

# Illustrated Biomechanics

*JV'n Dr. Barkha Khurana*

**JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR**

UGC Approved Under 2(f) & 12(b) | NAAC Accredited | Recognized by Statutory Councils

Printed by :  
JAYOTI PUBLICATION DESK

Published by :  
*Women University Press*  
Jayoti Vidyapeeth Women's University, Jaipur

**Faculty of Physiotherapy & Diagnostics**

**Title:** Illustrated Biomechanics

**Author Name**Dr. Barkha Khurana

**Published By:** Women University Press

**Publisher's Address:** Jayoti Vidyapeeth Women's University, Jaipur  
Vedaant Gyan Valley,  
Village-Jharna, Mahala Jobner Link Road, NH-8  
Jaipur Ajmer Express Way,  
Jaipur-303122, Rajasthan (INDIA)

**Printer's Detail:** Jayoti Publication Desk

**Edition Detail:** I

**ISBN:** 978-93-90892-87-7

**Copyright ©-** Jayoti Vidyapeeth Women's University, Jaipur

## Contents

<b>S.NO</b>	<b>TOPIC</b>	<b>PAGE NUMBER</b>
1	PLANES AND AXES	2-4
2	NEWTONS LAW OF MOTION	5-7
3	LEVERS	8-12
4	JOINTS	13-15
5	TYPES OF MUSCLES	16-17
6	SHOULDER JOINT	18-19
7	SCAPULO-HUMERAL RHYTHM	20-21
8	ELBOW JOINT	22-23
9	WRIST JOINT	24-26
10	PREHENSION	27-28
11	HIP JOINT	29-30
12	DEFORMITIES OF HIP	31-32
13	KNEE JOINT	33-34
14	ANKLE JOINT	35-38
15	POSTURE - INTRODUCTION	
16	ASSESSMENT OF POSTURE	39-40
17	POSTURAL DEFORMITIES	41-42
18	ABNORMAL POSTURES	43-45
19	EXERCISES FOR ABNORMAL POSTURE	46-48

## PLANES & AXES

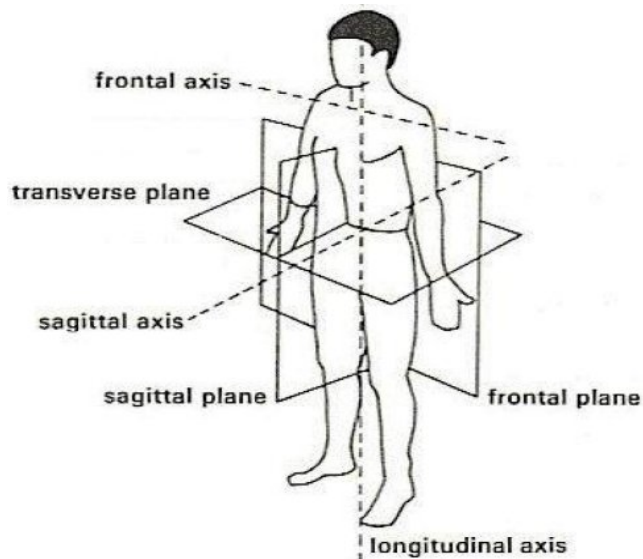
Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about shoulder joint & its biomechanics. I had discussed from oldest to new theories. Now tell me about shoulder joint? Topic to be discussed today- Today I will discuss about planes & axes. I will start this topic from scapula humeral rhythm.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams
  - lecture



### Three basic reference planes are utilized in anatomy:

- A sagittal plane, also referred to as the longitudinal plane, is perpendicular to the bottom and divides the body into left and right. The midsagittal or median plane is within the midline i.e. it might undergo the midline structures (e.g. navel or spine), and every one other sagittal planes (also mentioned as parasagittal planes) are parallel thereto . Median also can ask the midsagittal plane of other structures, like a digit.
- A coronal or frontal plane is perpendicular to the bottom and divides the body into dorsal (posterior or back) and ventral (anterior or front) portions.
- A transverse plane, also referred to as an axial plane or cross-section, divides the body into cranial (head) and caudal (tail) portions. it's parallel to the bottom , which (in humans) separates the superior from the inferior, or put differently , the top from the feet. When describing anatomical motion, these planes describe the axis along which an action is performed. So by moving through the transverse plane, movement travels from head to

toe. for instance , if an individual jumped directly up then down, their body would be moving through the transverse plane within the coronal and sagittal planes.

### **Axes**

An axis may be a line around which an object rotates. Movement at the joint takes place during a plane about an axis. There are three axes of rotation.

- Sagittal axis - passes horizontally from posterior to anterior and is made by the intersection of the sagittal and transverse planes.
- Frontal axis - passes horizontally from left to right and is made by the intersection of the frontal and transverse planes.
- Vertical axis - passes vertically from inferior to superior and is made by the intersection of the sagittal and frontal planes.

### **Describing Movement**

Extension occurs when the angle between two adjacent segments within the body increases because the ventral surfaces of the segments move faraway from one another and occurs during a sagittal plane a few frontal axis. An exception is extension of the thumb, which takes place during a frontal plane a few sagittal axis.

Flexion occurs when the angle between two adjacent segments within the body decreases because the ventral surfaces of the segments approximate one another and occurs during a sagittal plane a few frontal axis. An exception is flexion of the thumb, which takes place during a frontal plane a few sagittal axis.

### **University Library Reference-**

Joint structure and functions- Cynthia Norkins  
Online Reference – [www.physiopeia.com](http://www.physiopeia.com)

- Ancient Indian Literature Reference –  
The word Gulpha means where the Pada (foot) and Jangha meet together or the part of body where the foot is connected with the leg.

According to Dr. Ghanekar, Gulpha is ankle joint includes tibiofibular and talocrural articulation, when there is any injury on Gulpha there may be symptoms like: Ruja, stabdha padata, and khanjata According to Amarkosh Gulpha means Padasya granthi.

- Competitive questions from today topic (2 questions Minimum)-
- The plane which divides the body into superior and inferior halves is known as the ...

- A. Sagittal plane
  - B. Transverse plane
  - C. Coronal plane
  - D. Frontal plane
- The plane which divides the body into anterior and posterior halves is known as the ...
    - A. Sagittal plane
    - B. Transverse plane
    - C. Frontal plane
    - D. Horizontal plane
- Exam Name MPT entrance exam
  - Suggestions to secure good marks to answer in exam-
    - Give answer with complete labeled diagrams.
    - Explain answer with key point answers
  - Questions to check understanding level of students-
    - What is shoulder joint?
    - What is plane and axis?
  - Academic Day ends with-  
National song ' Vande Mataram '

## NEWTON LAW OF MOTION

Academic Day starts with –

- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

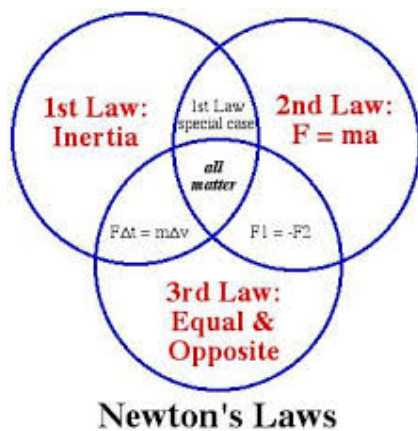
Lecture Starts with-

Review of previous Session- In previous session as I had discussed about levers . I had discussed from oldest to new theories. Now tell me about levers?

Topic to be discussed today- Today I will discuss about Newton law of motion.

Lesson deliverance (Diagrams & Live Example)-

- Diagrams
- lecture



The First Law of Motion states,

"A body at rest will remain at rest, and a body in motion will remain in motion unless it's acted upon by an external force." This simply means things cannot start, stop, or change direction all by themselves. It takes some force working on them from the surface to cause such a change. This property of massive bodies to resist changes in their state of motion is usually called inertia.

The Second Law of Motion describes what happens to a huge body when it's acted upon by an external force. It states, "The force working on an object is adequate to the mass of that object times its acceleration." this is often written in mathematical form as  $F = ma$ , where  $F$  is force,  $m$  is mass, and  $a$  is acceleration.

The Third Law of Motion states, "For every action, there's an equal and opposite reaction." This law describes what happens to a body when it exerts a force on another body. Forces always occur in pairs, so when one body pushes against another, the second body pushes back even as hard. for instance , once you push a cart, the cart pushes back against you; once you pull on a rope, the rope pulls back against you; when gravity pulls you down against the bottom , the bottom pushes up against your feet;

## University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.livescience.com](http://www.livescience.com)

### • Ancient Indian Literature Reference –

Vaisheshika or Vaiśeṣika (Sanskrit: वािशेशिक) is one among the six Hindu schools of philosophy in Ancient Vedic India. Vaishesika Sutras proposed 1800 years before Newton's Three Laws of Motion

• वािशेशिकसुत्रानुसारेण प्रथमसूत्रम् |  
Translation: Change of motion is thanks to impressed force.  
(The law stated that an object at rest tends to remain at rest and an object in motion tends to remain in motion with an equivalent speed and within the same direction unless acted upon by an unbalanced force.)

• वािशेशिकसुत्रानुसारेण द्वितीयसूत्रम् |  
Translation: Change of motion is proportional to the impressed force and is within the direction of the force.

• वािशेशिकसुत्रानुसारेण तृतीयसूत्रम् |

Translation: Action and reaction are equal and opposite.

Competitive questions from today's topic (2 questions Minimum)-

- 1) A goalkeeper in a game of football pulls his hands backwards after holding the ball shot at the goal. This enables the goalkeeper to:
  - (a) Exert large force on the ball
  - (b) Increases the force exerted by the ball on hands
  - (c) Increase the rate of change of momentum
  - (d) Decrease the rate of change of momentum
  
- 2) An object of mass 2 kg is sliding with a constant velocity of 4 m/s on a friction less horizontal table. The force required to keep the object moving with the same velocity is:
  - (a) 32 N
  - (b) 0 N
  - (c) 2 N
  - (d) 8 N



- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What are Newton laws of motion?
  - Give examples of levers?
- Academic Day ends with-  
National song 'Vande Mataram'

# LEVERS

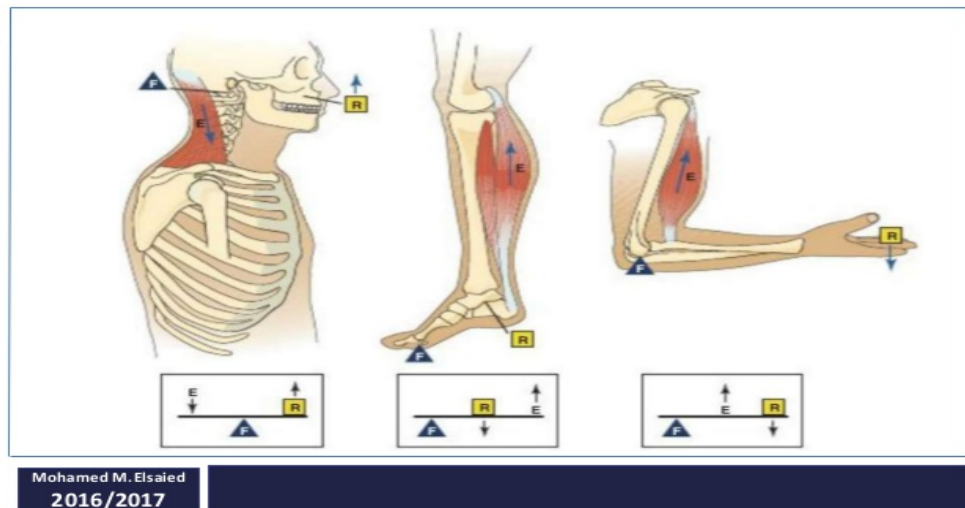
Academic Day starts with –

- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem. Lecture Starts with-

Review of previous Session- In previous session as I had discussed about planes & axes . I had discussed from oldest to new theories. Now tell me about sagittal plane?

Topic to be discussed today- Today I will discuss about levers. Lesson deliverance (Diagrams & Live Example)-

- Diagrams
- lecture



Muscles and bones act together to make levers. A lever may be a rigid rod (usually a length of bone) that turns a few pivot (usually a joint). Levers are often used in order that a little force can move a way bigger force. this is often called ratio .

Mechanical

advantage

Levers are often used in order that a little force can move a way bigger force. this is often called ratio . In our bodies bones act as lever arms, joints act as pivots, and muscles provide the trouble forces to maneuver loads.

There are four parts to a lever – lever arm, pivot, effort and cargo. In our bodies:

- bones act as lever arms
- joints act as pivots
- muscles provide the trouble forces to maneuver loads

- load forces are often the weights of the body parts that are moved or forces needed to lift, push or pull things outside our bodies.

Levers also can be wont to magnify movement, for instance, when kicking a ball; small contractions of leg muscles produce a way larger movement at the top of the leg. Levers are ready to give us a strength advantage or a movement advantage but not both together.

### **Nature of science**

Scientists use data to copy their explanations of the planet. These explanations increase a growing body of data. For instance, knowledge of levers underpins explanations of body movement. Remember that knowledge domain continues to evolve then is tentative.

### **Types of levers**

Different classes of levers are identified by the way the joint and muscles attached to the bone are arranged.

### **Pivot diagram of a category 1 lever**

Different classes of levers are identified by the way the joint and muscles attached to the bone are arranged.

For the category 1 lever the pivot lies between the trouble and cargo . A see saw during a playground is an example of a category 1 lever where the trouble balances the load. This pivot exists within the place where your skull meets the highest of your spine. Your skull is that the lever arm and therefore the neck muscles at the rear of the skull provide the force (effort) to lift your head against the load of the top (load). When the neck muscles relax, your head nods forward.

### **Class 1 lever – nod your head**

#### **Skull and neck**

Different classes of levers are identified by the way the joint and muscles attached to the bone are arranged.

For a category 1 lever the pivot lies between the trouble and therefore the load. A see saw during a playground is an example of a category 1 lever where the trouble balances the load. The place where your skull meets the highest of your spine may be a Class 1 lever. Your skull is that the lever arm and therefore the neck muscles at the rear of the skull provide the force (effort) to lift your head against the load of the top (load). When the neck muscles relax, your head nods forward.

The pivot is that the place where your skull meets the highest of your spine. Your skull is that the lever arm and therefore the neck muscles at the rear of the skull provide the force (effort) to lift your head against the load of the top (load). When the neck muscles relax, your head nods forward.

For this lever, the pivot lies between the trouble and cargo . A see saw during a playground is another example of a category 1 lever where the trouble balances the load.

### **Nature of science**

Scientists make models to demonstrate their explanations. Often models are constructed to demonstrate how things work. This model uses a physics idea of levers to supply an evidence for muscle/bone movement. The physics explanation of levers supports this model.

### **Class 2 lever – stand on tip toes**

The pivot is at your toe joints and your foot acts as a lever arm. Your calf muscles and Achilles tendon provide the trouble when the calf muscle contracts. The load is your weight and is lifted by the trouble (muscle contraction).

### **Pivot diagram of a category 2 lever**

Different classes of levers are identified by the way the joint and muscles attached to the bone are arranged.

For the category 2 lever the load is between the pivot and therefore the effort (like a wheelbarrow). the trouble force needed is a smaller amount than the load force, so there's a ratio .

Standing on tip toes may be a Class 2 lever. The pivot is at your toe joints and your foot acts as a lever arm. Your calf muscles and Achilles tendon provide the trouble when the calf muscle contracts. The load is your weight and is lifted by the trouble (muscle contraction).

The load is between the pivot and therefore the effort (like a wheelbarrow). the trouble force needed is a smaller amount than the load force, so there's a ratio . This muscular movement at the rear of your legs allows you to maneuver your whole body a little distance.

For the category 2 lever the load is between the pivot and therefore the effort (like a wheelbarrow). the trouble force needed is a smaller amount than the load force,

so there's a ratio .

Standing on tip toes may be a Class 2 lever. The pivot is at your toe joints and your foot acts as a lever arm. Your calf muscles and Achilles tendon provide the trouble when the calf muscle contracts. The load is your weight and is lifted by the trouble (muscle contraction).

### **Class 3 lever – bend your arm**

The pivot is at the elbow and therefore the forearm acts because the lever arm. The biceps muscle provides the trouble (force) and bends the forearm against the load of the forearm and any weight that the hand could be holding.

For a category 3 lever the load is further faraway from the pivot than the trouble . there's no ratio because the trouble is bigger than the load. However this disadvantage is compensated with a bigger movement. this sort of lever system also gives us the advantage of a way greater speed of movement.

A bent arm may be a Class 3 lever. The pivot is at the elbow and therefore the forearm acts because the lever arm. The biceps muscle provides the trouble (force) and bends the forearm against the load of the forearm and any weight that the hand could be holding. The load is further faraway from the pivot than the trouble . there's no ratio because the trouble is bigger than the load. However this disadvantage is compensated with a bigger movement – a little contraction of the biceps produces an outsized movement of the forearm. this sort of lever system also gives us the advantage of a way greater speed of movement..

For a category 3 lever the load is further faraway from the pivot than the trouble . there's no ratio because the trouble is bigger than the load. However this disadvantage is compensated with a bigger movement. this sort of lever system also gives us the advantage of a way greater speed of movement.

A bent arm may be a Class 3 lever. The pivot is at the elbow and therefore the forearm acts because the lever arm. The biceps muscle provides the trouble (force) and bends the forearm against the load of the forearm and any weight that the hand could be holding.

### **University Library Reference-**

Joint structure and functions- Cynthia Norkins

Online Reference – [www.physiopeia.com](http://www.physiopeia.com)

- Competitive questions from today topic (2 questions Minimum)-
  1. Mechanical advantage is the ratio of effort to load.
    - a) True
    - b) False

- Leverage is the ratio of load arm to effort arm.
  - a) True
  - b) False
- Exam Name MPT entrance exam
  
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is mechanical advantage?
  - What are levers?
- Academic Day ends with-  
National song 'Vande Mataram'

# JOINT

Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

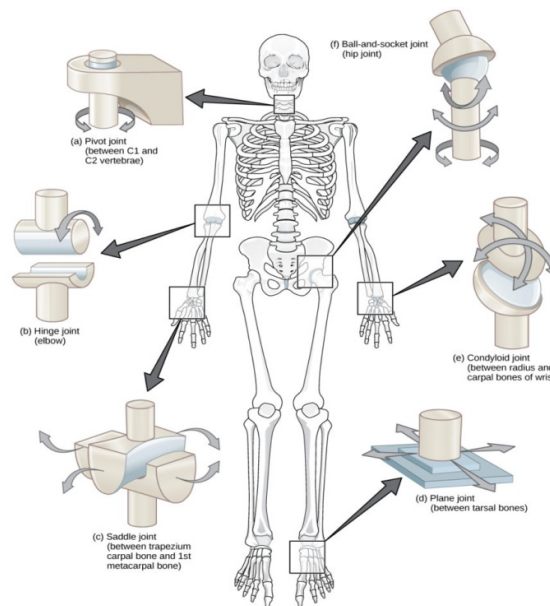
Lecture Starts with-

Review of previous Session- In previous session as I had discussed about muscles. I had discussed from oldest to new theories. Now tell me about muscles.

Topic to be discussed today- Today I will discuss about Types of joints.

Lesson deliverance -

- Diagrams
- Lecture



A joint may be a point where two or more bones meet. There are three main sorts of joints; Fibrous (immovable), Cartilaginous (partially moveable) and therefore the Synovial (freely moveable) joint. Fibrous Joints

- This sort of joint is additionally called synarthrodial. it's held together by just a ligament.

- Examples are where the teeth are held to their bony sockets and at both the radioulnar and tibiofibular joints.

Cartilaginous

joints

- Cartilaginous (synchondroses and symphyses): These joints occur where the connection between the articulating bones is formed from cartilage. for instance , between vertebrae within the spine.

- Synchondroses are temporary joints which are only present in children, up until the top of puberty. for instance , the epiphyseal plates in long bones.
- Symphysis joints are permanent cartilaginous joints, for instance , the pubic symphysis.

### Synovial Joints

- Synovial (diarthrosis): Synovial joints are far and away the foremost common classification of a joint within the physical body .
- They are highly moveable and every one have a synovial capsule (collagenous structure) surrounding the whole joint, a synovium (the inner layer of the capsule) which secretes synovia (a lubricating liquid) and cartilage referred to as cartilage which pads the ends of the articulating bones.

### University Library Reference-

Joint structure and functions- Cynthia Norkins

**Online Reference** –[www.techpe.com](http://www.techpe.com)

### Ancient Indian Literature Reference –

The term “Ayurveda” may be a combination of two Sanskrit terms “ayu” (life) and “veda” (knowledge). Practitioners work to balance the three energy forces, or “doshas,” of life: “vata,” “pitta,” and “kapha.”

Ayurvedic treatments for RA depend upon which diagnostic guidelines the practitioner uses.

For example, those that practice from the rules “Madhava Nidana” believe that imbalances within the gut and inflammatory compounds cause RA.

On the opposite hand, practitioners from the “Ashtanga Hridaya” school of thought believe that RA is that the results of poor dietary and lifestyle habits that cause inflammation within the body.

Both approaches use herbs, supplements, dietary changes, and exercise to assist relieve RA symptoms.

### Herbs and supplements

Ayurvedic practice often involves the utilization of herbs and supplements as treatment.

Some of the herbs that Ayurvedic practitioners often use to treat RA include:

- Boswellia serrata (Indian frankincense)
- garlic
- ginger
- Ricinus communis (castor oil)
- ashwagandha

Some Ayurvedic medicine formulations also contain “bhasma,” which are specially



prepared sorts of metals, like silver, copper, and iron.

An Ayurvedic practitioner can also prepare special oils that contain herbs. People can massage these oils into areas where they experience symptoms.

- **Competitive questions from today topic (2 questions Minimum)-**

1. The number of cartilaginous structures in a long bone are \_\_\_\_\_
  - a) 2
  - b) 5
  - c) 0
  - d) 1
2. Ellipsoid joint is found at \_\_\_\_\_
  - a) atlanto-occipital joint
  - b) first carpo-metacarpal joint
  - c) first tarso-metatarsal joint
  - d) atlanto-axial joint.

- Exam Name MPT entrance exam

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is the structure of synovial joint?
  - What are the types of joints?
- Academic Day ends with-  
National song 'Vande Mataram'

## TYPES OF MUSCLES

Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

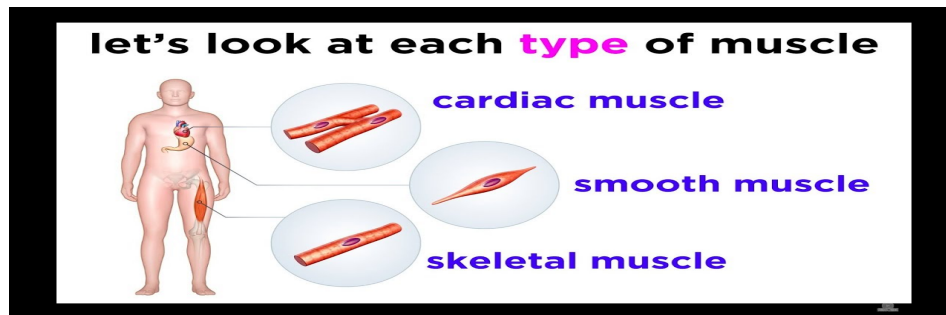
Lecture Starts with-

Review of previous Session- In previous session as I had discussed about muscles. I had discussed from oldest to new theories. Now tell me about muscles.

Topic to be discussed today- Today I will discuss about Types of Muscles.

Lesson deliverance -

- Diagrams
- Lecture



About half your body's weight is muscle. within the muscular system, muscle tissue is categorized into three distinct types: skeletal, cardiac, and smooth. Each sort of muscle tissue within the physical body features a unique structure and a selected role. striated muscle moves bones and other structures. heart muscle contracts the guts to pump blood. the graceful muscle tissue that forms organs just like the stomach and bladder changes shape to facilitate bodily functions. Here are more details about the structure and performance of every sort of muscle tissue within the human muscular system. Smooth muscle is found within the walls of hollow organs throughout the body. Smooth muscle contractions are involuntary movements triggered by impulses that travel through the autonomic systema nervosum to the graceful muscle tissue. The arrangement of cells within smooth muscle tissue allows for contraction and relaxation with great elasticity. 3. heart muscle Contracts in Response to Signals from the Cardiac Conduction System.

### University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference –[www.nature.com](http://www.nature.com)

- Ancient Indian Literature Reference
- Vedic meditation is the Meditation technique from which Rig Veda originated.
- Vedic meditation is a system of isometric exercises in which effect of change of tone of muscles on thinking and actions is studied. The findings are recorded allegorically as hymns, which were later compile into Rig Veda.

- **PURUSHA**

- Central to Vedic meditation is Purusha. The tone of all the muscles can be synchronized, equalized and unified. The unified muscle in Rig Veda is known as Purusha.

- **AGNI**

- Next in importance to Purusha is Agni and the first Sukta of Rig Veda is about Agni. Agni symbolizes a force, which is controllable, small in magnitude and short in duration. This force is ideally suited for practicing Vedic meditation.

- **PURUSHA SUKTA, 10.90, RIG VEDA**

- The most important Sukta of Rig Veda is Purusha Sukta, which is actually about the practice of Vedic meditation.
- 10.90.1 : we think, feel and move with our unified muscle.
- 10.90.6.2 : Increase and decrease of tone of the unified muscle produces a sinusoidal waves, which is symbolized by seasonal changes. This is what we call Atman.
- 10.90.7 : If Purusha is projected onto the universe he becomes maximally powerful.
- 10.90.15.1 : Purusha has seven hidden weapons and seven kinds of energy. In Manu Smriti 1.19 these are referred to as seven Mahapurushas. These are the same as the seven Hindu gods Indra, Shakti, Brahma, Vishnu, Shiva, Shani and Yama.
- Competitive questions from today topic (2 questions Minimum)-

- 1) The Muscles That You Cannot Control That Make Up Your Internal Organs Are Called \_\_\_\_\_ Muscles.
  - i) Smooth Muscles
  - ii) Tissue
  - iii) Skeletal Muscles
  - iv) None

- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is the structure of muscle?
  - What are the types of muscles?
- Academic Day ends with-  
National song ' Vande Mataram'

## SHOULDER JOINT

Academic Day starts with –

- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about shoulder girdle Anatomy.

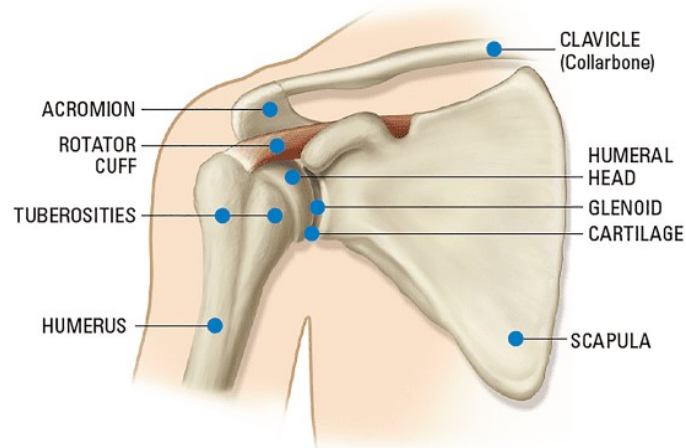
Shoulder is one among the most important and most complex joints within the body. The shoulder is made where the humerus (upper arm bone) fits into the scapula (shoulder blade), sort of a ball and socket. Other important bones within the shoulder include:

- The acromion may be a bony projection off the scapula.
- The clavicle (collarbone) meets the acromion within the acromioclavicular joint.
- The coracoid process may be a hook-like bony projection from the scapula.

The shoulder has several other important structures:

- The structure may be a collection of muscles and tendons that surround the shoulder, giving it support and allowing a good range of motion.
- The bursa may be a small sac of fluid that cushions and protects the tendons of the structure .
- A cuff of cartilage called the labrum forms a cup for the ball-like head of the humerus to suit into.

The humerus fits relatively loosely into the shoulder . this provides the shoulder a good range of motion, but also makes it susceptible to injury.



University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.sciencedirect.com](http://www.sciencedirect.com)

**Ancient Indian Literature Reference –**

100 years ago, Wood Jones ( 1920 ) characterized the hand as a specialized sensory organ and therefore the use of the hands in exploration as a defining characteristic of primates. Thus, from the start , researchers have investigated how primates use their hands to the touch and handle objects, also as during locomotion. Understanding how

primates use their hands is prime to reconstructing and interpreting the evolution of the order to which humans belong to (Napier 1960 , 1961 , 1980 ).

Primates were present within the Eocene, feeding and moving predominantly on thin and flexible terminal branches (Cartmill 1974 ; Sussman 1991 ; Sussman et al. 2013 ; see Chap. 14). They used both hands and feet to locomote during this environment and therefore the hands to feed. Prehension of small objects (such as insects or fruits) by one hand is taken into account a primitive characteristic of primates (Washburn 1951 ; Napier 1961 , 1980 ) and is integral to feeding altogether living primates. However, this characteristic is shared with other orders as primates aren't alone in using one appendage in prehension. Indeed, Iwaniuk and Whishaw ( 2000 ) reported that, of 29 tetrapod orders that the presence or absence of “skilled forelimb movements” (which includes reaching, grasping, and manipulation with one forelimb) was examined, 13 orders were characterized by such movements. Iwaniuk and Whishaw ( 2000 ) showed that skilled movements of the forelimbs in mammals probably share a standard origin in early tetrapods, appearing after the divergence of therian mammals (marsupials and placentals) from the monotremes. The prehensile actions of primates must therefore be considered against this ancient backdrop. useful to explore the presence of below-branch positional behaviors and assess their dependence on suspensory locomotion (Arias-Martorell et al., 2015a,b,c; Larson, 1993, 1995)

- Competitive questions from today topic (2 questions Minimum)-
  - 1) What is the ratio of SHR ?
    - a) 1:3 b) 2:2 c) 3:2 d) 2:1
  - 2) What type of joint is Shoulder joint?
    - a) Ball & socket b) saddle joint c) sellar joint d) hinge joint
- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is a shoulder joint?
  - What are the causes of altered SHR?
- Next Topic- Biomechanics of elbow joint.
- Academic Day ends with-  
National song' Vande Mataram'

## SCAPULOHUMERAL RHYTHM

Academic Day starts with –

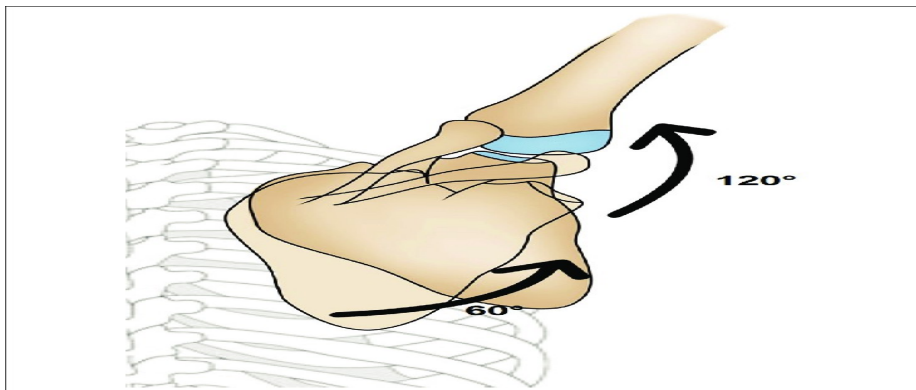
- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about shoulder joint & its biomechanics. I had discussed from oldest to new theories. Now tell me about shoulder joint?

Topic to be discussed today- Today I will discuss about biomechanics of ankle joint. I will start this topic from scapula humeral rhythm.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams
  - lecture



Scapulohumeral rhythm (also mentioned as glenohumeral rhythm) is that the kinematic interaction between the scapula and therefore the humerus, first published by Codman within the 1930s.

This interaction is vital for the optimal function of the shoulder. [2] When there's a change of the traditional position of the scapula in reference to the humerus, this will cause a disfunction of the scapulohumeral rhythm. The change of the traditional position is additionally called scapular dyskinesia. Various studies of the mechanism of the shoulder have attempted to explain the worldwide motion capacity of the shoulder ask that description, are you able to evaluate the shoulder to ascertain if the function is correct? and explain the complex interactions between components involved in placing the hand in space. The interplay of 4 articulations (Sternoclavicular Joint, Acromioclavicular Joint, Scapulothoracic Joint and Glenohumeral Joint) of the shoulder complex, leads to a coordinated movement pattern of the arm elevation. The involved movements at each joint are continuous, although occurring at various rates and at different phases of arm elevation. The movement of the scapula are often described by rotations in reference to the thorax.

The scapula moves around a dorso-ventral axis, leading to a rotation within the frontal plane. during this movement the glenoid fossa is turned cranially (upward rotation) or caudally (downward rotation). within the sagittal plane, around a latero-lateral axis the scapula rotates posteriorly (posterior tilting) or anteriorly (anterior tilting). External and internal rotation occurs around a cephalo-caudal (longitudinal) axis. The external rotation brings the glenoid fossa more into the frontal plane, whereas the interior rotation turns the glenoid fossa more to the sagittal plane.

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.physiopedia.com](http://www.physiopedia.com)

- Ancient Indian Literature Reference –

The word Gulpha means where the Pada (foot) and Jangha meet together or the part of body where the foot is connected with the leg.

According to Dr. Ghanekar, Gulpha is ankle joint includes tibiofibular and talocrural articulation, when there is any injury on Gulpha there may be symptoms like: Ruja, stabdha padata, and khanjata

**According to Amarkosh Gulpha means Padasya granthi.**

- Competitive questions from today topic (2 questions Minimum)-
  - 1) What is the type of shoulder joint?
    - a) ball and socket joint b) saddle joint c) hinge joint d) ginglymus
- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is shoulder joint?
  - What is scapula humeral rythmn?
- Academic Day ends with-  
National song' Vande Mataram'

## ELBOW JOINT

Academic Day starts with –

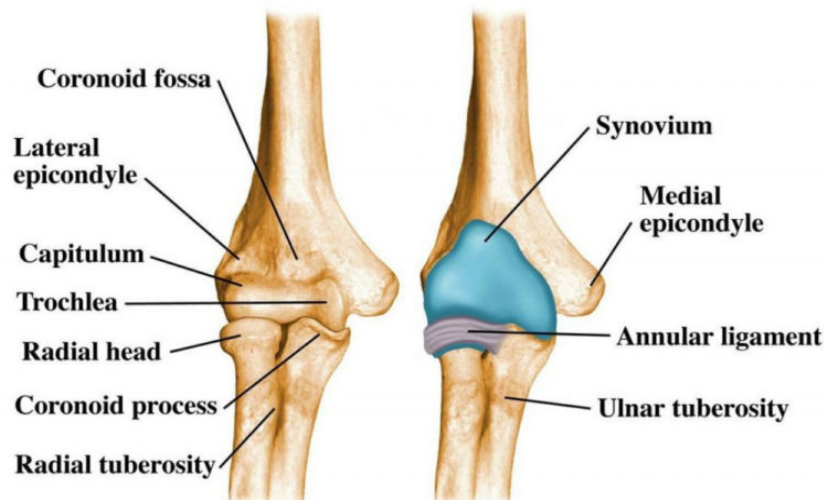
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about shoulder joint & its Anatomy. I had discussed from oldest to new theories. Now tell me about shoulder joint?

Topic to be discussed today- Today I will discuss about biomechanics of elbow joint. I will start this topic from Anatomy of elbow joint.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



The elbow is a [synovial](#) variety of hinge joint, formed within the distal end of the humerus and the proximal ends of the [ulna](#) and radius in the forearm. The elbow permits for the flexion and extension of the forearm, as well as rotation of the forearm and wrist. The articular surfaces of the bones are separated from each other by a layer of hyaline cartilage. Smooth movement of these joints is provided by the viscous synovial fluid, which acts as a lubricant. The carrying angle of the elbow is formed by the longitudinal axis between the humerus and ulna when the elbow is in full extension. In females, the average valgus angle is  $13^{\circ}$  to  $16^{\circ}$ , whereas in males, it is  $11^{\circ}$  to  $14^{\circ}$ . The joint capsule normally has a thin anterior portion. The anterior capsule becomes taut in extension and lax in flexion. The normal volume capacity of the joint is 30 ml, 11 with the greatest capacity occurring at approximately  $80^{\circ}$  flexion

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference -Teachmeanatomy.com



- Ancient Indian Literature Reference - This study was undertaken to study *Kurpara Marma* in relation to its *Vaikalyakara* effects when injured. The location of *Kurpara Marma* was found with the help of the description of *Marma* in Ayurvedic texts, dissection of the elbow joint, and with help of X-ray documentation. Total 80 patients having trauma to elbow joints due to various causes such as fall, road traffic accident, direct trauma on elbow joint, history of trauma a year back, and injury due to burn were included in this study. These patients were observed for 3 months for any changes in symptoms. In Sushruta Samhita, it was stated that an injury to the *Kurpara Marma* ends in *Kuni* (dangling of the hand), swelling, loss of power, restricted movements, and muscle wasting and associated symptoms like tingling sensation, heaviness, syncope, sweating, dizziness, and vomiting. After analysis of data, i.e., after analyzing the percentage of all symptoms on admission as well as after 3 months, it was found that all 80 patients, i.e., 100% had swelling and loss of muscle power. A total of 72 patients, i.e. 90% had dangling of hand on admission. After 3 months, 40 patients (50%) still remained with the dangling of hand. Seventy-two patients had restriction in flexion and extension deformity which still remained in 50% of patients. Hence, it was proved that *Kurpara* (elbow joint) is definitely a *Vaikalyakara Marma*. Disabilities like restriction of movements, swelling, and atrophy were remains of an injured elbow joint inspite of best surgical treatment.
- Competitive questions from today topic (2 questions Minimum)-
  - 2) What is the normal carrying angle?
    - a) 5- 15 b) 10-20 c) 22-24 d) 2:1
    - 2) What type of joint is elbow joint?
      - b) Ball & socket b) saddle joint c) sellar joint d) hinge joint
- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is elbow joint?
  - What is carrying angle?
- Next Topic- Biomechanics of wrist joint.
- Academic Day ends with-  
National song' Vande Mataram'

## WRIST JOINT

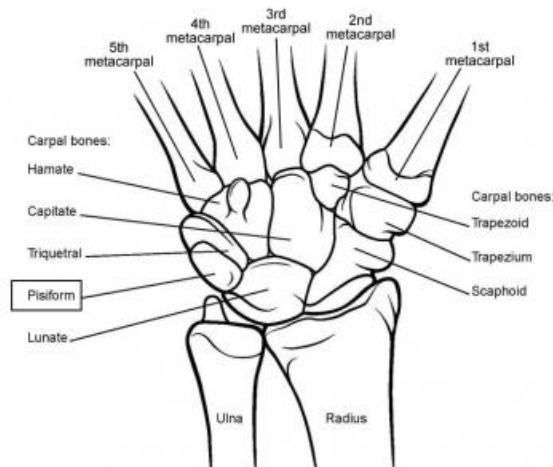
Academic Day starts with –

- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about elbow joint & its biomechanics. I had discussed from oldest to new theories. Now tell me about shoulder joint? Topic to be discussed today- Today I will discuss about biomechanics of wrist joint. I will start this topic from Anatomy of wrist joint.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



The wrist may be an articulation synovialis formed between the radius, its articular disc and three proximal carpal bones; the scaphoid, lunate and triquetral bones. Technically, the wrist is taken into account to be the sole articular component of the wrist joint; many references, however, can also include adjacent joints, like the carpal joints, during this definition.

In the wrist, the massive concave facet located on the distal end of radius directly articulates with the scaphoid and lunate bones. The articulation between the distal radius and triquetral is indirect and it's facilitated via a biconcave articular disk. The primary movements of the wrist are flexion, extension, abduction and adduction. this text will discuss the anatomy and performance of the wrist .

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.kenhub.com](http://www.kenhub.com)

- Ancient Indian Literature Reference –  
 100 years ago, Wood Jones ( 1920 ) characterized the hand as a specialized sensory organ and therefore the use of the hands in exploration as a defining characteristic of primates. Thus, from the start , researchers have investigated how primates use their hands to the touch and handle objects, also as during locomotion. Understanding how primates use their hands is prime to reconstructing and interpreting the evolution of the order to which humans belong to (Napier 1960 , 1961 , 1980 ). Primates were present within the Eocene, feeding and moving predominantly on thin and flexible terminal branches (Cartmill 1974 ; Sussman 1991 ; Sussman et al. 2013 ; see Chap. 14). They used both hands and feet to locomote during this environment and therefore the hands to feed. Prehension of small objects (such as insects or fruits) by one hand is taken into account a primitive characteristic of primates (Washburn 1951 ; Napier 1961 , 1980 ) and is integral to feeding altogether living primates. However, this characteristic is shared with other orders as primates aren't alone in using one appendage in prehension. Indeed, Iwaniuk and Whishaw ( 2000 ) reported that, of 29 tetrapod orders that the presence or absence of “skilled forelimb movements” (which includes reaching, grasping, and manipulation with one forelimb) was examined, 13 orders were characterized by such movements. Iwaniuk and Whishaw ( 2000 ) showed that skilled movements of the forelimbs in mammals probably share a standard origin in early tetrapods, appearing after the divergence of therian mammals (marsupials and placentals) from the monotremes. The prehensile actions of primates must therefore be considered against this ancient backdrop. useful to explore the presence of below-branch positional behaviors and assess their dependence on suspensory locomotion (Arias-Martorell et al., 2015a,b,c; Larson, 1993, 1995).

Competitive questions from today topic (2 questions Minimum)-

- 3) What is the number of carpal bones ?  
 b) 8 b) 12 c) 6 d) 5
  - 4) What type of joint is wrist joint?  
 c) Ball & socket b) saddle joint c) sellar joint d) hinge joint
- Exam Name MPT entrance exam

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is a wrist joint?
  - What are the bones forming wrist joint?
- Next Topic- hip joint
- Academic Day ends with-  
National song ' Vande Mataram '

## PREHENSION

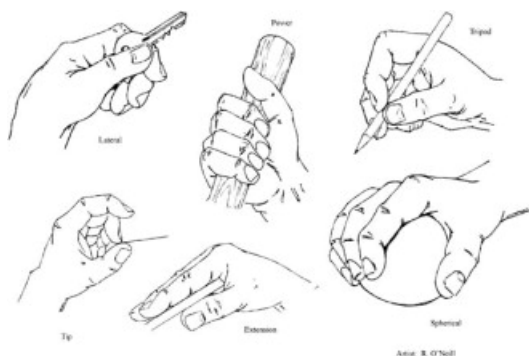
Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about wrist joint & its Anatomy. I had discussed from oldest to new theories. Now tell me about wrist joint?

Topic to be discussed today- Today I will discuss about Prehension (gripping) is an advanced skill in humans, resulting largely from the ability of the thumb to oppose the fingers. Two types of grip may be described, ‘precision’ involving the thumb and fingers and ‘power’, involving the whole hand.



University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.sciencedirect.com](http://www.sciencedirect.com)

**Ancient Indian Literature Reference –**

100 years ago, Wood Jones ( 1920 ) characterized the hand as a specialized sensory organ and the use of the hands in exploration as a defining characteristic of primates. Thus, from the beginning, researchers have investigated how primates use their hands to touch and handle objects, as well as during locomotion. Understanding how primates use their hands is fundamental to reconstructing and interpreting the evolution of the order to which humans belong to (Napier 1960 , 1961 , 1980 ). Primates were present in the Eocene, feeding and moving predominantly on thin and flexible terminal branches (Cartmill 1974 ; Sussman 1991 ; Sussman et al. 2013 ; see Chap. 14). They used both hands and feet to locomote in this environment and the hands to feed. Prehension of small objects (such as insects or fruits) by one hand is considered a primitive characteristic of primates (Washburn 1951 ; Napier 1961 , 1980 ) and is integral to feeding in all living primates. However, this characteristic is shared with other orders as primates are not alone in using one appendage in prehension. Indeed, Iwaniuk and Whishaw ( 2000 ) reported that, of 29 tetrapod orders for which the presence or absence of “skilled forelimb movements” (which includes reaching, grasping, and manipulation with one forelimb) was examined, 13 orders were characterized by such movements. Iwaniuk and Whishaw ( 2000 ) showed that skilled movements of the forelimbs in mammals probably share a common origin in early tetrapods, appearing after the divergence of therian mammals (marsupials and placentals) from the monotremes. The prehensile actions of primates must therefore be considered against this ancient backdrop. useful to explore the presence of below-branch positional behaviors and assess their dependence on suspensory locomotion (Arias-Martorell et al., [2015a,b,c](#); Larson, [1993](#), [1995](#))

- Competitive questions from today topic (2 questions Minimum)-
- 5) What is the ratio of SHR ?
  - c) 1:3 b) 2:2 c) 3:2 d) 2:1
- 6) What type of joint is Shoulder joint?
  - d) Ball & socket b) saddle joint c) sellar joint d) hinge joint
- Exam Name MPT entrance exam
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is precision?
  - What is prehension?
- Next Topic- Biomechanics of hip joint.
- Academic Day ends with-  
National song 'Vande Mataram'

## HIP JOINT

Academic Day starts with –

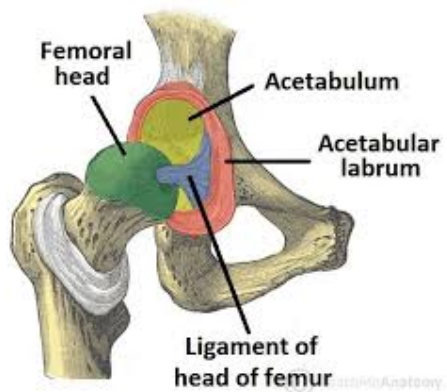
- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and anthem .

Lecture Starts with-

Review of previous Session-

In previous session as I had discussed about prehensions.

The hip (see the image below) may be a ball-and-socket synovial joint: the ball is that the femoral head, and therefore the socket is that the acetabulum. The hip is that the articulation of the pelvis with the femur, which connects the skeletal structure with the lower extremity. The adult os coxae, or hip bone, is made by the fusion of the ilium, the ischium, and therefore the pubis, which occurs by the top of the teenage years. the two hip bones form the bony pelvis, along side the sacrum and therefore the coccyx, and are united anteriorly by the pubic symphysis.



The hip (see the image below) may be a ball-and-socket synovial joint: the ball is that the femoral head, and therefore the socket is that the acetabulum. The hip is that the articulation of the pelvis with the femur, which connects the skeletal structure with the lower extremity. The adult os coxae, or hip bone, is made by the fusion of the ilium, the ischium, and therefore the pubis, which occurs by the top of the teenage years. the two hip bones form the bony pelvis, along side the sacrum and therefore the coccyx, and are united anteriorly by the pubic symphysis.

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.sciencedirect.com](http://www.sciencedirect.com)

Ancient Indian Literature Reference –

100 years ago, Wood Jones ( 1920 ) characterized the hand as a specialized sensory organ and therefore the use of the hands in exploration as a defining characteristic of

primates.

Thus, from the start, researchers have investigated how primates use their hands to touch and handle objects, also as during locomotion. Understanding how primates use their hands is prime to reconstructing and interpreting the evolution of the order to which humans belong to (Napier 1960, 1961, 1980).

Primates were present within the Eocene, feeding and moving predominantly on thin and flexible terminal branches (Cartmill 1974; Sussman 1991; Sussman et al. 2013; see Chap. 14). They used both hands and feet to locomote during this environment and therefore the hands to feed.

Prehension of small objects (such as insects or fruits) by one hand is taken into account a primitive characteristic of primates (Washburn 1951; Napier 1961, 1980) and is integral to feeding altogether living primates. However, this characteristic is shared with other orders as primates aren't alone in using one appendage in prehension. Indeed, Iwaniuk and Whishaw (2000) reported that, of 29 tetrapod orders that the presence or absence of "skilled forelimb movements" (which includes reaching, grasping, and manipulation with one forelimb) was examined, 13 orders were characterized by such movements. Iwaniuk and Whishaw (2000) showed that skilled movements of the forelimbs in mammals probably share a standard origin in early tetrapods, appearing after the divergence of therian mammals (marsupials and placentals) from the monotremes. The prehensile actions of primates must therefore be considered against this ancient backdrop. Useful to explore the presence of below-branch positional behaviors and assess their dependence on suspensory locomotion (Arias-Martorell et al., 2015a,b,c; Larson, 1993, 1995)

- Competitive questions from today topic (2 questions Minimum)-

7) Which is the longest bone ?

d) scapula b) humerus c) femur d) tibia

8) What type of joint is hip joint?

e) Ball & socket b) saddle joint c) sellar joint d) hinge joint

- Exam Name MPT entrance exam

- Suggestions to secure good marks to answer in exam-

- Give answer with complete labeled diagrams.

- Explain answer with key point answers

- Questions to check understanding level of students-

- What is a hip joint?

- What is angle of torsion?

- Next Topic- Biomechanics of ankle joint.

- Academic Day ends with-

National song 'Vande Mataram'



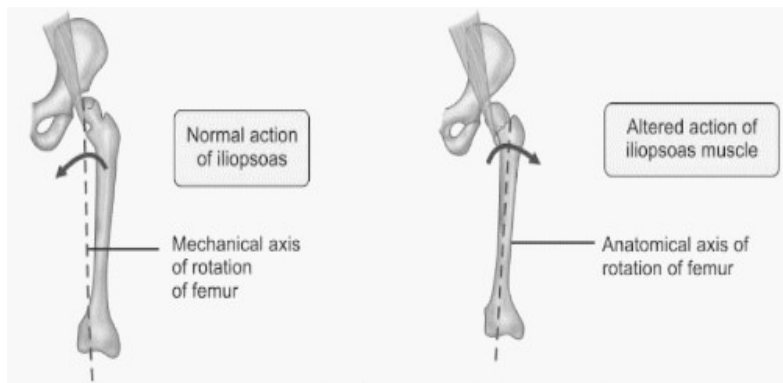
## DEFORMITIES OF HIP JOINT

Academic Day starts with –

- Greeting with saying 'Namaste' by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- I had discussed about hip joint.



These six basic deformity terms; varus, valgus, flexion, extension, internal or external torsion are often applied to other joints and long bones. However, alteration of the hip joint's unique configuration creates deformities specific to the present joint. A hard and fast abduction deformity leads to apparent leg lengthening because the pelvis tilts down thereon side bringing the leg parallel. The patient then adjusts their posture by flexing the knee on the affected side. ... a hard and fast adduction deformity leads to apparent limb shortening. The pelvis is raised on the affected side. Squaring of the pelvis is completed by making both the ASIS at an equivalent level. This is often done by further adducting the affected hip in presence of an adduction deformity till both ASIS are at an equivalent level.

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference – [www.sciencedirect.com](http://www.sciencedirect.com)

Ancient Indian Literature Reference –

*Sandhigata Vata* is one of *Vata Vyadhi* characterized by the symptoms such as *Sandhishoola* (joint pain) and *Sandhishopha* (swelling of joint). Osteoarthritis (OA) is degenerative joint disorder, represents failure of the diarthrodial (movable, synovial-lined) joint. OA of knee joint comes under the inflammatory group which is almost identical to *Sandhigata Vata* described in Ayurveda with respect to etiology, pathology, and clinical features. *Agnikarma* (therapeutic heat burn) is one which gives instant relief from pain by balancing local *Vata* and *Kapha Dosha* without any untoward effects

- Competitive questions from today topic (2 questions Minimum)-
- 9) Which is the longest bone ?
  - e) scapula b) humerus c) femur d) tibia
- 10) What type of joint is hip joint?
  - f) Ball & socket b) saddle joint c) sellar joint d) hinge joint
- Exam Name MPT entrance exam
  
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is a FFD?
  - What is angle of inclination?
- Next Topic- Exercises for hip joint
- Academic Day ends with-  
National song ' Vande Mataram '

# KNEE JOINT

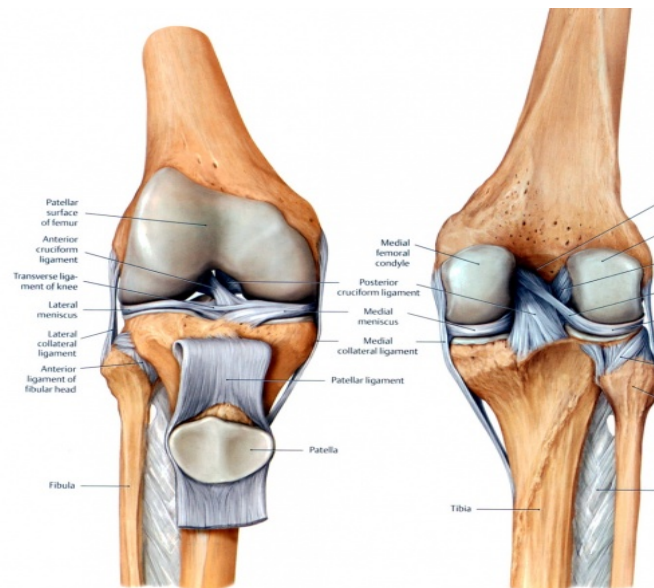
Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session-

In previous session as I had discussed about hip joint.



The knee is one among the most important and most complex joints within the body. The knee joins the thigh bone (femur) to the shin bone (tibia). The smaller bone that runs alongside the tibia (fibula) and therefore the kneecap (patella) are the opposite bones that make the knee .

Tendons connect the knee bones to the leg muscles that move the knee . Ligaments join the knee bones and supply stability to the knee:

- The anterior cruciate ligament prevents the femur from sliding backward on the tibia (or the tibia sliding forward on the femur).
- The posterior cruciate ligament prevents the femur from sliding forward on the tibia (or the tibia from sliding backward on the femur).
- The medial and lateral collateral ligaments prevent the femur from sliding side to side. Two C-shaped pieces of cartilage called the medial and lateral menisci act as shock absorbers between the femur and tibia.

Numerous bursae, or fluid-filled sacs, help the knee move smoothly.

### **Knee Conditions**

- Chondromalacia patella (also called patellofemoral syndrome): Irritation of the cartilage on the underside of the kneecap (patella), causing knee pain. This is often a standard explanation for knee pain in children .
- Knee osteoarthritis: Osteoarthritis is that the commonest sort of arthritis, and sometimes affects the knees. Caused by aging and wear and tear of cartilage, osteoarthritis symptoms may include knee pain, stiffness, and swelling.
- Knee effusion: Fluid buildup inside the knee, usually from inflammation. Any sort of arthritis or injury may cause a knee effusion.
- Meniscal tear: Damage to a meniscus, the cartilage that cushions the knee, often occurs with twisting the knee. Large tears may cause the knee to lock.
- ACL (anterior cruciate ligament) strain or tear: The ACL is liable for an outsized part of the knee's stability. An ACL tear often results in the knee "giving out," and should require surgical repair.
- PCL (posterior cruciate ligament) strain or tear: PCL tears can cause pain, swelling, and knee instability. These injuries are less common than ACL tears, and physiotherapy (rather than surgery) is typically the simplest option.
- MCL (medial collateral ligament) strain or tear: This injury may cause pain and possible instability to the inner side of the knee.
- Patellar subluxation: The kneecap slides abnormally or dislocates along the thigh bone during activity. Knee pain round the kneecap results.

## ANKLE JOINT

Academic Day starts with –

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and **anthem** .

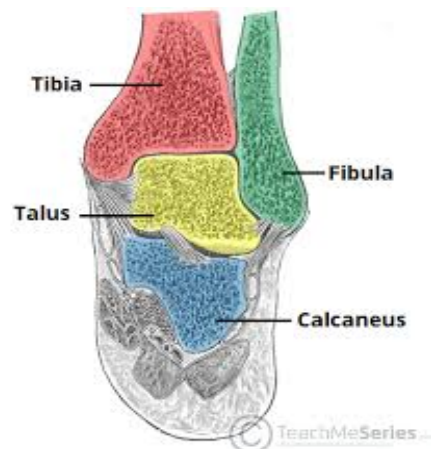
Lecture Starts with-

Review of previous Session- In previous session as I had discussed about **hip** & its biomechanics. I had discussed from oldest to new theories. Now tell me about ankle joint?

Topic to be discussed today- Today **i will be able to** discuss about biomechanics of **ankle** . **i will be able to start this subject** from Anatomy of **ankle** .

- Lesson deliverance (Diagrams & Live Example)-

Diagram—



The ankle could also be a hinged synovial joint that's formed by the articulation of the talus, tibia, and fibula bones. Together; the three borders (listed below) form the ankle mortise.

1. The articular facet of the lateral malleolus (bony prominence on the lower fibula) forms the lateral border of the ankle
2. The articular facet of the medial malleolus (bony prominence on the lower tibia) forms the medial border of the joint
3. The superior portion of the ankle forms from the inferior articular surface of the tibia and thus the superior margin of the talus.

The talus articulates inferiorly with the calcaneous and anteriorly with the navicular.

- The side , called the trochlear surface, is somewhat cylindrical and allows for dorsiflexion and plantarflexion of the ankle.

- The talus is wider anteriorly and more narrow posteriorly.

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference -Teachmeanatomy.com

- Ancient Indian Literature Reference -...
- Pundita Gangadhara Kaviratna of Murshidabad in his famous commentary, referred to as the Tika-jalpa-kalpa-taru, within the 7th. chapter of Sarira Sthana within the Charaka Samhita states:—
  - “In the surgical text-book of Sushruta the amount of bones within the physical body is given to be 300 altogether . Of these, 100 and eight bones are within the four extremities; 100 and twenty-six within the cavity (Shroni), sides (Parshva), back (Prishtha), (Aksha) collar-bones and breast (Urah) ; and sixty-six within the region upward the neck. Thus the entire number of 300 is formed up.
  - Now there are three bones in each toe of the feet; this makes fifteen altogether.
  - Seven bones constitute the only (Tala), clutter (Kurcha), and therefore the ankle (Gulfa).
  - There is one bone within the heel (Pashni), two within the leg (Jangha), one within the knee (Janu), and one within the thigh (Uru). Thus there are twenty-seven bones in one lower limb.
  - The same number applies to the opposite lower limb also on the 2 upper limbs. Thus a complete number of 1 hundred and eight bones is formed up.
  - There are five bones within the cavity (Shroni) ; of those there are two within the hips (Nitamba), and therefore the pubes (Bhaga), anus (Guda) and sacrum (Trika) is constituted with one bone each.
- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is ankle joint?
  - What bones make ankle joint?
- Academic Day ends with-  
National song’ Vande Mataram’

## Posture

Academic Day starts with –

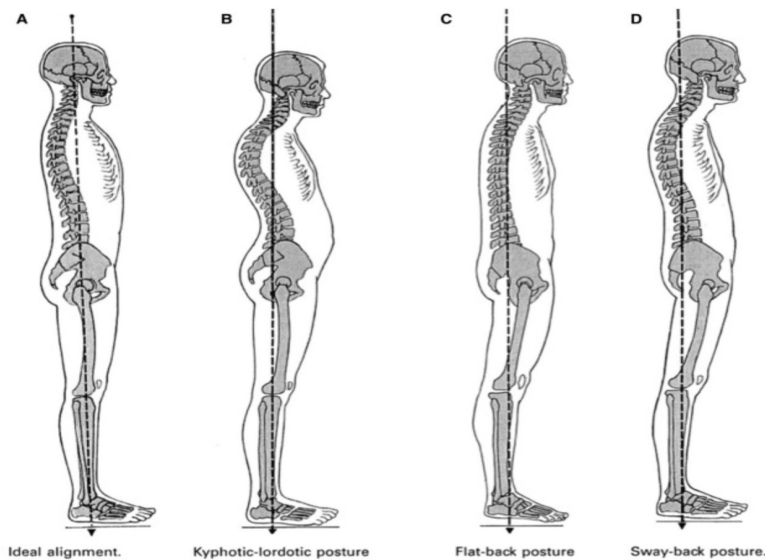
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about ankle joint & its biomechanics. I had discussed from oldest to new theories. Now tell me about ankle joint?

Topic to be discussed today- Today I will discuss about posture. I will start this topic from definition & types of posture.

- Lesson deliverance (Diagrams & Live Example)-  
Diagrams



**Figure 1** The 4 postural types defined according to the classification of Kendall. (A) Ideal alignment. (B) Kyphotic-lordotic posture. (C) Flat-back posture. (D) Sway-back posture. (Reprinted from Kendall FP, McCreary EK, Provan PG, Rodgers MM, Romani WA. *Muscles: testing and function, with posture and pain*. 5th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2005)

Good posture involves holding your body against gravity so there's little strain on the muscular skeleton system of the muscles and joints. Good posture boosts the systema nervosum, improves breathing circulation, enhances workout and reduces neck and body pain. When walking, keep the chin parallel to the bottom and confirm the heel is that the first part to hit the bottom. It is important to stay the stomach and bottom in line with the remainder of the body. When walking, you ought to breakthrough and step backwards with rotations within the chest and large curves eliminated.

## University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference - [Teachmeanatomy.com](http://Teachmeanatomy.com)

- Ancient Indian Literature Reference –

The practice of Yoga is believed to possess started with the very dawn of civilization. The science of yoga has its origin thousands of years ago, long before the primary religions or belief systems were born. within the yogic lore, Shiva is seen because the first yogi or

Adiyogi, and therefore the first Guru or Adi Guru.

Several Thousand years ago, on the banks of the lake Kantisarovar within the Himalayas, Adiyogi poured his profound knowledge into the legendary Saptarishis or "seven sages". The sages carried this powerful yogic science to different parts of the planet, including Asia, the center East, Northern Africa and South America. Interestingly, modern scholars have noted and marvelled at the close parallels found between ancient cultures across the world. However, it had been in India that the yogic system found its fullest expression. Agastya, the Saptarishi who travelled across the Indian subcontinent, crafted this culture around a core yogic way of life. The difficult but relaxing postures proposed by yogis, years ago are quite effective than the other branch of drugs. It teaches the art of living an upright life, giving a psychological edge thereto.

Sitting down within the posture of 'Padmasana' and chanting the spiritual word 'om' at a stretch, for jiffy cleanses the mind, unburdens one among tension and pressure and even enhances concentration. Medical reports too bear a sworn statement to the very fact that such rituals activate different parts of the brain and neuron ends. 'Asanas' helps in getting obviate severe problems.

'Vajrasana' helps to stay the medulla spinalis in an upright position and also cure problems of gastritis. Doing 'Vajrasana' for half-hour after lunch and dinner helps within the proper digestion of food.

Competitive questions from today topic (2 questions Minimum)-

- 1) Poor Posture affects which body systems
  - a) Respiratory
  - b) Digestive
  - c) Circulatory
  - d) All of the above
- 2) What are the three different parts of the spine?
  - a. Cervical, Thoracic, and Lumbar
  - b. Upper, Middle, and Lower
  - c. Ventral, Dorsal, and Lateral
  - d. None of the above

Exam Name - MPT entrance exam, RRB

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is posture?
  - What are the types of posture?
- Academic Day ends with-  
National song 'Vande Mataram'



# POSTURE ASSESSMENT

Academic Day starts with –

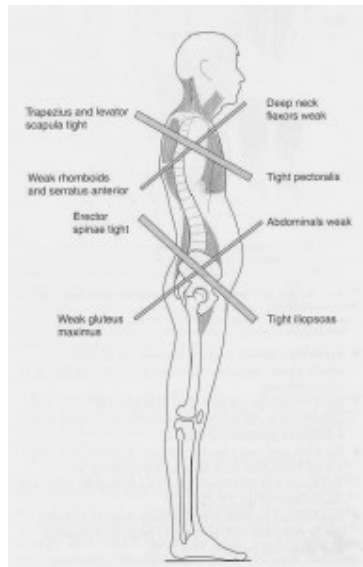
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about types of posture. I had discussed from oldest to new theories. Now tell me about types of posture?

Topic to be discussed today- Today I will discuss about posture assessment. I will start this topic from assessment.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



In a perfect posture, the road of gravity should undergo specific points of the body. this will simply be observed or employing a perpendicular . The road of gravity should undergo the external acoustic meatus , then through the shoulder , then through the hip , approximately through greater trochanter of femur, then anterior to the knee and lastly anterior to the lateral malleolus. When viewed from the front or the rear, the vertical line passing through the body's centre of gravity should theoretically bisect the body into two equal halves, with the bodyweight distributed evenly between the 2 feet. In assessing posture, symmetry and rotations/tilts should be looked out for within the anterior, lateral and posterior views. Assess:

- Head alignment
- Cervical, thoracic and lumbar curvature
- Shoulder level symmetry
- Pelvic symmetry

### **University Library Reference-**

Joint structure and functions- Cynthia Norkins  
Online Reference – [www.physiopeia.com](http://www.physiopeia.com)

### **Ancient Indian Literature Reference -...**

The word Gulpha means where the Pada (foot) and Jangha meet together or the part of body where the foot is connected with the leg.

According to Dr. Ghanekar, Gulpha is ankle includes tibiofibular and talocrural articulation, when there's any injury on Gulpha there could also be symptoms like: Ruja, stabdha padata, and khanjata.

According to Amarkosh Gulpha means Padasya granthi.

# POSTURAL DEFORMITIES

Day starts with –

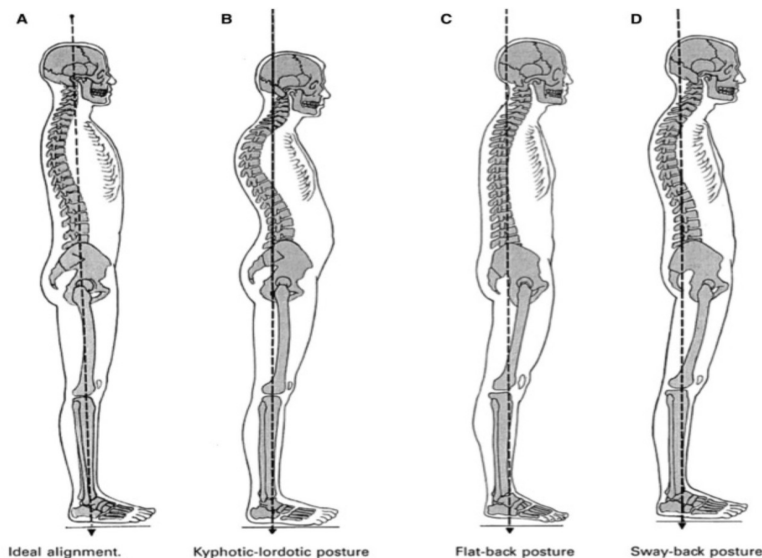
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about ankle joint & its biomechanics. I had discussed from oldest to new theories. Now tell me about ankle joint?

Topic to be discussed today- Today I will discuss about posture. I will start this topic from definition & types of posture.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



**Figure 1** The 4 postural types defined according to the classification of Kendall. (A) Ideal alignment. (B) Kyphotic-lordotic posture. (C) Flat-back posture. (D) Sway-back posture. (Reprinted from Kendall FP, McCreary EK, Provan PG, Rodgers MM, Romani WA. *Muscles: testing and function, with posture and pain*. 5th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2005)

Good posture involves holding your body against gravity so there's little strain on the muscular skeleton system of the muscles and joints. Good posture boosts the systema nervosum, improves breathing circulation, enhances workout and reduces neck and body pain. Walking When walking, keep the chin parallel to the bottom and confirm the heel is that the first part to hit the bottom.

It is important to stay the stomach and bottom in line with the remainder of the body. When walking, you ought to breakthrough and step backwards with rotations within the chest and large curves eliminated.

## University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference - [Teachmeanatomy.com](http://Teachmeanatomy.com)

- Ancient Indian Literature Reference –

The practice of Yoga is believed to have started with the very dawn of civilization. The science of yoga has its origin thousands of years ago, long before the first religions or belief systems were born. In the yogic lore, Shiva is seen as the first yogi or Adiyogi, and the first Guru or Adi Guru.

Several Thousand years ago, on the banks of the lake Kantisarovar in the Himalayas, Adiyogi poured his profound knowledge into the legendary Saptarishis or "seven sages". The sages carried this powerful yogic science to different parts of the world, including Asia, the Middle East, Northern Africa and South America. Interestingly, modern scholars have noted and marvelled at the close parallels found between ancient cultures across the globe. However, it was in India that the yogic system found its fullest expression. Agastya, the Saptarishi who travelled across the Indian subcontinent, crafted this culture around a core yogic way of life. The difficult but relaxing postures proposed by yogis, years ago are quite effective than any other branch of medicine. It teaches the art of living an upright life, giving a psychological edge to it.

Sitting down in the posture of 'Padmasana' and chanting the spiritual word 'om' at a stretch, for few minutes cleanses the mind, unburdens one of tension and pressure and even enhances concentration. Medical reports too bear a testimony to the fact that such rituals activate different parts of the brain and neuron ends. 'Asanas' helps in getting rid of severe problems.

'Vajrasana' helps to keep the spinal cord in an upright position and also cure problems of gastritis. Doing 'Vajrasana' for 30 minutes after lunch and dinner helps in the proper digestion of food.

Competitive questions from today topic (2 questions Minimum)-

- 3) Poor Posture affects which body systems
  - a) Respiratory
  - e) Digestive
  - f) Circulatory
  - g) All of the above
- 4) What are the three different parts of the spine?
  - a. Cervical, Thoracic, and Lumbar
  - b. Upper, Middle, and Lower
  - c. Ventral, Dorsal, and Lateral
  - d. None of the above

Exam Name - MPT entrance exam, RRB

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What is posture?
  - What are the types of posture?
- Academic Day ends with-  
National song 'Vande Mataram'

## ABNORMAL POSTURE

Academic Day starts with –

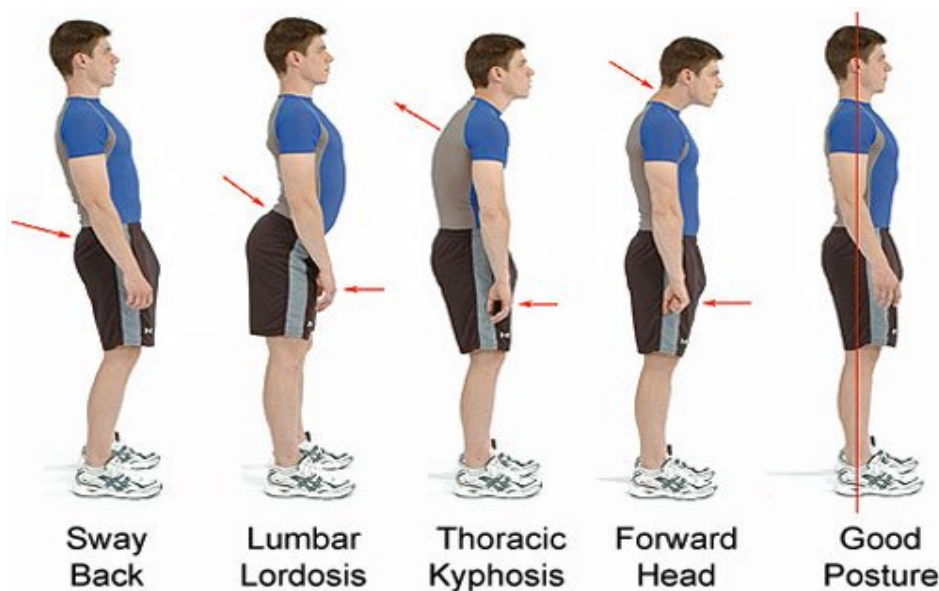
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about Posture & its types. I had discussed from oldest to new theories. Now tell me about posture?

Topic to be discussed today- Today I will discuss about poor posture. I will start this topic with types of posture.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



Posture is that the attitude assumed by the body either when the body is stationary or when it's moving. Posture is attained as results of the coordinated action of varied muscles working to take care of stability. Posture in easy terms is often understood because the position during which you hold your body when standing or sitting.

Types of Postures- Posture is essentially divided into two types:

1. Inactive- These are postures or attitudes adopted for resting or sleeping. They require theoretically minimal muscle activity and are usually assumed in need of relaxation.
2. Active- The integrated action of the many muscles is required to take care of active

postures, they're basically divided into two types:

- Static postures- Body segments are aligned and maintained in fixed positions. This is often usually achieved by co-ordination and interaction of varied muscle groups which are working statically to counteract gravity and other forces. Samples of static postures are standing, sitting, lying, and kneeling.

- Dynamic postures- during this sort of posture body segments are moving. It's usually required to make an efficient basis for movement. Muscles and non-contractile structures need to work to adapt to changing circumstances. Examples are walking, running, jumping, throwing, and lifting.

- An understanding of static posture forms the idea for understanding dynamic posture.

Posture

Assessment

In a perfect posture, the road of gravity should undergo specific points of the body. this will simply be observed or employing a perpendicular the road of gravity should undergo the external acoustic meatus , then through the shoulder , then through the hip , approximately through greater trochanter of femur, then anterior to the knee and lastly anterior to the lateral malleolus. When viewed from the front or the rear, the vertical line passing through the body's centre of gravity should theoretically bisect the body into two equal halves, with the bodyweight distributed evenly between the 2 feet. In assessing posture, symmetry and rotations/tilts should be looked out for within the anterior, lateral and posterior views.

Assess

- Head alignment
- Cervical, thoracic and lumbar curvature
- Shoulder level symmetry
- Pelvic symmetry
- Hip, knee and ankle joints

University Library Reference-

Joint structure and functions- Cynthia Norkins

Online Reference -[Teachmeanatomy.com](http://Teachmeanatomy.com)

- Ancient Indian Literature Reference –

The practice of Yoga is believed to possess started with the very dawn of civilization. The science of yoga has its origin thousands of years ago, long before the primary religions or belief systems were born. within the yogic lore, Shiva is seen because the first yogi or Adiyogi, and therefore the first Guru or Adi Guru.

Several Thousand years ago, on the banks of the lake Kantisarovar within the Himalayas, Adiyogi poured his profound knowledge into the legendary Saptarishis or "seven sages". The sages carried this powerful yogic science to different parts of the planet , including Asia, the center East, Northern Africa and South America. Interestingly, modern scholars have noted and marvelled at the close parallels found between ancient cultures across the world . However, it had been in India that the yogic system found its fullest expression. Agastya, the Saptarishi who travelled across the Indian subcontinent, crafted this culture around a core yogic way of life. The difficult but relaxing postures proposed by yogis, years ago are quite effective than the other branch of drugs . It teaches the art of living an upright life, giving a psychological edge there to .

Sitting down within the posture of 'Padmasana' and chanting the spiritual word 'om' at a stretch, for jiffy cleanses the mind, unburdens one among tension and pressure and even enhances concentration. Medical reports too bear a sworn statement to the very fact that such rituals activate different parts of the brain and neuron ends. 'Asanas' helps in getting obviate severe problems.

'Vajrasana' helps to stay the medulla spinalis in an upright position and also cure problems of gastritis. Doing 'Vajrasana' for half-hour after lunch and dinner helps within the proper digestion of food.

Competitive questions from today topic (2 questions Minimum)-

- 5) Poor Posture affects which body systems
  - a) Respiratory
  - b) Digestive
  - c) Circulatory
  - d) All of the above
- 6) What are the three different parts of the spine?
  - a. Cervical, Thoracic, and Lumbar
  - b. Upper, Middle, and Lower
  - c. Ventral, Dorsal, and Lateral
  - d. None of the above

Exam Name - MPT entrance exam, RRB

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What are the causes of poor posture?
  - What are the types of posture?
- Academic Day ends with-  
National song 'Vande Mataram'

## EXERCISES FOR POOR POSTURE

Academic Day starts with –

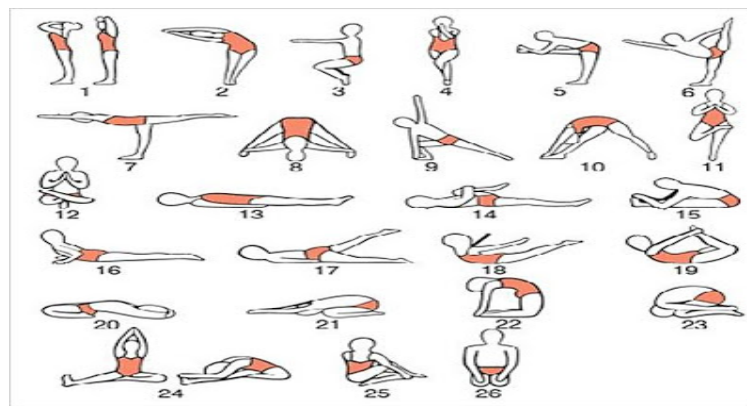
- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and National Anthem.

Lecture Starts with-

Review of previous Session- In previous session as I had discussed about Posture & its assessment. I had discussed from oldest to new theories. Now tell me about assessment?

Topic to be discussed today- Today I will discuss about exercises for poor posture. I will start this topic with types of poor posture.

- Lesson deliverance (Diagrams & Live Example)-
  - Diagrams



### Pelvic tilt

The pelvic tilt helps strengthen your abdominal muscles. it's recommended you perform it on a yoga mat.

### Arm/leg raise

Arm/leg raises strengthen your lower back muscles and core muscles, which support your spine. Here's the way to do it:

1. Lie on your stomach together with your chin or forehead to the bottom (you can place a towel underneath). Keep your legs straight and arms extended overhead.
2. Slowly raise one arm off the bottom , hold for a flash , and lower it back to the bottom .
3. Now repeat this for your other arm and legs, 15 repetitions each.

### Cat/cow

This exercise stretches the muscles and tendons that support your spine.

1. Start on your hands and knees. Align your arms straight under your shoulders and your knees under your hips.
2. check out the ground , keeping your head straight in line together with your torso and spine.
3. Round your back, lifting your spine toward the ceiling. Your eyes should face your belly.
4. Hold for a deep breath.
5. Slowly lift your chest and tailbone toward the ceiling, letting your stomach sink



toward the bottom . Your eyes will search toward the ceiling.

6. After another breath, gently round your back and lift your spine toward the ceiling again. Alternate between the poses.

Latissimus stretch

This stretch can help loosen and strengthen your lat muscles, which can feel tight thanks to scoliosis.

1. Stand together with your feet shoulder-width apart, slightly bent at the knees.
2. Reach overhead and grab your left wrist together with your right .
3. Bend at your right side until you are feeling a stretch your left trunk. Put most of your weight on your right leg.
4. Hold for five to 10 seconds, and then return to starting position by pushing from your right foot.
5. Do this exercise on the other side.

University Library Reference-

Joint structure and functions- Cynthia Norkins

**Online Reference** –[www.scoliosisjournal.biomedcentral.com](http://www.scoliosisjournal.biomedcentral.com)

**Ancient Indian Literature Reference** –

The practice of Yoga is believed to have started with the very dawn of civilization. The science of yoga has its origin thousands of years ago, long before the first religions or belief systems were born. In the yogic lore, Shiva is seen as the first yogi or Adiyogi, and the first Guru or Adi Guru.

Several Thousand years ago, on the banks of the lake Kantisarovar in the Himalayas, Adiyogi poured his profound knowledge into the legendary Saptarishis or "seven sages". The sages carried this powerful yogic science to different parts of the world, including Asia, the Middle East, Northern Africa and South America. Interestingly, modern scholars have noted and marvelled at the close parallels found between ancient cultures across the globe. However, it was in India that the yogic system found its fullest expression. Agastya, the Saptarishi who travelled across the Indian subcontinent, crafted this culture around a core yogic way of life. The difficult but relaxing postures proposed by yogis, years ago are quite effective than any other branch of medicine. It teaches the art of living an upright life, giving a psychological edge to it.

Sitting down in the posture of ‘Padmasana’ and chanting the spiritual word ‘om’ at a stretch, for few minutes cleanses the mind, unburdens one of tension and pressure and even enhances concentration. Medical reports too bear a testimony to the fact that such rituals activate different parts of the brain and neuron ends. ‘Asanas’ helps in getting rid of severe problems.

‘Vajrasana’ helps to keep the spinal cord in an upright position and also cure problems of gastritis. Doing ‘Vajrasana’ for 30 minutes after lunch and dinner helps in the proper digestion of food.

Competitive questions from today topic (2 questions Minimum)-

- 7) Poor Posture affects which body systems
  - a) Respiratory
  - e) Digestive
  - f) Circulatory
  - g) All of the above
  - h)
- 8) What are the three different parts of the spine?
  - a. Cervical, Thoracic, and Lumbar

- b. Upper, Middle, and Lower
- c. Ventral, Dorsal, and Lateral
- d. None of the above

Exam Name - MPT entrance exam, RRB

- Suggestions to secure good marks to answer in exam-
  - Give answer with complete labeled diagrams.
  - Explain answer with key point answers
- Questions to check understanding level of students-
  - What are the causes of poor posture?
  - What are the types of posture?
- Academic Day ends with-  
National song 'Vande Mataram'



Contact Us:

University Campus Address:

## Jayoti Vidyapeeth Women's University

Vadaant Gyan Valley, Village-Jharna, Mahala Jobner Link Road,  
Jaipur Ajmer Express Way, NH-8, Jaipur- 303122, Rajasthan (INDIA)

(Only Speed Post is Received at University Campus Address, No. any Courier Facility is available at Campus Address)

Pages : 48  
Book Price : ₹ 150/-



Year & Month of Publication- 3/6/2021