomatic harmonizing effects of pranayama and yogic relaxation. According to tradition, yoga implies both the process as well as the attainment of a state of psychosomatic, harmony and balance (samatvam yoga uchyate-Bhagavad Gita) and this restoration of physical, mental, emotional and spiritual balance may be the prime factor behind the changes seen across all short term and long term studies.

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