



## Discussion

Proposed identification of physiological classification and theoretical mechanisms of *yogāsanas*

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## ABSTRACT

Yoga in the theoretical and practical form is now accepted all over the world, by the researchers as well as by the general population. *Yogāsana* or Yogic postures are one of the main foundations of practical yoga. Mechanisms of Mediation and *Prānāyāma* has already been established. In this article, the author is for the first time proposing physiological classification of *Yogāsana* i.e. (a) Stretch (b) Contraction (c). Neuromuscular Coordination (d) Sense Reduction (e) Spine Brain Activation. In support of this physiological classification author has proposed five hypothetical theories i.e. (i) Stretch Relaxation Awareness (ii) Contraction Relaxation Awareness (iii) Ballistic Contraction Relaxation Awareness (iv) Sensory Motor Function Awareness and (v) Vital Energy Flow Awareness to understand the underlying mechanisms of *Yogāsana* practice and to explain its benefits.

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## 1. Introduction

## 1.1. Yoga and Yogasana (Yogic posture)

Yoga is an ancient *Bharatian* (Indian) and *Hindu* culture. Archaeological evidence of Yoga seals (3300 BC) were excavated from the Harrapan civilization or Indus valley civilization [1–6]. The *Vedas*, world's oldest literature (2500 BCE) and *Upanishads* elucidated the wisdom of Yoga from the time of Vedic period [7,8]. Yoga culture was an essential part of *Vedic tapabana ashramic* educational system and in daily life from that time. *Ramāyana* and *Mahābhārata* the historical marvel of India recognised the practice and benefits of Yoga in *Chaturāshramas* of life: *Brahmacharya*-(celibate student hood and life building time, up to the age 25 years); *Gārhasthya* (house holder stage and family life up to the age of 50 years); *Vāṇaprastha* (detachment from the family life, up to the age of 75 years); and (complete detachment and surrender to the God, after the age of 75 years). In the time of *Mahābhārata*, *Srīmadbhagavadgītā*, the conceptual gist of *Vedas* and *Upanishads*, was written with all its 18 chapters' names attached with Yoga. It was the first time, Yoga was elaborated for general population and through it the general

population received direction to cope with this world. *Gītā* described the four main paths of life: *Jñāna Yoga* (Wisdom seeker); *Bhakti Yoga* (Devotion maker); *Karma Yoga* (Selfless worker) and *Dhyāna Yoga* (Practical experiencer) to achieve success and peace in life. *Takshashila* university (600 BCE), the world's oldest University and *Nalanda*, another ancient university of India introduced compulsory Yoga in all their educational curriculums. During and after *Bauddha* and *Jain* period (500 BCE) Yoga was accepted by all spheres of life and people practiced Yoga regularly for their physical, mental, and spiritual wellbeing.

Ayurveda, the world's oldest record of medical practice [2,6] is ancient Indian medicinal system. Ayurveda meaning the science of long and healthy life, describes human being as the combination of body, mind, and soul. It prescribes *Vyāyama* (exercise) for the body and Yoga for mind and soul [9,10]. However, in the Ayurvedic text Yoga has been discussed only with few *ślokes* (oapharisms) and strongly recommended it as a specialized area [11]. *Dhyāna Yoga* or *Rāja Yoga* was explained in a structured form in 'Yoga Sutra' written by the Sage Patanjali [12]. In this text had been described in eight limbs (*Astāṅga Yoga*): *Yama* (Social discipline); *Niyama* (Individual discipline); *Āsana* (Yogic postures); *Prānāyāma* (Control of the vital energy through breathing); *Pratyāhāra* (Withdrawal of sense organ); *Dhāraṇā* (Concentration); *Dhyāna* (Deep concentration) and *Samādhi* (Deepest concentration). The detail description of *Yogāsana* (*Yogic postures*), the third limb of *Astranga Yoga* was found in the ancient Hatha Yogic text:

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*Hatha Yoga Pradīpikā* [13]; *GhrendaSamhitā* [14]; *Śhiva Samhitā* [15]; *Vasiṣṭhasamhitā* [16] and *Haṭharatnāvalī* [13] with the description of eighty four *yogāsana*s. Scientific description with classification on *Yogāsana* has been available in the modern literature [17–19]. In the most authentic way, Iyengar [20] described with two hundred *Yogic* postures. Both the ancient and modern literature on *Yogāsana* claim that it improves wellbeing and can be effective for therapeutic purposes. The aim of this article is to propose physiological classification and theoretical mechanisms to understand *Yogāsana*, in its practices.

## 2. Proposal of classification of *Yogāsana*: On the basis of physiological functions

*Yogāsana* have been classified by the authorities as meditative and cultural postures including relaxation posture [17]; along with meditation, standing, back bending, forward bending, spinal twisting, inverted, balancing poses [18]; standing, sitting, prone, supine, top-syturvy and relaxation postures [19]; and primary, intermediate and advance postures [20]. The author is actively involved in Yoga research for past 30 years and guided three PhD projects [21–23]. Also the author has published many research papers on scientific *Yogāsana* practice protocol [24–29]. With these experiences, author would like to propose new *Yogāsana* (*Yogic* postures) classification on the basis of physiological functions, i.e: (a) Stretch (*Paśchimottānāsana* etc.); (b) Contraction (*Mayūrāsana* etc.); (c) Neuromuscular Coordination (*Vṛkṣāsana* etc.); (d) Sense Reduction (*Śavāsana* etc.); (e) Spine Brain Activation (*Padmāsana* etc.). However, in the practice of *Yogāsana* three principles (i.) Slow movement awareness, (ii.) Body awareness and (iii.) Breathing awareness should be present in a synchronize manner to achieve the best result [17–20].

## 3. Proposal of five theories: theoretical mechanisms of *Yogāsana*

Earlier Srinivasan [30] and Murphy [31] tried to understand *Yogāsana* (*Yogic* postures) in the perspective of Proprioceptive Neuromuscular Facilitation (PNF) technique. PNF is very useful scientific technique for improving the daily life activities, injury/illness prevention and rehabilitation. The PNF scientists had proposed four theoretical mechanisms: i. Autogenic Inhibition; ii. Reciprocal inhibition; iii. Stress relaxation; iv. Gate control theories [32–35]. Here, the author would like to propose five theories to understand the underlying mechanisms of *Yogāsana* (*Yogic* posture): i.e. i. Stretch Relaxation Awareness; ii. Contraction Relaxation Awareness; iii. Ballistic Contraction Relaxation Awareness; iv. Sensory Motor Function Awareness; and v. Vital Energy Flow Awareness for discussion and suggestions from the scientific community.

### 3.1. Stretch relaxation awareness theory

The author proposes that some *asanas* can be classified as ‘Stretch’ for example *Paścimottānāsana*, *Bhujāṅgāsana*, *Śalabhāsana* etc. At the time of stretching muscles spindle (stretch receptors) could be activated and after releasing these *asanas* same area would be relaxed than before. These functions will activate sensory and motor cortex. Body and breathing awareness will activate more brain parts to be engaged in this process. So, the concentration is developed automatically to maintain these postures.

### 3.2. Contraction relaxation awareness theory

In this theory, golgi tendon organ (GTO), another mechanoreceptor is targeted. Some *Yogāsana*s can be grouped as ‘Contraction’ for example *Mayūrāsana*, *Utkatāsana* etc. At the time of performing these *asanas* fullest contraction could be focused on the related muscles. As a result, the GTO is activated and after

releasing same area is relaxed much more. This process also activates the sensory-motor cortex. At the same time body and breathing awareness activates many other regions of the brain and enables concentration.

### 3.3. Ballistic contraction relaxation awareness theory

In this theory, the author would like to highlight vestibular apparatus in the inner ear and pacinian corpuscles present in the skin. Some balance or ‘Neuromuscular Coordination’ *Yogāsana* like *Vṛkṣāsana*, *Garuḍāsana*, *Natarājāsana* etc. could activate these two receptors with their related sensory motor and other cortical areas. Also these type of *asanas* should activate lower brain or Cerebellum for coordination and body awareness. The Pons and Medulla areas are also involved for monitoring, the breathing awareness. Together, these activations may develop more concentration because many parts of the brain are involved in these balance type of *Yogāsana*.

### 3.4. Sensory motor function awareness theory

In the fourth theory, the author proposes relaxation *āsanas* or ‘Sense Reduction type’ *asanas* such as *Shavāsana*, *Advāsana*, *Makarāsana* etc. Here, the sensory motor nerve activity is forcefully reduced. So, the sensory-motor awareness in the cortical areas is slowly diminished. Also, by detracting and diverting all the external and internal sensory motor organs’ activity these types of *asanas* could produce relaxation feelings. With this breathing awareness makes the person more aware about the vital activity of the body and beyond. Specially, the Midbrain area i.e. the filtering unit of sensory motor information has been deactivated and feeling of relaxation is persisted.

### 3.5. Vital energy flow awareness theory

The fifth proposed group in this article is ‘Spine-Brain Activation’. In this group of *asanas* also called as meditative posture like *Padmāsana*, *Śukhāsana*, *Siddhasana*, and *Svastikāsana* etc. Here, the spine and head should be erect to allow all neural impulses and vital energy to flow smoothly from the lower part of the spine to all areas of the brain and back to the lower part again. In these type of meditative postures, all the somatic and subtle autonomic neural awareness and vital organ awareness are subsided. Brain and spine level electrical activity and energy cost is reduced. But the higher cortical activity increased. Also in these type of *asanas* one may feel the *PranaVayu* (vital energy) in the different parts of the body and *Chakras* (energy wheels) in the spine and brain areas. One can relate individual energy with cosmic energy.

## 4. Conclusion

*Yoga* with all its forms (practical and theory) is now accepted globally. *Yogāsana*s or *Yogic* postures are one of the pillars of the practical *Yoga* foundation. Analysis of mechanisms of meditation and *prāṇāyāma* has already been established. *Yogāsana* effect in the human psychophysiological areas and its underlying mechanisms are not yet been identified. In this article, the author classified *Yogāsana* from the physiological point of view i.e. Stretch, Contraction, Neuromuscular Coordination, Sense Reduction and Spine Brain Activation for the first time. To support the physiological classification the author has also for the first time proposed five theories i. Stretch Relaxation Awareness ii. Contraction Relaxation Awareness iii. Ballistic Contraction Relaxation Awareness iv. Sensory-Motor function awareness and v. Vital Energy Flow Awareness to understand the underlying mechanisms of *Yogāsana* practices. All these hypothetical theories should be examined by scientific protocols and methods for final conclusion.

## Conflict of Interest

The author declare that there is no conflict of interests regarding the publication of this paper.

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