

Physiological effect of *yogasana* on cardiovascular and musculoskeletal system - a review**Patil Shilpa Sanjiv^{*1}, Dhindhime Ravindra S.², Madavi Amol Shah M.³**¹P.G. Scholar, Department of *Kriya Sharir*, Govt. Ayurved College, Osmanabad, M. S.²Prof. & HOD Department of *kriya sharir*; Govt. Ayurved College, Osmanabad, M. S.

Mob.no.- 9075423288; Email id- rutilusama1964@gmail.com

³Associate Professor, Department of *Sanskrit Samhita Siddhant*, Noble Ayurved College, Junagad, Gujrat,

Mob.no.- 7588773289

***Corresponding author:** Mob. no. 8208776987; Email id- dr.shilpapatil188@gmail.com**ABSTRACT**

Due to sedentary lifestyle before and in current scenario of pandemic Covid 19, lockdown, online school, classes, work from home like conditions are helping to go closure to sedentary lifestyle. In this pandemic situations everyone is going through tough and worse situation which is hampering mentally as well as physically. Due to lack of physical activities, mental disturbances give rise to many lifestyle diseases, psychosomatic disorders such as Hypertension, Ischemic Heart Diseases, Bronchial Asthma, Diabetes mellitus, Peptic Ulcer, Ulcerative Colitis...etc which are also a byproduct of westernization. This is a step towards interest in Yoga to evaluate the physiological effects of various *Yogasanas*, to establish its scientific basis so that such practices may be applied to tackle certain problems on mental and Physical health. and also includes *Suryanamaskara* (Sun-Salutation) which is a set of different *Yogasana*. In Yogic exercise there is very

much synchronized breakdown and recovery of energy which ultimately enhances the physiological efficiency of muscle tissue and there is difference in *Yogic* exercises and physical Exercise in energy production and energy utilization mechanism.it is important to spread awareness among the people by providing information how actually *yogasana* acts on body system mainly on cardiovascular and musculoskeletal system.

Keywords- *Yogasana*, Cardiovascular system, Musculoskeletal system, *Suryanamaskara*, physical exercise.

INTRODUCTION

Ayurveda is a broad-based science of life developed with twofold objective that is to preserve the health of the healthy and to relieve the disease of the ailing.^[1] *Ayurveda* is not merely a system of medicine but is a comprehensive science of life was developed to ensure *Arogya*. That is healthy life in all its dimensions which was considered essential for achieving the four instinct

of life- *Dharma, Artha Kama and Moksha*. *Yoga* and *Ayurveda* are the unique science of antiquity. Both were developed and practiced in similar circumstances with similar objectives in the same land.^[2] the term *Yoga* is derived from the *Sanskrit* word *Yuja*

Yuja= To combine, to unite, to integrate
Thus, may be taken to mean a state of union or integration .it may be considered as a system of mental, physical and spiritual development. According to Rele (1968) the ultimate aim of *yoga* is to prepare the body to achieve that tranquility of mind which may be necessary for the realization of the supreme.

Yoga constitute 8fold methods/steps^[3]

1. *Yama* (Abstention)
2. *Niyama* (observances)
3. *Asana* (yogic postures)
4. *Pranayama* (yogic breathing practices)
5. *Pratyahara* (concentration)
6. *Dhyana* (fixed attention)
7. *Dharana* (Meditation)
8. *Samadhi* (absolute contemplation)

Yogasana

These are physical postures to control Body and Mind

स्थिर सुखमासनं || पा.यो.द.२/४६

Asana means the body posture which gives *sthiratva* to body and gives *sukhsnubhuti*^[4] .

The *yogin* gets rid of a disease by means of *Asana*. *Asana* works on all the systems of the body also making the spine and joint supple. It tones up the muscles, gland and internal organs also chronic health conditions are treated. *Yogasanas* must be executed with proper breathing.

Cardiovascular System

A healthy cardiovascular system is one that passages blood efficiently. A healthy heart carries nutrition from food and oxygen to fuel your muscles and organs, including your brain. *Yoga's* impact on Cardiovascular System is multidimensional

Musculoskeletal system

Musculoskeletal system is designed for support, movement and protection of our internal organs. It consists of bones, joints, muscles, ligaments and tendons. Modern day life has had its impact on the musculoskeletal system. The disorders seriously impair quality of life, causing pain and discomfort. While medications relive symptoms temporarily, the cause can only be eliminated through physical activity which includes sports, jogging, *yogasanas*.... etc.^[5]

AIM

To study the physiology of *Yogasana*

OBJECTIVES

1. To study the effect of *Yogasana* on cardiovascular system
2. To study the effect of *Yogasana* on musculoskeletal system
3. To study the physiology of CVS and Musculoskeletal system.

MATERIAL AND METHODS

Material collected from different *samhita-charaka, sushruta, Hathayogapradipika*, various research articles, journals, different websites, URLs, textbooks...etc.

Yogasana

Asana means seating oneself in comfortable sitting position.

Scientific aspects:

Yogasana or *yogic* postures are typical physical postures of the body where in different Muscles get simultaneously stretched and relaxed. The different *yogic* psycho physiological techniques are

bound to have different effects on each and every cell of the human body systems, organs, and tissue involved in the performance of such practices^[6]

Asana is the third step in the practice of *Patanjali's Astanga yoga*. *Asana* have multidimensional roles to play in the practice of the *Yoga* and welfare of the mankind namely

- 1) Relaxation
- 2) Meditation
- 3) 3) Correction and the culture of the physical body

Yogopnishada also considers *YogaSiddhi* as the means of relieving the disease, "*Asanamarujamhanti*"^[7]

आसनेन रूजं हन्ति| योगचुडामणी
उपनिषद१०९

A large number of yogic postures or *Asana* can be broadly classified in to **twogroups**

- 1. The meditative postures** – *siddhasana*, *padmasana*, *bhadrasana*, *muktasana*, *vajrasana*, *swatikasana* these postures are usually practiced as a pre-requisite of meditative procedures namely *dhyana*...etc.
- 2. Culture asanas** – *siddhasana*, *gomukhasana*, *virasana*, *dhanurasana*, *Masyasana*, *kukkutasana*, *bhujangasana*, *shalabhasan*, *vjrasana*, *ushrasana*.... etc. most of this category of posture are practiced mainly for developing the physique.^[8]

The recent scientific studies (Udapa and Singh 1973) suggest that *Asanas* providing suitable body postures conducive for *Dhyana* and *Samadhi* (meditative *asana*) or their role in

developing in the physique (cultural *Asanas*)

The practice of *Asanas* brings about the number of physiological, Biochemical and psychological changes in the body.

- Reduction in body weight
- Reduction in rate of respiration
- Increased chest Expansion
- Increased Vital Capacity
- Reduction in BSL, Serum lipid level
- Increase in serum proteins
- Improved adrenocortical functions
- Certain improved psychological functions. Viz. Performance quotient, Memory Quotient, Reduced mental fatigue, Reduced Neuroticism index accompanied by conforming electrophysiological and Neurohumoral changes are notable.^[9]

Now we are going to see the physiological effect of *Yogasana* on Cardiovascular System and Musculoskeletal system

➤ **YOGASANA AND MUSCULOSKELETAL SYSTEM**

- The adult human skeletal system consists of 206 bones as well as network of tendons, Ligaments and Cartilage that connects them with each other.
- It provides a framework for our body, protecting our Brain, Heart, and other organs.
- It gives points of attachments for our muscles so that we can move.
- Our bones also protect Red and White Blood cells

- Stores minerals like calcium to be released into the body when needed

As age increases by age 30 our bones density peaks and bone loss normally start around this time. you can decrease your risk of bone loss by-

- 1) Healthy diet
- 2) Regular exercise

Any activity that moves muscle will build muscle strength and weight bearing exercises are particularly beneficial. *Yogasana* is not only a weight bearing activity, but it is low impact which means it is less stressful for our joint. It is perfect way to build strong bones.

1. Increases Flexibility
2. Build muscle strength
3. Improves Posture
4. Protects Bone Health
5. Maintains Joint health
6. Promotes flow of Synovial Fluid
7. Strengthens Joint Supporting Muscles

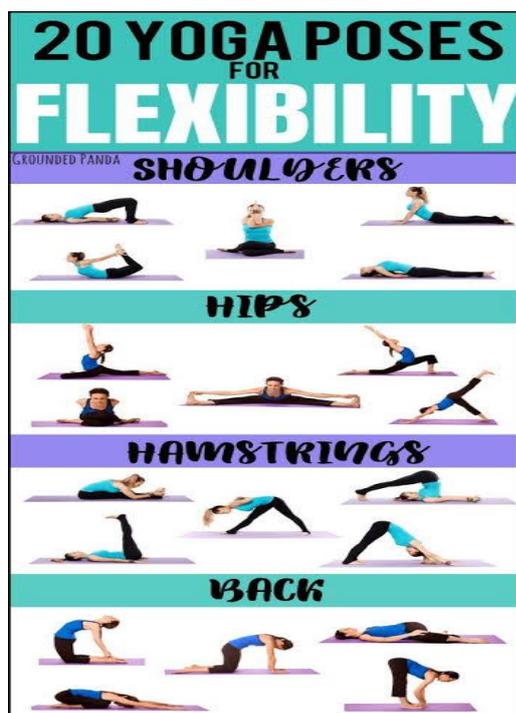


Fig no.1- showing poses for flexibility.

1. Weight Loss

1)Increases Flexibility^[10]

Yoga practice is often regarded as an elaborate form of stretching. There is quite a bit more to it than that, but it certainly does involve stretching and it is a great way to increase your flexibility.

As you stretch and move within your practice you undoubtedly improve your level of flexibility. One of the most obvious side effects of yoga practice is a lengthening and loosening of the muscles and the connective tissue (such as fascia) of the body.

You may notice as you lengthen the Hip Flexors that your lower back pain starts to decrease.

2)Build Muscle Strength^[10]

Beauty of yoga is that as you build strength within the muscles, you simultaneously create flexibility. Strong muscles work to protect the body, ideally keep it free from injury, help your body to align the skeletal system keeping space and integrity in the vertebra of the lower spine.

Yoga poses which are isometric train the smaller muscles that surround the joints so that they are able to endure more pressure and we are able to work harder to stabilize ourselves. This simple balance of strength and flexibility helps to keep your body safe to maintain longevity in your body's overall health.

3) Improves Posture^[10]

Yoga builds equivalent strength and flexibility within the body. This action creates a more aligned stacking of your bones in their natural and intended positioning. As a result, this lengthens and extends your spine back into its meticulous configuration, recreating the natural curvatures of your whole spinal

column. Not only does this action make the load of your body weight much easier for the muscles to bear and thus creating less tension, tightness and strain. It also improves your ability to breathe fully and deeply.

4) **Protects Bone Health**^[10]

It is well documented in modern science that weight bearing exercise increase bone stability and strength. The physical *Yoga* practice is chock full of weight bearing poses in which you use your own body weight to strengthen and train the bones.

Poses such as Plank, *Chaturanga*, Down dog, Up dog, Handstand and many more are weight bearing postures that helps to strengthen bones (particularly within the arms where we don't bear weight) which may also help to prevent Osteoporosis. *Yoga* along with green diet, helps creating a strong for healthy bones. When we perform asanas, we are holding the weight of our body up against gravity however like other weight bearing exercises *Yoga* does not cause damage to cartilage or stress to bones. Instead, the practice lengthens as well as flexes our muscles holding them in place, creating tension on the bone.

5) **Maintains Joint Health**^[10]

Healthy joints all have one thing in common: they often used and moved. Movement within the joints stimulates the production of synovial fluid i.e. a viscous liquid that lubricates the joint, removes debris and reduces the friction between the articular cartilages of the joint. Without production of synovial fluid, the cartilage within the joints can be worn down causing deterioration and pain. A well-rounded *Yoga* practice moves the body through the full range of motion within the major joints of the

body. Due to the benefit of stretching and increasing muscle length *Yogasanas* enable to increase our normal range of motion making us more capable of performing our daily task better. These actions within the body stimulate the production of synovial fluid to keep the joints safe, mobile, and stable to be able to maintain a lifelong practice.

6. **Promotes flow of synovial fluid**^[11]

Synovial fluid is slippery liquid in joint systems that along with hyaline cartilage, allows smooth, painless movements of bones. Synovial fluid is found in joints like knee, hips and elbows where more free movements of bones is allowed. The few joints that do not have synovial fluid are the disc between your vertebrae in your back and both sacroiliac joints in the back of your pelvis. Consequently, movements of these joints are limited than others. Synovial fluid is also essential for delivering nutrients and oxygen to the hyaline cartilage which don't have any sort of blood supply. The various poses in *Yoga* allow this fluid to flow to different parts of your body and with regular practice can increase the smooth muscle flow of synovial fluid to your joints and make you move around more smoothly.

7. **Strengthens Joint Supporting Muscles**^[11]

The isometric poses of *Yoga* train the similar muscle surrounding our joints to endure more pressure and make us them work harder in order to stabilize ourselves. Poses that force us to balance on one leg and change elevation or rotate train our supporting muscle to work in ways strictly for stability and balance, thereby improving their function as you go about daily activities.

8. Weight Loss^[11]

Every pound of excess weight you carry on your body puts an unnecessary burden on your joints. The weight your joints are supporting grows exponentially when doing vigorous exercise such as running or jumping. Running upstairs can put as much as five times the amount of excess weight you are carrying in pressure on your joints. Our joints are built to support us as we carry extra loads now and then but excess fat; to the point of obesity has been proven to cause earlier and more serious joint problems in individuals throughout their lives. *Yoga* along with a healthy diet can help you shed excess weight that is putting more pressure on your joints and inhibiting your movements.

No other form of exercise can separate and concentrate on the muscles surrounding joints like *Yoga* can while promoting healthy flow of blood and synovial fluid throughout the body. Even if joints problems are already getting the better of you there are many poses that can be done on the floor that you to increase fluidity and slacken up the joints.

As emphasized by **Singh and Chhina(1974)** “the practice of *Yogasanas* essentially tends to exercise and relax almost all the muscles of the body to prepare it for a prolonged steady stable and coordinated activity without producing fatigue.”^[9]

They classify *Asana* in to **three categories**

- First meant for only to relax almost all muscles of the body, along with the mental relaxation.
- Second type of *Asanas* are meant for an improved coordination as well as exercise of different

groups of muscles for maintaining steady postures. Such *Asanas* have a static as well as a dynamic phase of muscle of action.

- Third variety of *asanas* are essentially meant to maintain a stable position of the body for a prolonged period usually needed for meditation (*Dhyana*), *pranayama*, *kundalini yoga*.

Singh and Chhina(1974) rightly emphasized that this methodological use of the muscle of the body for the control of physical, mental, visceral functions. depicts a highly specialized interest in kinesiology and related fields of muscle of action.

- As earlier said *Yogasanas* or yogic postures are typical physical postures of the body where in different muscles gets simultaneously stretched and relaxed.
- *Yogic* postures recondition body and mind to bring about the highest possible muscular tone, mental health and organic vigour.
- Steadiness and calmness are ultimate criteria for a perfect yogic posture.
- In *yogic* postures muscular tonic reflexes occurs through the stimulation of nerve endings and tonic postures are maintained. They bring fixed postures; the energy expenditure is minimum with minimum stress.

YOGASANA AND CARDIOVASCULAR SYSTEM **The Cardiovascular Network**^[12]

- The cardiovascular system is composed of the Heart and the network of the arteries, veins and capillaries that transport blood throughout the body.

- The blood volume in an average adult is 5lit.
- Blood carries oxygen, nutrients and hormones to all the cells in the body and also carbon dioxide and other waste products from the cells for elimination.
- Good blood circulation is essential to maintain a healthy body. Poor blood circulation can be caused by lack of exercise or movement, stress tight fitting cloths, atherosclerosis(hardened blood vessels), venous thrombosis (inflamed blood veins due to blood clots) ...etc. immune system can also weaken due to poor circulation.
- Cardiovascular fitness is one of the most important aspects of health. It is defined as ability of heart and lungs to supply oxygen rich blood to the muscle tissue and the ability of muscles to use oxygen to produce energy. this type of fitness is brought about by sustained physical activity.

❖ **The Heart healthy practice of Yoga**

1. Improves Heart function
2. Increases microcirculation of Heart
3. Lowers Blood pressure.
4. Cardiovascular endurance increases.
5. Effective in cardiovascular disorders
6. Helps in Essential Hypertension etc.

1) Cardiac function^[13]

Through *yogic* postures the afferent (sensory) receptor mechanism is trained to dampen these impulses to brain to thus helping in controlling the emotional disturbances. Thus, by averting mental stress, *yogic* postures regulate cardiac function.

2) Cardiac endurance^[13]

Yogasanadefinitely improve the physical strength and endurance. They also decrease the body fat percentage and improve the microcirculation in endocrines and vital organs like Heart. Hence cardiovascular endurance is increased which enhance the physiological efficiency.

3) Cardiac muscle

Yogic postures increase the cardiac muscle tone which in turn regulates the cardiac functions without undue muscular development.

4) Yoga in Essential Hypertension^[14]

‘Essential Hypertension’ where no primary cause like Renal, endocrine ...etc, for hypertension can be discovered about 90% of the Hypertensive patients are having essential Hypertension. Hypertension is the ‘Curse of Nature’ to the man of modern ‘stress-Age’. It has now been established that transient Hypertension occurring from stress and strain may later become persistent, and that the change from benign to malignant Hypertension may in certain individuals be preceded by episode of severe emotional and nervous tension. Symptoms like Hypertension arising from emotional strain and anxiety and involving cardiovascular system also constitute as high as about 71.4%. The mechanical living of modern civilization and increasing ‘Struggle for Existence’, results in constant increase in stress, Environment and Obesity are the causative and aggravating factors in Hypertension.

As we earlier seen, Yoga achieves equilibrium or peace of mind which is almost necessary for the control of Hypertension. *Yoga* also reduces fat. It has been observed that fat reduction by

itself reduce Hypertension in some primary cases.

Hypertension kills a patient prematurely by causing:

1. Cerebral hemorrhage.
2. Cerebral thrombosis.
3. Coronary thrombosis.
4. Cardiac enlargement followed by congestive cardiac failure
5. Renal failure.

Yoga therapy acts effectively in averting these complications by,

1. Lowering High blood pressure.
2. Increasing Micro-circulation and Cerebral and Cardiac circulation.
3. Increasing cardiovascular efficiency.
4. Lowering Basal Metabolic Rate (B.M.R.)
5. Controlling and increasing Endocrine functions.etc.

In the most advanced and richest nation of the world like America alone, Essential Hypertension affects over 25 million citizens, including one out of every three adult males. Considering this fact, one should easily assess the extreme importance of *Yoga*. For prevention and treatment of Essential hypertension in which instability of Autonomic nervous system is a definite precursor.

5) Yoga in Cardiovascular Disorders^[15]

As we have already seen, *Yoga* exerts voluntary control over the Autonomous Nervous System by establishing an equilibrium between the Sympathetic and parasympathetic System. This is most essential for normal Cardiac function.

Yoga increases Cardio-Vascular efficiency (Harvard step test) by decreasing the body fat percentage and improving micro-circulation. *Yoga* causes reduction in Oxygen consumption and Basal Metabolic Rate (B.M.R.) which is very helpful for normal cardiac functions. Cardiovascular endurance is increased by *Yogic* exercises.

Coronary Heart disease, Systemic Arterial Hypertension, Rheumatic heart disease etc., are the cause of Cardiac Failure. In cardiac failure physical and mental rest to the patient is one of the most important therapeutic measures as it diminishes Cardiac function. Here *Yoga* therapy definitely achieves Mental and Physical rest and helps regulation of cardiac function in variation to Cardiac output.

Yogic postures like *Shavasana*, some breathing practices and meditation are really very helpful in regulating and improving the Cardiac Function.

Table no. 1 - Effect of different types of *Yogasana* on Cardiovascular System and Musculoskeletal system.^[16]

YOGASANAS	Cardiovascular System	MUSCULOSKELTAL SYETEM
1)Padahastasana (forward-bend posture)	Circulation to head increases.	Muscles of calf, thighs are toned up Spine is straightened and becomes flexible
2)Ardhachakrasana (backward-bend posture)	Circulation of spine and head is stimulated	Muscles of neck and back are toned up Chest muscles are stretched.

3)Ardhakatichakrasana	-	Fat reduction on lat. Aspect of abd., chest, waist Spine-elastic and tonic
4)Trikonasana	-	Back muscle stretched and relaxed. Fat of lat. Aspect of the trunk is reduced.
5)Padmasana	-	The Sacral nerve plexus is stimulated. The spine gets erect.
6)Matsyana (fish posture)	1.Cardiac nerve plexus is stimulated, and cardiac circulation is improved. 2. Blood pressure is lowered	1. the neck muscles are activated.
7)Vakrasana	-	Neck muscle becomes elastic Spinal function improves.
8)Ushtrasana (camel posture)	Circulation to head region is improved	Muscles of hands, thighs, and legs are toned up. Abdominal muscles are stretched, abd. Fat is reduced.
9)Bhujangasana	-	All the vertebrae and concerned muscles are stretched & relaxed. Beneficial in Cervical spondylosis.
10)Dhanurasana	-	Intercostal, chest, abdominal muscles are stretched The spine muscles are strengthened.
11)Makarasana (crocodile posture)	High blood pressure is lowered.	Lower abd. Portion is pressed on the ground and with respiration, the organs there in are gently massaged.
12)Pavanmuktasana	-	Abdominal muscles and viscera are toned up. Spinal muscles and spine are stretched & toned up.
13)Shavasana	1.High blood pressure is lowered. 2. beneficial in cardiac disorders by attaining maximum Physical and Mental rest.	-

13) Viparitakarani Mudra (stand on elbow gesture)	Blood from lower portion of the body is well drained to the Heart and Circulation is improved.	-
14) Sarvangasana (stand on shoulder gesture)	1. High blood pressure is lowered. 2. Blood from the lower portions of the body is well drained to heart and Circulation is improved.	Maximum physiological improvement is sought.
15) Halasana (plough posture)	1. High blood pressure is lowered.	Muscular and spinal circulation is the back is improved.
16) Shirshasana	1. Blood pressure is lowered. 2. Blood from the lower portion of the body is well drained to the heart & circulation is improved.	-

SURYA NAMASKAR (Sun salutations) [17]

A good cardio workout can be achieved through *Suryanamaskar* (sun salutations). *Surya namaskar* is a golden treasury of ancient Indian culture. It has sprung from the man's deep faith in sun, the God of Energy. Sun is the 'Self' of all the Moving and Non-moving world. It has further been thought that our 'self' or 'soul' is the same energy which exists in the sun.

Such is the great scientific outlook of the *vedic* people towards the sun. the same is reflected in *Suryanamaskar*. Now, modern world also, regards the greatest everlasting beneficial effects of the Heat, Light and Energy of the sun on the

human being. It has been proved now that human life is quite impossible without existence of the sun. if sun stops shining for only a few minutes, the whole earth will become a big ice-ball with all the living being dead. In ancient India, people started *suryanamaskaras* as the devotion towards Lord Sun and also with a great scientific hygienic view. Now it has been experienced that *suryanamaskaras* are the combination of best Physical Exercises and *Yogic* Breathing practices.

Benefits:

1. They improve the muscle tone
2. They improve the function specially of the Circulatory system, the Digestive system, the Respiratory system, the Nervous system.

3. They improve the functions of vital organs like Heart, Lungs, Liver, Spleen.....Etc.
4. They increase the body weight by influencing the skeletal muscles but the sometimes reduce excessive fat, if any.
5. They are quite beneficial for preservation of our Physical and Mental Health.
6. Besides, like *Yoga*, *Suryanamaskar* do not require any cost. They can be well practiced by Men or Women between the age of 12 and 80 on any clean place of 1meter × 3 meters only they are absolutely simple, safe, without much physical exertion and without any side effects.

Howto do *Suryanamaskara*(Procedure of *Suryanamaskar*)



fig no.2- showing steps of *Suryanamaskar*.

There are total **12 steps/stages** which include mainly **9 different asanas** which together form 1 set of *Suryanamaskara*.

1. *Urdwanamaskara*
2. *Hastapadasana*
3. *Dakshinapadaprasarnasana*
4. *Dwipadaprasarnasana*
5. *Bhujanwasana*
6. *Sashatangpranipatasana*
7. *Bhujangasana*
8. *Bhudharasana*

9. *Bhujanwasana*
10. *Dakshinpadasankochasana*
11. *Hastapadasana*
12. *Namaskarasana*

Each step has specific benefits:

- i. This stage stretches the arms, chest, and abdomen so that the muscles are toned up and deep breathing and gently helped.
- ii. This position stretches the muscles of the back and tones them, stimulates the spinal cord and improves the circulation in the Back, Face and Head.
- iii. Third and eighth stages toned up the muscles of the legs and arms. The liver and spleen are also stimulated by pressure of the respective thighs during these stages.
- iv. Fourth stage tones up the Toes, Arms and Neck muscles to their maximum.
- v. The *Sastang* stage stimulates the thyroid gland by pressure and tones up the abdominal muscles
- vi. The seventh stage stimulates the nerves in the Back and improve the circulation in Abdomen, Chest, Thyroid Gland, and Back and tone up the concerned muscles it also reduces abdominal fat.
- vii. The eighth stage gives exercise to the abdomen and pelvic region in particular. The Back muscles are also toned up.

Scientific aspect:

If the *Suryanamaskaras* is to be carried on in the early morning Sunlight as basically designed, we feel Fresh and become Healthy due to Ultra-violet Rays Actinic rays and other beneficial

properties of the sunlight. Production of Vitamin D in our body is the most important effect amongst them. The prolonged pronunciation of *Omkara*, the basic word 'Ha' and the letter or sound 'R' which is included in every *Suryanamaskara* rhyme; stimulates the nerve centers in the brain which control the Respiratory, Circulatory, Digestive systems and tone up these systems. These pronunciations definitely improve our Physical and Mental health.

***Suryanamaskara*, in general, has the following effects on the body:**

1. The muscles of the Leg, Arm, Abdomen, Chest and Back are toned up with improved circulation.
2. The Digestive organs, Liver, and Brain are spinal cord are stimulated.
3. Vital organs like Heart, Lungs and Brain are stimulated with improved circulation and Respiration.
4. The Endocrine secretions are stimulated by stimulation of spinal cord and nerve Centre and their functions are improved.
5. Our Mental power is definitely improved with increase of self-confidence.

Difference in *Yogasana* and Other exercises

Yoga is different from other exercises like

- Walking
- Jogging
- Running
- Conditional Exercises
- other sports.

Running and Jogging exercises are meant for relaxing in general, the muscles and joints of the legs, trunk and arms.

Benefits-

1) The muscles and joints of the legs, trunk and arms are relaxed.

2) Due to rhythmic contractions and relaxation of the muscles of the arms and legs. General circulation is

Improved and cardiac efficiency is increased.^[18]

▪ **Energy expenditure**^[6]

In yogic posture the energy expenditure is minimum with minimum stress. These postures are not physical exercises and they don't need the use of extra calories like physical exercises.

A normal person resting in bed requires - 0.9 to 1 calorie/min

Physical exercise requires - 2 to 14 calories/min

Yogic postures require - 0.8 to 3 calories/min

▪ **Parasympathictonic state & Sympathictonic state**^[6]

✓ Yogic postures are rather tonic with diminution of muscular activity and maximum possible voluntarily induced muscular relaxation. A series of such exercises result in state of mental calmness [Parasympathictonic state] one feels fresh and steady.

✓ The other Gymnastics on other hand produces an increase of Adrenogenic activity [Sympathictonic state] manifested by an increase in Heart rate, Breathing rate, Blood pressure and Catabolic activity with resultant fatigue.

DISSCUSION

As earlier said *Yogasana* has multidimensional effects. In different *upanishadasAshtangyoga* is explained. That is

- *Yama*

- *Niyama*
- *Asana*
- *Pranayama*
- *Pratyahara*
- *Dharana*
- *Dhyana*
- *Samadhi*.

Above sequence is important because if we do not follow the principles and ethics that are to be social behavior (Yama) and personal behavior (Niyama) there will be no effect of asanas on body which we want.

As a matter of fact, *Yogasanas* have been considered as the most inexpensive and convenient method of achieving certain desired effect of the practice of *yoga* namely the mental and the physical development, prevention of aging and diseases. These *asanas* can be practiced without causing any undue disturbance in the daily routine of life by anybody irrespective of age, sex, place, climate or any other such factor.^[7]

Regular practice of combination of asanas restore Baroreflex sensitivity towards normal, especially in patients having Essential Hypertension. yogic exercise also alters autonomic responses by increasing vagal tone and decreasing sympathetic discharges and peripheral resistance by affecting Hypothalamic discharge. Decreased sympathetic activity in turn reduces Resting Heart Rate and Catecholamine secretion and also leads to improvement in peripheral circulation and hence decrease in Diastolic pressure. It is also observed that regular yogic practice which include *Yogasana* and *Pranayama* reduces basal metabolic rate and resting oxygen consumption. All these may be

responsible for reduction in Resting Pulse Rate. These factors also decrease work load on heart leading to decrease in cardiac output and hence systolic blood pressure decreases^[19].

Along with cardiovascular system yoga helps to maintain healthy Joints, align the body, improve balance, keeps healthy bones. in perspective of musculoskeletal system yoga balances the tissues around the joints. Similarly, it free ups the tissues and make them more flexible. *Yoga* brings more space to your body. Secondly yoga is responsible for more altering the fluidity in the body, thereby loosening any stiffness. More movement ensures hydration of the tissues which doesn't let us feel stiff.^[20]

More Yoga –More Movement – Less diseases

Previously we studied about Scientific aspect of *Yoga* many biochemical changes of cardiovascular and Musculoskeletal system due to which normal physiology is maintained and the chances of disease occurring reduces. Not only on these system *Yogasana* having very important beneficial effects on Respiratory system, Digestive system, Endocrine system, Nervous system.

CONCLUSION

A study of these *Asanas* would show that these postures have been devised in such a way that besides many other desired effects they induce varying degrees of mental and physical relaxation. Thus, *Asanas* as practiced in *yoga* system are not only a form of physical culture but are also the methods of achieving perfect mental and physical relaxation. Therefore, these *Asanas* may be practiced as a means of reducing the stress of the daily life of the modern society.^[7] In contrast to the common

physical exercises, the yogic postures specifically influence various organs of the body rather than producing simple skeletal muscle actions. It is postulated that by virtue of these specific physical effects the *yogic* practices rehabilitate various vital organs and make them functionally more competent.^[7] Therefore, *Yogasana* has beneficial effects on cardiovascular and musculoskeletal system. It may improve lifestyle in present era, prevents aging (slowers the aging process in practitioners of yoga) due to which quality of life improves. Further study is needed to study about effect of *Yogasana* on different systems.

REFERENCES

1. Prof. Ravidatta Tripathi edited *charaka Samhita* (Hindi translation) *sutrasthana, adhyaya 30, verse 26, chaukhambha Sanskrit pratisthan, Delhi; 2011:447*
2. Prof. Ravidatta Tripathi edited *charaka Samhita* (Hindi translation) *sutrasthana, adhyaya 1, verse 41, chaukhambha Sanskrit pratisthan, Delhi; 2011:11*
3. Dr. Vijay Patrikar, *swathavrittavidnyan, Godavaripublishers, Nagpur; 2006:33*
4. Dr. Vijay Patrikar, *swathavrittavidnyan, Godavaripublishers, Nagpur; 2006:40*
5. *bahiranga.com > yogas impact on musculoskeletal system.*
6. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:21*
7. Prof. Satyendra prasad Mishra, *Yoga and Ayurveda, chaukhambha Sanskrit sansthan, Varanasi; 2004:43*
8. Prof. Satyendra prasad Mishra, *Yoga and Ayurveda, chaukhambha Sanskrit sansthan, Varanasi; 2004:44*
9. Prof. Satyendra prasad Mishra, *Yoga and Ayurveda, chaukhambha Sanskrit sansthan, Varanasi; 2004:45*
10. <https://www.doyou.com>
11. <https://www.fireengineering.com>
12. bahirang.com > yoga cardiovascular system
13. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:22*
14. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:3*
15. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:2*
16. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:25-61*
17. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:14-18*
18. Prof. Dr. Ravindranath Javalgekar, *The Yoga Science for all, chaukhambha Sanskrit sansthan, Varanasi; 2005:11-12*
19. Dr. Chakraborty T. et al Effect of yoga on selected cardiovascular parameters in elderly subjects, *IJBAMR, vol(4), issue(2); 2015:301*
20. <https://www.thinkright.me/live-right>.

Conflict of Interest: Non

DOI:

<https://doi.org/10.52482/ayurline.v5i03.572>

Source of funding: Nil

Cite this article:

Physiological effect of yogasana on cardiovascular and musculoskeletal system - a review
Patil Shilpa Sanjiv, Dhimdhime Ravindra. S., Madavi Amol Shah M.

Ayurline: International Journal of Research In Indian Medicine 2021; 5(4):01-14