



YOGA AND ITS PHYSIOLOGICAL EFFECTS ON MIND AND BODY

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ABSTRACT

Yoga is an ancient Indian way of life which includes changes in mental attitude, diet and practice of certain techniques such as *Yoga Asanas* (postures), breathing practices (*Pranayama*) and meditation to attain the highest level of consciousness. Since yoga aims at perfection of body and mind, it is natural to ask whether the progress towards perfection is reflected in objective reproducible changes in physiological variables. The amazing claims made by some yogis such as their ability to stay underground for long periods or to stop the heartbeat voluntarily, have posed a challenge to scientists to either confirm or refute these claims. Further, the claims regarding wide ranging therapeutic benefits of yoga have prompted scientists to examine whether there is any physiological basis for such claims.

Key words: *Yoga, Mana, Atma, Pranayama*

INTRODUCTION

Physiology is concerned with the scientific study of functioning of human body. There are various systems working in a human body. The principal systems are the nervous system, the endocrine system, the respiratory system, the circulatory system and the digestive system. In a state of good health, these systems function in harmony with each other¹.

In order to maintain this harmony, various exercises have been prescribed. The physiological value of an exercise depends upon its capacity to confer health upon the person practicing it. Yoga prescribes several practices which help to maintain proper functioning of these systems¹.

Concepts and practices of yoga originated in India several thousand years ago. Its founders were great saints and sages. The great yogis gave rational interpretation to their experiences of yoga and brought about a practical and scientifically sound method within everyone's reach. Yoga today is no longer restricted to hermits, saints and sages and it has taken its place in our everyday lives and has aroused a worldwide awakening and acceptance in the last few decades. Experts of various branches of medicine including modern medical science are realizing the role of yogic techniques in prevention of disease, mitigation and cure of disease and promotion of health².

LIMITATIONS AND DIFFICULTIES

Performing scientific studies on yoga is not easy. First sincere and sustained pursuit of yoga is not very common. Secondly, sincere and serious yogis shun

publicity, being an ego boosting exercise and it interferes with their sadhana. Finally, some of the most significant changes induced by yoga are attitudinal and subjective and hence can only be experienced by the yogi. Experiences are difficult to describe in words and more difficult to depict in terms of physiological or biochemical variables. In spite of all these limitations, several studies have been conducted on the physiological effects of yogic practices³.

I would like to present some of the studies conducted at various institutes showing physiological effects of yogic practices and transcendental meditation on various systems of human body.

EFFECTS ON HUMAN BODY

CARDIOVASCULAR EFFECTS

The study was conducted at Defence Institute of Physiology and Allied Sciences. It was found that a combination of asanas for three weeks if done, reduced resting heart rate and blood pressure (systolic and diastolic). It restores baroreflex sensitivity towards normal in patients of Essential Hypertension.⁴

RESPIRATORY EFFECTS

Yogic Asanas and *pranayama* reduce resting respiratory rate. They increase vital capacity, timed vital capacity, maximum voluntary ventilation, maximum inspiratory pressure, maximum expiratory pressure, breath holding time. In a study involving comparison of routine NDA training two groups were made, one athletic group which

performed routine physical exercises and the other yogic group which did *Asanas* and pranayama. The yogic exercise group showed maximum improvement in respiratory functions.⁵

METABOLIC RATE

Prof. B.K. Anand and his colleagues at AIIMS conducted a study on a yogi who could spend long periods of time underground. He was kept in an airtight box while his oxygen consumption and carbon dioxide production were measured. It was found that during his stay in the box, the yogi could lower his metabolic rate to nearly half his Basal Metabolic Rate (BMR). A reduction in oxygen consumption has also been demonstrated during transcendental meditation.⁶

BMR: It is the amount of energy expended while at rest in a neutrally temperate environment, in the post absorption state (12 hours after digestion)

Meditation is a wakeful hypometabolic state. Meditation slows down metabolism, it slows down wear and tear resulting from life processes, or in other words it slows down the aging process. Wallace assessed the biological age of meditation using three variables- B.P., acuity of hearing and degree of presbyopia. He found that those who had been meditating regularly for more than five years were biologically twelve years younger than what their chronological age would indicate.⁷

ENDOCRINAL EFFECTS

A reduction in average glucocorticoid level is seen. But glucocorticoid response to an acute challenge is enhanced that means lower

level of stress and enhanced capacity to cope up with a challenge.

Certain *Asanas* described in Diabetes reduce fasting blood glucose. Also certain asanas described in atherosclerosis reduce serum cholesterol.

Higher night plasma melatonin levels are immediately seen following meditation.³

EFFECTS ON NERVOUS SYSTEM

Professor B.K. Anand and his colleagues at AIIMS observed a preponderance of α waves in EEG of yogis indicating a more relaxed state of mind. Also any sensory stimuli which normally block the α rhythm, could not do so in yogis during meditation.

Analysis of 24 hr. EEG in those practicing transcendental meditation has shown an increase in α/δ power indicating reduction in time spent sleeping and decrease in β/α power which shows a more relaxed mind in awake period.

A better synchrony is seen in EEG of both sides of brain and from frontal and occipital leads indicating enhanced creativity.⁸

A study conducted at Swami Vivekananda Yoga Research Foundation showed that during meditation there was a significant reduction in heart rate but an increase in cutaneous peripheral vascular resistance indicating a physiologically relaxed state but increased mental alertness.⁹

Unilateral Forced Nostril Breathing (UFNB) affects cerebral hemispherical dominance. Left side UFNB leads to right hemispherical dominance and improves spatial skills. Right side UFNB leads to left hemispherical dominance and improves

verbal skills. Pattern of cerebral blood flow is different during meditation as compared to resting phase of normal awake state.¹⁰

Studies on autonomic functions indicate that yogic practices bring about a tilt towards parasympathetic dominance. One of the yogis voluntarily slowed down his heart rate and even achieved disappearance of P wave in ECG for as long as 16 cycles. The study was conducted at AIIMS.⁸

Galvanic skin response (GSR) is used in studies on autonomic function. Sympathetic activity following an alerting stimulus leads to palmar sweating. Sweat being a good conductor leads to fall in electrical resistance of skin. The magnitude of response is considered as indicator of sympathetic reactivity. Those who practice transcendental meditation have fewer spontaneous GSRs, indicating lower reactivity to stressful stimuli.⁸

Studies by Dr. Shirley Tellas and her colleagues practicing asanas, pranayama, meditation and tratakas and attending devotional sessions for 10 days led to significant improvement in fine coordinated movements.¹¹

YOGA AS GENE EXPRESSION

Yoga has a positive impact on genetic level. It works at molecular level changing the expression of 111 genes. The research team did the experiment with 10 participants who practiced various asanas, breathing exercises & meditation for 2 hours for first 2 days and then shifted to spending time in nature walk and listening to music for next 2 days. Blood was drawn before and after each session. They found that yoga changed the expression of almost triple the

number of genes in immune cells than the nature walk did, 111 vs. 38. The study has been published in Pacific Standard.¹²

OM ENCHANTING

A sensation of vibration is experienced during OM chanting. It stimulates vagus nerve through its auricular branches and effects on the brain thereof. Function MRI indicates that OM chanting did limbic system deactivation. (Limbic lobe is associated with emotions)¹³

SURYA NAMASKAR (Salutation to Sun)

Surya namaskar is the most useful and popular mode of yogic exercises which briefly bestows the benefits of asanas, pranayama and mudras altogether. It consists of a series of 12 postures which are performed early in the morning facing the rising sun. Surya namaskar energizes the entire neuro-glandular and neuro-muscular system of the body and its regular practice ensures a balanced supply of oxygenated blood and perfect harmony to all the systems of the body, thus invigorating the entire psychosomatic system of human constitution.¹

CONCLUSION

Systematic research with proper control carried out in India and abroad to evaluate the prophylactic, promotive and curative potentials of yoga, indicated that long term yogic practice leads to enhancement of parasympathetic activities, provides stability of autonomic balance during stress, produces a relative hypermetabolic state, improves thermoregulation efficiency, body flexibility, improves cognitive functions such as concentration, memory, learning, efficiency and vigilance.

It is a well-known dictum that “frequent use of a physiological process strengthens it”. And if so half-hearted yoga done for one hour each day for 3-6 months can do significant results than how much more might possibly be accomplished if yoga becomes a way of life.

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