

A Critical Review Study on Importance of Anatomical Knowledge While Practicing Yoga Asana

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Abstract

In recent years *Yoga* has become commercialized and transformed into a mass movement in India as well as Western culture, where it has been made into a practice to enhance physical fitness and beauty, often labeled as *Hatha Yoga*. This Western approach to *Yoga* has in turn influenced the way in which *Yoga* is now taught and practiced in India. It is evident that the Western and modern Indian concept of *Yoga* and the traditional Indian *Yoga* systems are not the same in nature and goal. One might in fact wonder whether the use of the term *Yoga* is appropriate for the former. The combination of *Ayurvedic* medications and lifestyle management in addition to the effective use of various asana, breathing techniques and meditations have worked wonders on patients afflicted with joint pains down to those suffering from certain serious conditions. The beneficial combination provided to the patients being subject to the alternative mode of rehabilitation has also emerged as an effective therapeutic option for those suffering from psychiatric stress and anxiety. In modern day life, sitting on a piece of furniture is the body position in which one spends most of their waking hours, this can result in various ill effects. Knowledge of anatomical principles can aid in understanding the beneficial effects of practicing *Yoga Asana*.

Keywords: Ayurveda; Yoga Asana; Anatomical Knowledge; Hathyoga etc.

Introduction

In the spiritual history of India, the human body acquired an importance it had never before during the development of *tantrism*. The divine body is a necessity to attain or fulfill the purpose of *Yoga*. The body more than a source of a pain now became a most reliable and effective instrument at man's disposal for conquering death. And since liberation can be gained even in this life, the body must be preserved as long as possible, and in perfect condition, precisely as an aid to meditation. In *Hatha Yoga* there is a will to master the body in order to transform it into divine body. The term Hatha can be explained by Ha = sun and Tha

=moon, the union of sun and moon forming the *Yoga*. Some other texts explain ha-thau= surya-chandrau=pranapanau. The *Kanphata* yogis called their particular discipline *Hatha Yoga*. Later the term soon came to be collectively designation for traditional formulas and disciplines that made it possible to attain perfect mastery of the body. *Hatha Yoga* gives importance to preliminary purifications which are of six types. These are *dhauti*, *vasti*, *neti*, *nauli*, *trataka* and *kapala bhata*. In *Hatha Yoga* perfection is always the goal, and it is neither athletic nor hygienic perfection. *Hatha Yoga* cannot be linked with gymnastics.

In recent years *Yoga* has become socialize, commercialized and transformed into a mass movement in India as well as Western culture, where it has been made into a practice to enhance physical fitness and beauty, often labeled as *Hatha Yoga*. This Western approach to *Yoga* has in turn influenced the way in which *Yoga* is now taught and practiced in India. It is evident that the Western and modern Indian concept of *Yoga* and the traditional Indian *Yoga* systems are not the same in nature and goal. One might in fact wonder whether the use of the term *Yoga* is appropriate for the former. The combination of *Ayurvedic* medications and

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lifestyle management in addition to the effective use of various asana, breathing techniques and meditations have worked wonders on patients afflicted with joint pains down to those suffering from certain serious conditions. The beneficial combination provided to the patients being subject to the alternative mode of rehabilitation has also emerged as an effective therapeutic option for those suffering from psychiatric stress and anxiety. In modern day life, sitting on a piece of furniture is the body position in which one spends most of their waking hours, this can result in various ill effects. Knowledge of anatomical principles can aid in understanding the beneficial effects of practicing *asana*.

In the contemporary time, everybody has conviction about *asana* practices towards the preservation, maintenance and promotion of health. But the lacuna of anatomical explanation of structures involved and their role in benefit achieved is still persisting. The knowledge of anatomy will also help the *asana* practitioners, to avoid injuries. If practiced with attention to the anatomy of the relevant joints, muscles, and connective tissue, they can help to restore some of the natural flexibility. To make a step forward for better understanding of *asana* in anatomical terminology this work is undertaken. As *asana* posture affects every system of body but is expressed through musculoskeletal framework which is controlled by nervous system, thus these two forms most basic system to be explored for their involvement in *asana*. This study will be fulfilling the essential quest of *asana* practitioner about the importance anatomical knowledge concerning the *Asana* and how this involvement is beneficial in maintaining health or in management of any disease.

Yoga practices traditionally involve multiple components which should be practiced to yield the benefits of yoga. This includes physical postures with stretching, breathing exercises and deep relaxation. Yoga is a form of mind-body fitness that involves a combination of muscular activity and an internally directed mindful focus on awareness of the self. Improved flexibility is one of the first and most obvious benefits of yoga which made it so popular. With continued practice comes a gradual loosening of the muscles and connective tissues surrounding the bones and joints. Yoga helps to build muscle mass and maintain muscle strength, which protects from conditions such as arthritis, osteoporosis and back pain. And in the practice of Hatha yoga, it is plainly the musculoskeletal system that enables us to achieve external balance, to twist, bend, turn upside down, to be still or active,

and to accomplish all cleansing and breathing exercises [1]. Contracting muscles not only produce movement but also stabilizes the joints. The contractile state of muscles affects the mobility of the joint. Tight muscles limit joint mobility and relaxed muscles increase it. Stretching lengthens the muscular stabilizers of a specific joint, allowing for greater range of motion of that joint. Practicing yoga lengthens muscles surrounding multiple joints and increases the range of motion for the entire body. Since bone shape cannot be changed and ligament length should not be changed we are left to work with the muscular stabilizers. The length of the skeletal muscles can be safely affected by practicing yoga to improve the body's range of motion [2]. All skeletal muscles have an origin in one part of the skeleton and an insertion on another part. Stretching a muscle basically involves moving its origin and insertion farther apart. Muscles can be stretched by fixing their skeletal origin in place and moving the insertion, or vice versa [3].

Muscle Activation

A muscle is able to produce different types of muscle tension, either with or without movement. There are different types of motions that muscle activation produces [4].

Isometric motion

When a muscle produces force with no apparent change in the joint angle, the activation is isometric (Gr. Isos-equal, metron, measure). Isometric activations are also called static or holding contractions. During functional activities, isometric activation stabilizes joints.

Concentric- A shortening of the muscle is a concentric activity. Concentric motion occurs as the muscle shortens and the muscle's proximal and distal insertion points move closer towards each other. Concentric activity produces acceleration of body segments.

Eccentric motion

When the muscle lengthens during activation, it is an eccentric activity. Eccentric motion occurs as the muscle lengthens and the muscle's points of insertion move away from each other. Eccentric motion often occurs against gravity as the muscle controls the speed with which gravity moves the joint. Eccentric activity decelerates body segments and provides shock absorption as when landing from a jump or in walking.

Isotonic motion

The word isotonic is derived from the Greek isos meaning equal, and tonus meaning tension. It includes contraction of a muscle detached from the body and lifting a load vertically against gravity.

Iso-kinetic motion

An isokinetic (Gr. Isos-equal, kinetos- moving) contraction occurs when the rate of movement is constant.

Stretching of muscles [5]

Although there are many different ways to stretch, they can all be grouped into one of two categories: static or dynamic.

Static Stretches

The term static stretches refers to stretching exercises that are performed without movement. In other words, the individual gets into the stretch position and holds the stretch for a specific amount of time. Listed below are five different types of static stretching exercises. Static stretching is the most common technique used in Hatha Yoga.

Static Stretching

Static stretching is performed by placing the body into a position whereby the muscle (or group of muscles) to be stretched is under tension. To begin, both the antagonist, or opposing muscle, and the agonist, or muscle to be stretched, are relaxed. Then slowly and cautiously the body is moved to increase the tension of the muscle being stretched. At this point the position is held or maintained to allow the muscle to lengthen. Static stretching is a very safe and effective form of stretching, with a limited threat of injury.

Passive (or Assisted) Stretching

This form of stretching is very similar to static stretching; however, another person or apparatus is used to help further stretch the muscle. Due to the greater force applied to the muscle, this form of stretching is slightly more hazardous. Passive stretching is useful in helping to attain a greater range of movement, but carries with it a slightly higher risk of injury. It can also be used effectively as part of a rehabilitation program or as part of a cool-down.

Active Stretching

Active stretching is performed without any aid or assistance from an external force. This form of stretching involves using only the strength of the opposing muscles (antagonists) to generate a stretch within the targeted muscle group (agonists). The contraction of the opposing muscles helps to relax the stretched muscles. A classic example of an active stretch is one where an individual raises one leg straight out in front as high as possible and then maintains that position without any assistance from a partner or object. Active stretching is useful as a rehabilitation tool and a very effective form of conditioning before moving on to dynamic stretching exercises.

PNF Stretching

PNF stretching is a more advanced form of flexibility training, which involves both the stretching and contracting of the muscle group being targeted. PNF stretching was originally developed as a form of rehabilitation and for that function it is very effective. It is also excellent for targeting specific muscle groups and, as well as increasing flexibility (and range of movement), it also improves muscular strength. Yoga practitioner uses facilitated stretching to deepen their postures. This type of stretching involves contracting the muscle being stretched during an active static stretch. This action triggers a reflex arc involving the Golgi tendon organ, resulting in a profound relaxation of the target muscle when the contraction period ends [6].

Isometric Stretching

Isometric stretching is a form of passive stretching similar to PNF, but the contractions are held for a longer period of time. Isometric stretching places high demands on the stretched muscles and is not recommended for children or adolescents who are still growing.

Dynamic Stretches

The term dynamic stretches refers to stretching exercises that are performed with movement. In other words, the individual uses a swinging or bouncing motion to extend their range of movement and flexibility. Yoga practitioners use dynamic stretching during a Vinyasa style of practice. This type of stretching involves repetitive movement of the body into increasingly deeper

stretches. Performing dynamic stretching in the morning “resets” the resting muscle length for the day. Listed below are different types of dynamic stretching exercises.

Ballistic Stretching

Ballistic stretching is an outdated form of stretching that uses momentum generated by rapid swinging, bouncing, and rebounding movements to force a body part past its normal range of movement.

Dynamic Stretching

Unlike ballistic stretching, dynamic stretching uses a controlled, soft bounce or swinging motion which move a particular body part to the limit of its range of movement. The force of the bounce or swing is gradually increased but should never become radical or uncontrolled.

Resistance Stretching and Loaded Stretching

Resistance stretching and loaded stretching are forms of dynamic stretching that both contract and lengthen a muscle at the same time. They work by stretching a muscle group through its entire range of motion while under contraction. For this reason, both resistance stretching and loaded stretching are as much about strengthening a muscle group as they are about stretching it.

Important Movements of the Body

After studying the basic structures, yoga instructors have to know how the body incorporates these structures in basic movements. The basic movements include flexion, extension, external and internal rotation and so on. Shoulder blade or scapula has different kind of movement such as elevation, depression, protraction, retraction, medial rotation and lateral rotation. Students of Yoga must be familiar with these movements in order to learn the role of shoulder blade stability in performing different *Asanas*. It is important to know the movements involved in each yoga asana, as one asana may involve multiple movements. Overstretching or prolonged stationary position can lead to strain or sprain in beginner students.

Effect of asana on nervous system

Static stretching (SS) is the most common technique used in hathayoga in which a specific skeletal muscle (or muscle group) is deliberately

stretched and reflects the mechanical characteristics of skeletal muscle. It is widely used to increase the range of motion of joints by favorably affecting the flexibility of muscles and tendons. In addition, it is reported that SS can also provide relaxation effects. Based on studies, it can be understood that the balance of autonomic nerve activity shifts to the sympathetic nerve activity-dominant state during SS and the parasympathetic nerve activity-dominant state after SS. Even though the term SS is used collectively it is assumed that active SS and passive SS have different influences on the autonomic nerve activity. Many studies have identified the response of nervous system to active SS. Studies have been conducted in which SS was evaluated by analyzing the changes in autonomic nerve activity based on the changes in heart rate variability (HRV) in human subjects. When SS (trunk flexion) conducted on healthy volunteers, it showed that parasympathetic nerve activity was significantly higher after SS than it was before SS. In another study where SS (trunk flexion) conducted on subjects with a low level of flexibility and showed that parasympathetic nerve activity decreased remarkably during SS and was significantly higher after SS than it was before SS. SS conducted in an study on the large muscles of body-building athletes and confirmed a significant increase in parasympathetic nerve activity and a significant decrease in sympathetic nerve activity after the completion.

According to the study conducted on passive SS, the following results are found. The balance of autonomic nerve activity shifts to a parasympathetic nerve-dominant state during passive SS and the parasympathetic nerve-dominant state continues even after the completion of SS (for at least 5 minutes after completion). Considering the studies all together when SS is conducted actively, the autonomic nerve activity shifts to a sympathetic nerve-dominant state during SS and a parasympathetic nerve-dominant state after the completion of SS. However, unlike active SS, the response during SS shifted to a parasympathetic nerve-dominant state. This result indicates the possibility that the process differs between active SS and passive SS, although the response after the completion of SS is similar for both. In summary, autonomic nerve activity shifts to a parasympathetic nerve-dominant state by passive static stretching, and the effect continues for at least five minutes after the completion [7].

Hatha yoga and meditation causes alterations in balance of autonomic nervous system. Also there are

changes in respiratory performance and wellbeing. There is significant reduction in systolic, diastolic, and mean arterial pressure. This indicates a trend of gradual shift of autonomic equilibrium toward relative parasympathetic dominance because of the reduction of sympathetic activity. This modulation of autonomic nervous system activity probably might have been brought about through the impact of yoga on autonomic function, mediated through limbic system and higher areas of the central nervous system. The individuals who are practicing yoga on regular basis have been demonstrated to develop some degree of resistance against physical stress. Meditation is an important part of yoga which is a state characterized physiologically as a wakeful hypo metabolic state of parasympathetic dominance. During meditation the yogi remains awake and vigilant but the physical body goes into a state of deep muscle relaxation. The most characteristic feature of all meditational techniques appears to be a decline in O₂ consumption and CO₂ elimination with decrease in respiratory rate and minute ventilation with no change in respiratory quotient. The important significant difference is that the body appears to move into a state similar to sleep, but not all aspects of sleep while subjects remain responsive and alert. There is increase in melatonin levels after yoga and meditation. The studies have showed that there were higher levels of melatonin during night after yoga and meditation and it has positive correlation with wellbeing. This shows that yoga and meditation induced psychological elation might have been due to increased secretion of melatonin. This increase in melatonin levels may either be caused by increased activity of pineal gland or decreased clearance from the circulation. Some studies have reported higher levels of serotonin, which can act as a precursor for increased melatonin synthesis. Melatonin in turn counteracts sympathetic activity, improves quality of sleep, counteracts stress induced disorders, rests body's aging clock and elevates mood [8].

Significance of Physio- anatomical knowledge in yoga Asana

Knowing the anatomy of the body is an added benefit if you are practicing it habitually and appropriately. It is vital to know which muscles and bones can sustain which type of injuries, which asana targets which muscle compartments and which poses are specific to healing on injuries. The contents of the body of a human being is not just muscles and bones, but also nerves, blood vessels, joints and organs. Being a yoga education

or practice does not mean you have to know only knowledge of yoga. For appropriate education or practice of yoga one should know the basic terminology and structural anatomy of various body parts like abdominal organs, thoracic organs, sense organs, nervous system, musculoskeletal system major muscles, joints and bones as well the most common movements of the body.

The body has 206 bones, and these are divided into long and short bones. As a yogi in training, you only need to know the major bones of the body, such as those in the legs and arms. It is also important to know the structure of the spine, as it is - quite literally- the backbone of the skeleton. Having knowledge of bones will help aspiring yogis to know which *Asana* are applicable on which anatomical part of the body, and which bones are at risk of injury during yoga practice. With the bones, we should also learn the origin and insertions of muscles to the bones. While these may seem daunting, students must remember that muscles are divided into compartments. Each Muscle is grouped according to the movements of body or in other words they are arranged according to function. Learning them in conjunction with the movements in *Asana* will give yogis a fair idea of who can benefit from these *Asana*, such as individual with shoulder dislocation problems must focus on the *Asana* which strengthen the muscles around the shoulder joint, because shoulder joint is vulnerable joint by its very structure and it is kept stable only by a strong muscular structure around it. Yoga practice can either focus on one muscle compartment, or multiple ones at the same time. It is therefore important to know which muscles are being used in various yoga poses. Joints are the structural attachment between bones, and are most prone to injuries during yoga poses. It is important to know the movement of major joints (primarily the arms and legs), as well their degree of rotation. Joint movements such as flexion, extension and rotation allow yogis to determine which movements are safe in particular yoga poses. After studying the basic structures, yoga instructors have to know how the body incorporates these structures in basic movements. The basic movements include flexion, extension, external and internal rotation and so on. Shoulder blade or scapula has different kind of movement such as elevation, depression, protraction, retraction, medial rotation and lateral rotation. Students of Yoga must be familiar with these movements in order to learn the role of shoulder blade stability in performing different yoga poses. It is important to know the structures or body parts and movements involved in each

yoga process, as one asana may involve multiple movements and effect on more than one body part of the body. Thus anatomical knowledge in yoga education or yoga practice builds up the body physically and mentally. There is a lot to learn about the human body and it's easy to get plagued. The biggest reason to discuss anatomy is to facilitate healthy practice and help to understand what's going on or change in the body during and after the yoga. Here are some key aspects of anatomy that are helpful to understand the significance of anatomy knowledge in yoga education or yoga practice like below

Discussion

The word "Yoga" means union. The word means 'unity' or 'oneness' and is derived from the Sanskrit word *yuj*, which means 'to join'. This unity or joining is described in spiritual terms as the union of the individual consciousness with the universal consciousness. Yoga as a school of thought was systematized by *Patanjali* and ever since then there has been attempts to understand it, and make it understandable, on the basis of various degrees of both engaged practice and intellectual distance. *Patanjali* collected some of these floating arguments and speculations and gave them the form of a system of thought, which closely resembled the *Samkhya* system of philosophy which was said to have been promulgated by *Kapila*. The resemblance of the *Yoga* way of thought with that of the *Samkhya* is so great that they are regarded as representing two schools of the same system. The *Yoga*-system has undergone much elaboration and improvement at the hands of *Vyasa*, *Vacaspati* and *Vijnana Bhikshuu*.

In the contemporary time, everybody has conviction about *asana* practices towards the preservation, maintenance and promotion of health. But the lacuna of anatomical explanation of structures involved and their role in benefit achieved is still persisting. The knowledge of anatomy will also help the *asana* practitioners, to avoid injuries. If practiced with attention to the anatomy of the relevant joints, muscles, and connective tissue, they can help to restore some of the natural flexibility. To make a step forward for better understanding of *asana* in anatomical terminology this work is undertaken. As *asana* posture affects every system of body but is expressed through musculoskeletal framework which is controlled by nervous system, thus these two forms most basic system to be explored for their involvement in *asana*. But due limitation of time, the anatomical assessment of

the vast number of *asana* cannot be undertaken in single study so, here an attempt will be made to scientifically understand *asana* involved in sitting postures described in *Gheranda samhita* which is one of the premier treatise in this field. This study will be fulfilling the essential quest of *asana* practitioner about the anatomical structures involved in the *asana* and how this involvement is beneficial in maintaining health or in management of any disease.

The modest use of simple anatomical terms can express these advantages, giving confidence as to why we practice certain aspects of yoga. To avoid excessive anatomy, try to focus on a few basic points with intentions that add to the experience. When it does prove to be useful in yoga education or yoga practice, it may also be necessary to explain where this area is located so there is no confusion. It is essential to reflect upon your intentions and re-evaluate when necessary. A lack of inclusive wording reveals ambivalence towards a supportive better relationship. Demeaning others in an attempt to reinforce your credibility goes against many of the values we want to embrace and instill in others. For better society health, the goal should be to elevate your anatomical knowledge by cultivating a healthy relationship between anatomical knowledge and yoga practice. By creating an inclusive environment the society feels confident in their ability to follow the yoga education or yoga practice. It is clear that anatomy and physiology have significant roles, specifically for teaching; however the emphasis should be on the experience of yoga as a whole. An understanding of anatomy can have a profound effect on your cueing, sequencing, alignment, safety, and inclusivity in your teaching as well as your own personal practice. Developing a healthy relationship with anatomy to refine your knowledge can benefit your teaching while creating a supportive learning environment for yoga. Thus, for the rapidly growing yoga community needs this essential anatomical knowledge of biomechanics, especially in yoga education or training programs. This article presents basic anatomical information in a progressive and conceptual sequence so that anatomical details should balance with the holistic perspective of yoga as an integrative, transformational lifelong practice in present and in upcoming era. It is clear that anatomy and physiology have significant roles, specifically for teaching; however the emphasis should be on the experience of yoga as a whole. An understanding of anatomy can have a profound effect on your cueing, sequencing, alignment, safety, and inclusivity in your teaching as well as your own personal practice.

Developing a healthy relationship with anatomy to refine your knowledge can benefit your teaching while creating a supportive learning environment for yoga.

Conclusion

Asana is all about harmonizing the body with the mind and breath through the means of various *Pranayama* (breathing techniques), *Asana* (yoga postures) and *Dhyana* (meditation). Anatomical knowledge regarding Asana plays key role education or practice in society to change their body and mind physically, mentally & spiritually. The earliest yoga scholar held the view that we actually possess three bodies: physical, astral, and causal. From this perspective, yoga anatomy is the study of the subtle currents of energy that move through the layers, or "sheaths," of those three bodies. The circumstance that yoga provides for the study of anatomy is rooted in the investigation of how the life force expresses itself through the movements of the body, breath, and mind. Knowing yoga anatomy is the foundation for physical safety, know the effect of yoga on different organs of the body upon which you can layer all the other goodness you know, intuit, and absorb while educating or practicing the yoga Asana. Thus knowledge of *Anatomy regarding various Asana postures* is the ideal cohort for practice of yoga Asana because it fills in knowledge gaps about the human body, biomechanics and systems in a holistic and integrated way.

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