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Muscle And Joint Involvement In Selected Standing *Yoga Asanas*: A Review And Applied Aspects

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ABSTRACT

Background: *Yoga* has been practiced for many years and shown to have holistic health benefits. This scoping review investigates how some standing yoga poses entail joint and muscle motions.

Objectives: To recognize and chart the nerve supply, joint motions, and muscle activities used in the practice of *Parivrtta Parshvakonasana, Trikonasana, Garudasana and joints.*

Charting Methods: For each asana, information about the muscles, joints, movements, and nerve supply was retrieved. Data on range of motion (ROM) was included in accordance with AMA and AAOS guidelines.

Results: Particular joint movements across the shoulder, elbow, hip, knee, ankle, wrist, and neck were involved for each of the three asanas, along with matching muscle actions and innervations. Significant neural controls and ROM values were noted.

Conclusions: Muscular strength and joint mobility are greatly enhanced by the asanas under examination. Results might provide credence to the use of yoga in clinical and therapeutic application.

INTRODUCTION

Yoga poses, or asanas, are used extensively in therapeutic and clinical contexts to enhance joint function, flexibility, posture, and muscle tone. Since it has been practiced for many years and shown to have been proved to enhance physical, mental, social, and spiritual well-being. In addition to encouraging mental clarity and physical tone, yoga poses strengthen muscles to support healthy joint function. Our joints are composed of cartilages, ligaments, tendons, two or more bones, and lubricating synovial fluid. Doing yoga led to increase in muscular system's flexibility. The majority of yoga poses necessitate precise control over joint and muscle usage. Maintaining bone density, muscle strength, and joint flexibility can all be aided by yoga poses. Proper joint function enhances mobility, balance, and posture. Analyzing the muscle groups, joint actions, nerve supplies, and range of motion (ROM) involved in specific standing poses is the goal of this scoping review. It is easier to confirm the value of yoga in therapy and rehabilitation when these biomechanical factors are understood.

METHODS

- References related to anatomy from contemporary books
- References related to Yoga from Yoga Books.

- References from internet and published articles.

SUMMARY OF LITERATURE REVIEW

Parivrtta Parshvakonasana [1], Trikonasana [2], and Garudasana [3] showed consistent activation in the following areas:

- **Shoulder Joint:** Movements included adduction/abduction, external rotation (muscles: deltoid, pectorals, rotator cuff).
- **Hip Joint:** Exhibited complex movements: flexion, extension, internal/external rotation, abduction/adduction.
- **Knee and Ankle:** Primarily flexion-extension and plantar/dorsiflexion (muscles: quadriceps, hamstrings, gastrocnemius).
- **Neck and Spine:** Axial rotation and flexion.
- **Wrist (Garudasana):** Extension with radial nerve innervation.RESULTS

A total of 3 *yoga asanas* were analyzed. Each joint involved was categorized by type of movement and corresponding muscles. Range of motion (ROM) was extracted from AAOS and AMA standards

STANDING POSITION *ASANA* -

1. ***Parivrtta Parshvakonasana***

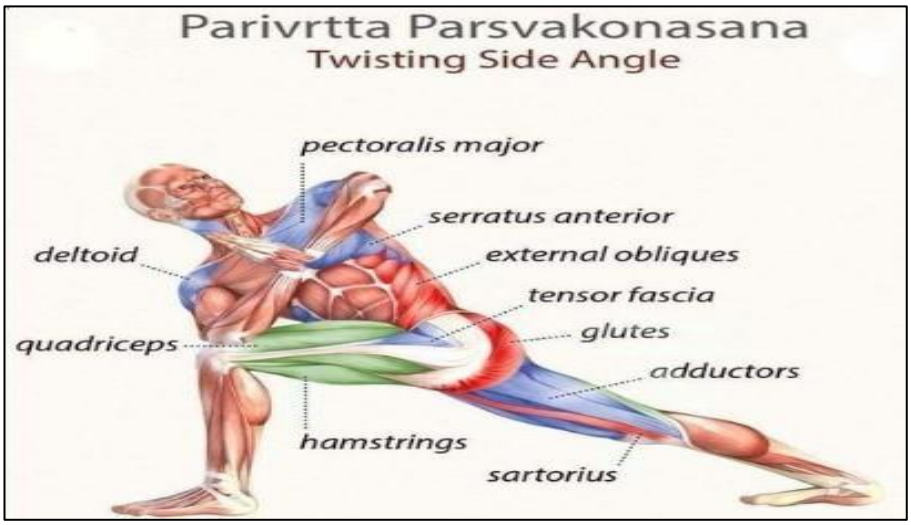


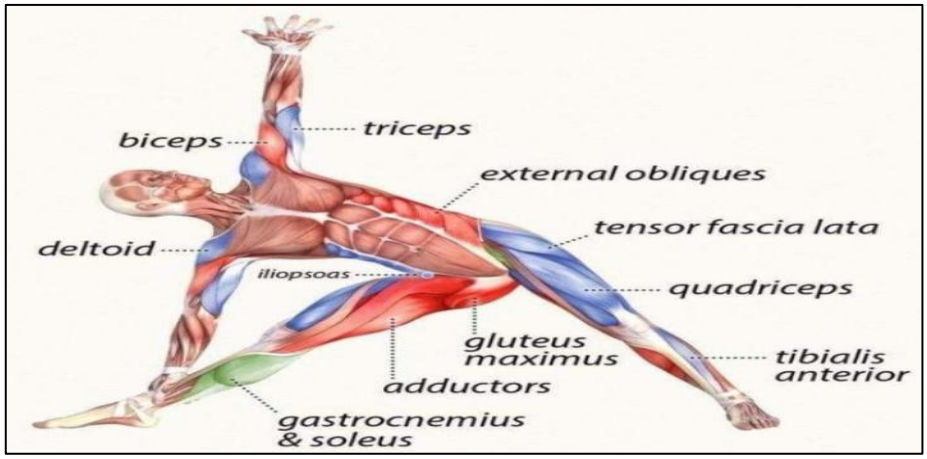
Table 1- Movement of joints, muscle involved and nerve supply [4] [5]

Sr. No.	Name of the joint	Movement of joint	Muscle action	Movement of joint	Muscle action	Nerve supply
1	Shoulder joint	Adduction	Pectoralis Major	Abduction	Pectoralis Minor, Deltoid, Serratus anterior	Pectoral, Axillary, long thoracic nerve
2	Elbow joint	Flexion	Biceps brachii, Brachialis,	--	--	Musculocutaneous nerve

3	Hip Joint	Flexion	Tensor Fascia, Quadriceps, Sartorius	Extension	Gluteus maximus, medius, minimus, Hamstrings	Superior gluteal nerve, Femoral nerve, Obturator nerve
4	Knee joint	Flexion	Hamstrings	Extension	Quadriceps	Sciatic nerve Femoral nerve
5	Foot	Flexion	Gastrocnemius ius Soleus, Plantaris	--	--	Tibial nerve
6	Neck	Flexion	Sternocleidomastoid	--	--	Spinal accessory nerve

Table 2- Movement of Range of Motion of joints [7]

Sr. No.	**Name of the joint**	**ROM Extension**		**ROM Flexion**		**ROM Abduction**		**ROM Adduction**	
		AAOS	AMA	AAOS	AMA	AAOS	AMA	AAOS	AMA
1	Shoulder joint	--	--	--	--	180	180	0	0
2	Elbow joint	0	0	140	150	--	--	--	--
3	Hip Joint	20	30	120	100	--	--	--	--
4	Knee joint	0	0	--	150	--	--	--	--
5	Foot	--	--	20	20	--	--	--	--
6	Neck	--	--	--	60	--	--	--	--



2. ***Trikonasana***

Table 3- Movement of joints, muscle involved and nerve supply [4][5][6]

Sr. No	Name of the joint	Move ment of joint	Muscle action	Move ment of joint	Muscle action	Move ment of joint	Muscle e action	Nerve supply
1	Neck	Flexion	Sternocleidom astoid	Axial rotatio n	Sternocleidom astoid, Scalenus, Longus co li, Rectus capitis lateralis, Levator scapulae, Longissimus, Obliquus capitis	--	--	Accessary, Cervical ventral & dorsal rami, C1 ventral & dorsal rami,
2	Shoulder joint	Extension	Triceps brachii Deltoid Latissimus dorsi, Ter es major, Pectoralis Major	--	--	--	--	Radial, Axillary, Thoracodorsal , Lower subscapular, Medial & Lateral Pectoral
3	Elbow joint	Extension	Triceps brachii, Anconeus, Coracobrachialis is, Pronator teres, Pronator quadratus	--	--	--	--	Radial, Musculocutan eous, Median, Anterior interosseous

4	Hip Joint	Abduction	Gluteus medius & minimus, Tensor fasciae lata, Piriformis, Obturator Internus	Extern al rotatio n	Gluteus maximus, Obturator externus & internus Piriformis, Quadratus femoris, Sartorius, Gemilli	Flexion	Iliacus , Psoas major, Sartor ius, Tenso r fascia lata, Pectin eus, Adduc tor longus & Brevis	Superior & inferior gluteal, L 5, S1&2 Ventral rami, Femoral, Obturator, L4&5, S1 Ventral rami
5	Hip Joint	Adduction	Adductor longus, magnus, brevis, Gracilis Pectineus, Quadratus Femoris	Intern al rotatio n	Gluteus medius & minimus, Tensor fasciae lata, Adductors, Iliopsoas	Extension	Adduc tor magn us, Glute us maxi mus, Hamst ring muscl e	Inferior gluteal, Femoral, L4&5, S1 Ventral ram i, Superior gluteal, Obturator, L1&2 ventral rami, Inferior gluteal, Sciatica nerve (Tibial part)
6	Knee joint	Extension	Quadriceps femoris, Gluteus maximus, Tensor fasciae latae	--	--	--	--	Femoral nerve, Superior & Inferior gluteal Nerve
7	Ankle joint	Plantar flexion	Gastronemius,	--	--	--	--	Tibial nerve,

			Soleus, Plantaris,Tibial is posterior, Flexor Digitorum longus, Flexor hallucis longus, Peronius longus & brevis					Superficial peroneal nerve

Table 4- Movement of Range of Motion of joints [7]

Sr. No	**Name of the joint**	**ROM Extension**		**ROM Flexion/ Plantar flexion**		**ROM Abduction**		**ROM Adduction**		**ROM External Rotation**		**ROM Internal Rotation**		**ROM Axial Rotation (Right & Left)**	
		AA OS	AM A	AA OS	AM A	AA OS	AM A	A A OS	AM A	A A OS	AM A	AA OS	AM A	A A OS	AMA
1	Neck	--	--	--	50	--	--	--	--	--	--	--	--	--	80
2	Shoulder joint	60	50	--	--	--	--	--	--	--	--	--	--	--	--
3	Elbow joint	0	0	--	--	--	--	--	--	--	--	--	--	--	--
4	Hip joint	20	30	120	100	--	40	--	20	45	40	45	50	--	--
5	Knee joint	0	0	--	--	--	--	--	--	--	--	--	--	--	--
6	Ankle joint	--	--	50	40	--	--	--	--	--	--	--	--	--	--

3. ***Garudasana***

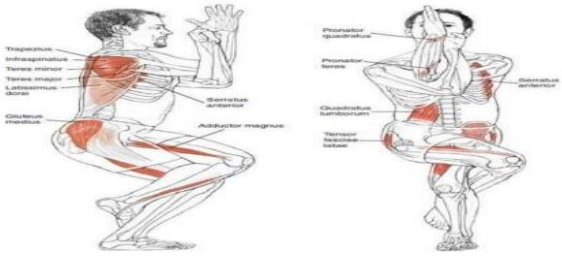


Table 5- Movement of joints, muscle involved and nerve supply [4][6]

Sr. No	Name of the joint	Movement of joint	Muscle action	Movement of joint	Muscle action	Nerve supply
1	Shoulder joint	External rotation	Infraspinatus, Teres minor	--	--	Suprascapular, Axillary
2	Elbow joint	Flexion	Biceps brachii, Brachialis	--	--	Musculocutaneous nerve
3	Wrist joint	Extension	Extensor Carpi radialis longus, Extensor carpi radialis brevis, Extensor carpi radialis Ulnaris	--	--	Radial
4	Hip Joint	Flexion	Iliacus, Psoas major, Sartorius,	Adduction	Adductor longus,	Superior Gluteal, Inferior gluteal, Femoral, L4&5, S1
			Tensor fascia latae, Pectineus		magnus, brevis, Gracilis Pectineus, Quadratus Femoris	Ventral rami, Superior gluteal, Obturator, L1&2
		Internal rotation	Gluteus medius & minimus, Tensor fasciae lata, Adductors, Iliopsoas			
5	Knee joint	Flexion	Hamstrings	--	--	Femoral,
6	Ankle joint	Dorsiflexion on	Tibialis anterior, External Hallucis longus, Extensor Digitorum Longus, Peroneus Tertius.	--	--	Deep Peroneal

Table 6- Movement of Range of Motion of joints [8]

Sr. No	Name of the joint	ROM Extension		ROM Flexion/ Dorsiflexion		ROM Abduction		ROM Adduction		ROM External Rotation		ROM Internal Rotation	
		AAOS	AMA	AAOS	AMA	AAOS	AMA	AAOS	AMA	AAOS	AMA	AAOS	AMA
1	Shoulder joint	--	--	--	--	--	--	--	--	90	90	--	--
2	Elbow joint	--	--	150	140	--	--	--	--	--	--	--	--
3	Wrist joint	70	60	--	--	--	--	--	--	--	--	--	--
4	Hip joint	--	--	120	100	--	--	--	20	--	--	45	40
5	Knee joint	--	--	--	150	--	--	--	--	--	--	45	40
6	Ankle joint	--	--	50	40	--	--	--	--	--	--	--	--

DISCUSSION

1. Coordinated movements of shoulder, elbow, hip, knee, foot, and neck are required for *Parivrtta Parshvakonasana*. Joint mobility is supported by muscle movements and range of motion (e.g. hip flexion: 100°, shoulder adduction: 180°).

2. *Trikonasana* works on the muscles involved in knee extension, hip internal / external rotation, and neck left lateral rotation. Hip rotation ROM ranged from 40 to 50 degrees.

3. Balance and fine control of internal rotations, especially in the shoulder and hip joints are emphasized in *Garudasana*.

4. At the neuromuscular junction, muscle fiber contraction triggers the neural signal that causes the nerve impulse to release acetylcholine. Similarly, in an action potential, the released CA ions go to the sarcoplasm. The muscles will continue to contract as long as ATP and CA ions are available. When a muscle relaxes, its ATP utilization decreases, its sarcoplasmic CA ion level decreases, and it returns to its resting condition.[9]

Parivrtta Parshvakonasana -The application of Parivrtta Parshvakonasana (Revolved Side Angle Pose) in the context of muscular diseases (myopathies, certain dystrophies) is highly exquisite, potential to maintain trunk flexibility and respiratory capacity through spinal mobility, but with significant safety modifications due to its high physical demand and risk of instability.[10][11]

Trikonasana-The application of Trikonasana (Triangle Pose) in the context of muscular diseases (such as

Muscular Dystrophy, Myositis, or other myopathies) is primarily focused on therapeutic intervention for maintaining flexibility and balance, rather than building significant muscle bulk, stretch and pose's static is valuable for managing the secondary complications of progressive muscle weakness. [10][11]

Garudasana- Garudasana presents a dual-modality therapeutic opportunity for muscular diseases: a standing balance challenge for the lower body and a deep, Due to the inherent weakness and instability in these conditions, its application must focus entirely on modified, supported variations to prioritize safety and maintenance of function. [10][11]

Primary Therapeutic Focus: Upper Body Flexibility

In conditions like muscular dystrophy, muscle weakness in the back and shoulders (e.g., in the serratus anterior, rhomboids, and upper back extensors) can lead to rounded shoulders (kyphosis) and limited arm movement. [10][11]

CONCLUSION

Parivrtta Parshvakonasana, Trikonasana and *Garudasana,* these standing asanas works on several joints and muscle groups offering potential benefits in musculoskeletal rehabilitation and preventive care. By charting range of motion, muscle activity and nerve supply it helps physical therapists and clinicians. Yoga therapists can use this knowledge to prevent joint injuries, improve flexibility and create rehabilitation regimens thus, supports yoga's clinical applications and adds biomechanical insights.

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