



**BHARATHIDASAN UNIVERSITY**

**Tiruchirappalli- 620024,  
Tamil Nadu, India**

**Department of Physical Education and Yoga**

**Course Title : SPORTS BIOMECHANICS AND KINESIOLOGY**  
**Course Code : 21MPE22**

**Unit- (II)**

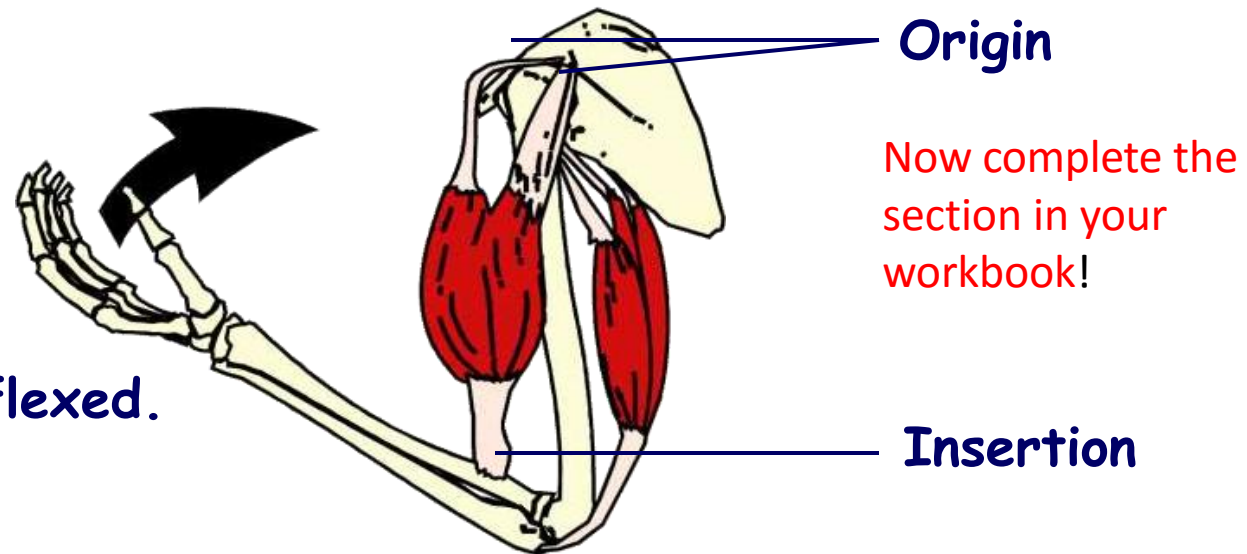
**Dr. M. RAJESWARI,  
Dr.V.SANKARALINGAM  
GUEST LECTURER**

# Muscle attachments

- A skeletal muscle attaches to bone at two or more sites. If the place is a bone that remains immobile for an action, the attachment is called an **origin**. If the place is on the bone that moves during the action, the attachment is called an **insertion**.

# The Origin and Insertion

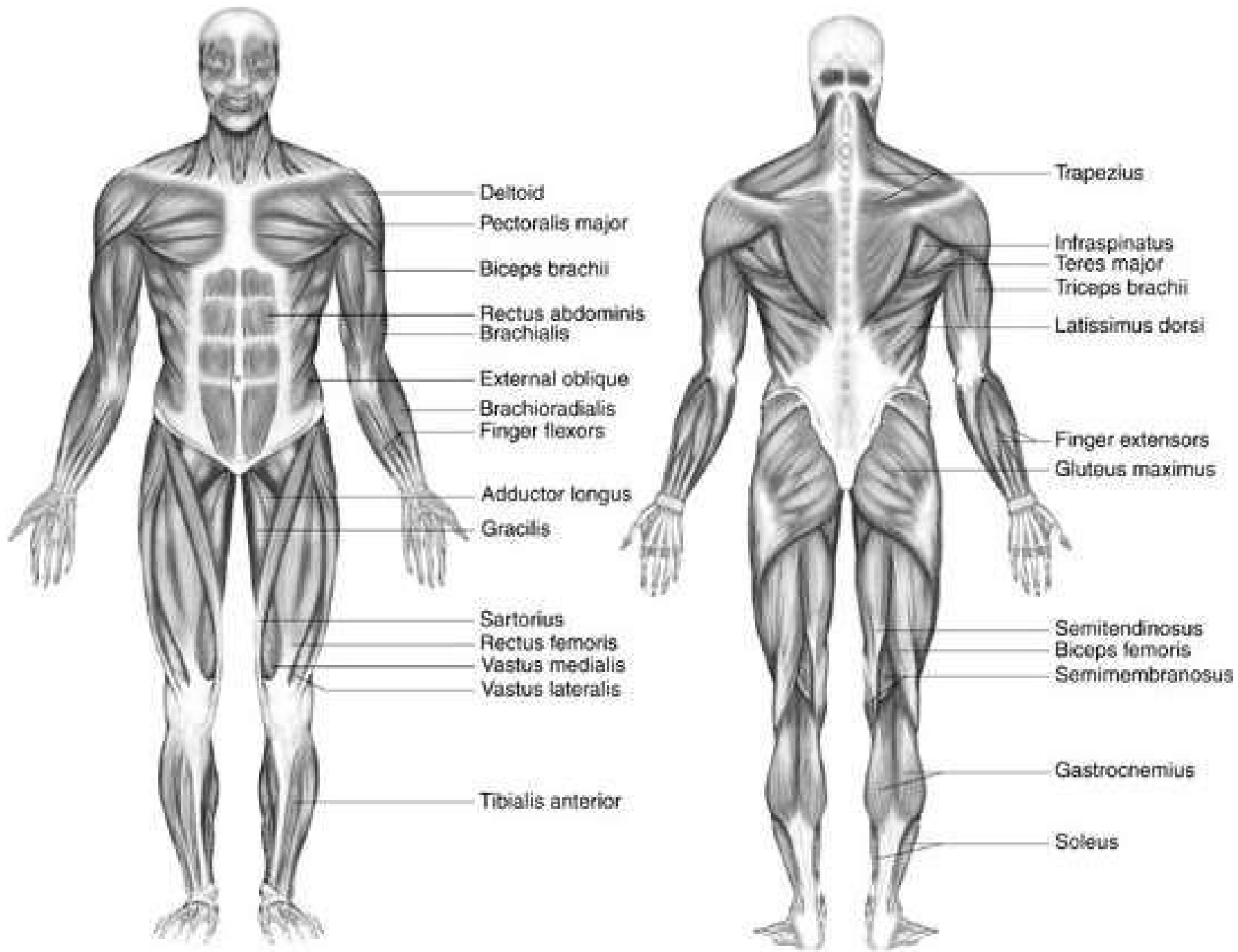
- When a muscle contracts, only one bone moves leaving the other stationary. The points at which the tendons are attached to the bone are known as the **origin** and the **insertion**.
- The **origin** is where the tendon of the muscle joins the **stationary** bone(s).
- The **insertion** is where the tendon of the muscle joins the **moving** bone(s).



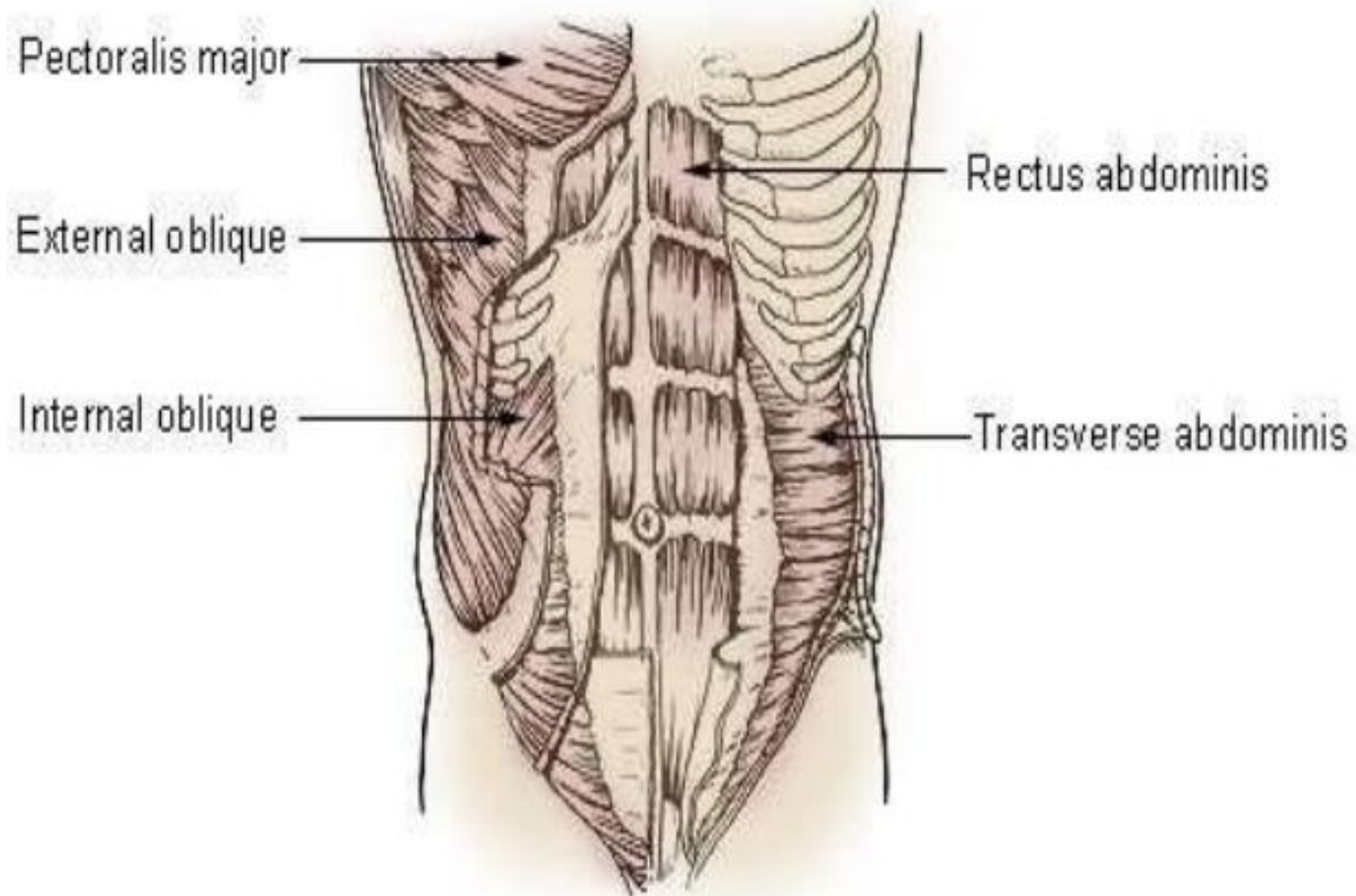
The arm is being flexed.

The **radius** and **ulna** are the moving bones- **INSERTION**

The **humerus** and **scapula** are **stationary** bones- **ORIGIN**



## Muscles of the Trunk



# RECTUS ABDOMINIS

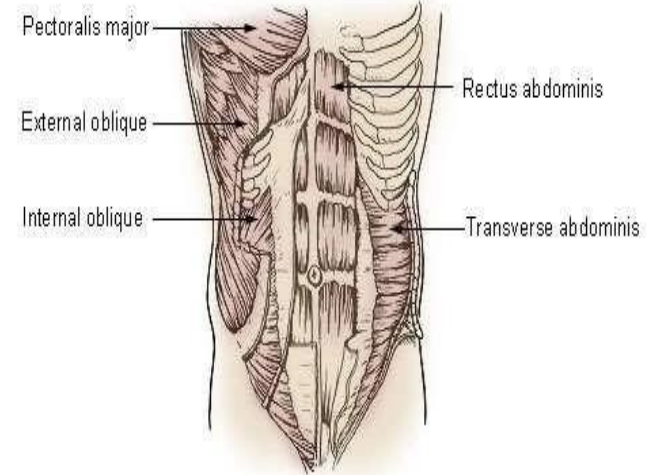
Flexion of the spine

**ORIGIN:** Pubis

**INSERTION:** Sternum and 5<sup>th</sup> – 7<sup>th</sup> ribs



**Muscles of the Trunk**



**STRENGTHENING  
EXERCISE:** Crunches

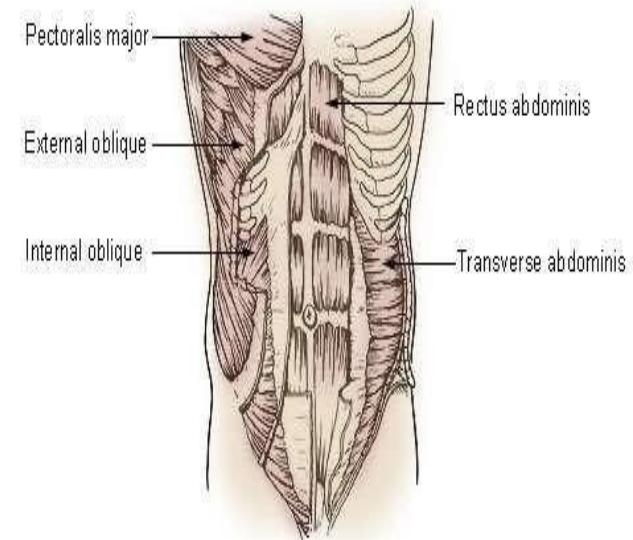
# EXTERNAL OBLIQUES

**MOVEMENT:** Flexion

**ORIGIN:** Lower eight ribs

**INSERTION:** Ilium

**Muscles of the Trunk**



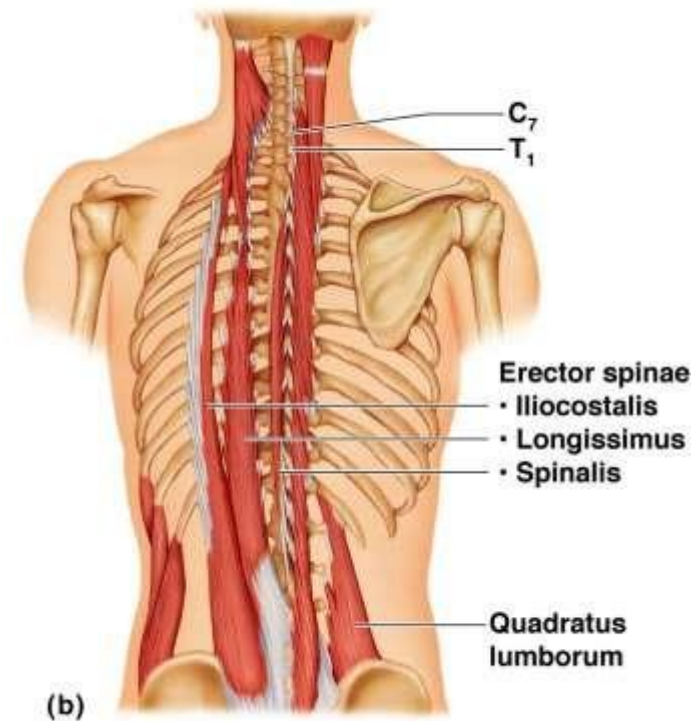
**STRENGTHENING EXERCISE;** Broomstick twists

# ERECTOR SPINAE

**MOVEMENT:** Extension

**ORIGIN:** ribs, vertebrae, ilium

**INSERTION:** ribs and vertebrae



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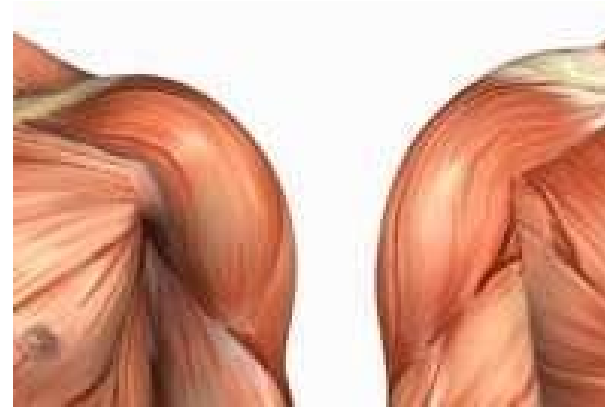
**STRENGTHENING  
EXERCISE:** Chest raises



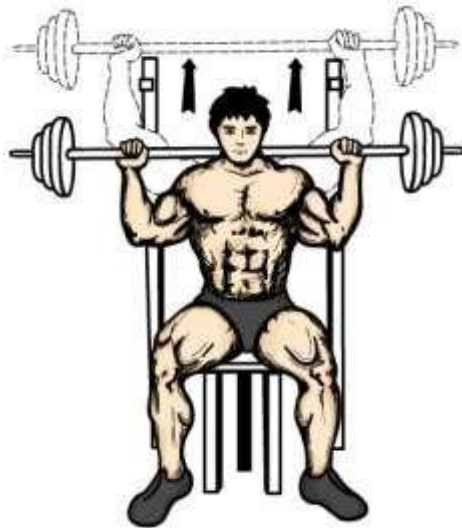
## DELTOID

**ORIGIN;** Clavicle and scapula

**INSERTION:** Lateral humerus



**MOVEMENT:** Flexion, extension and abduction of the shoulder



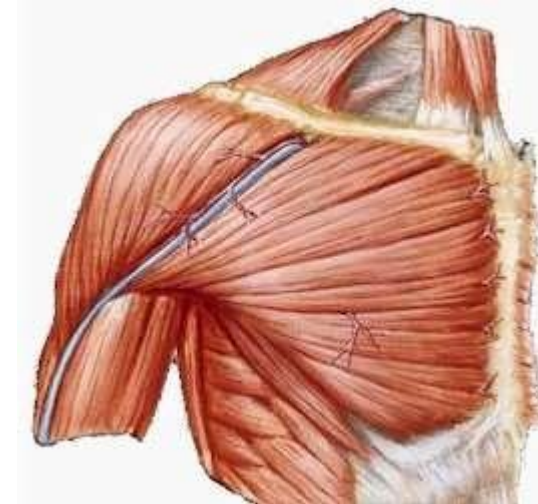
**STRENGTHENING  
EXERCISE:** Back press

## PECTORALIS MAJOR

**MOVEMENT-** Flexion, Adduction of the shoulder

**ORIGIN-** Clavicle, sternum, anterior ribs

**INSERTION-** Humerus



**STRENGTHENING  
EXERCISE:** Seated rows

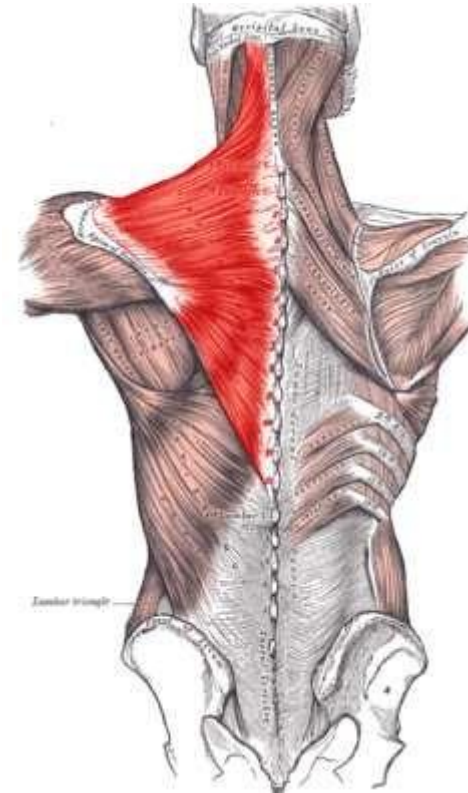
## TRAPEZIUS

**MOVEMENT-** Extension of the shoulder

**ORIGIN-** cervical and thoracic vertebrae,  
base of skull

**INSERTION-** Clavicle and Scapula

**STRENGTHENING EXERCISE:** Shrugs



# BICEPS BRACHII

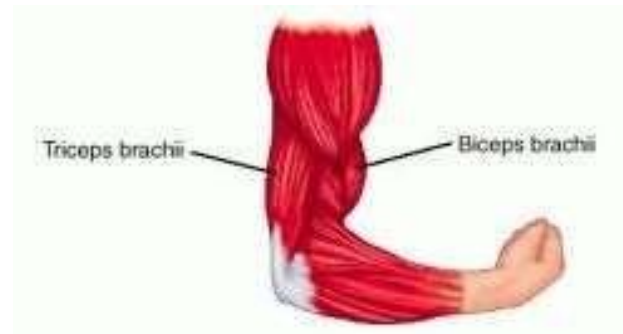
## **FLEXION**

**Origin:** Scapula

**Insertion:** Radius and ulna

Biceps

Triceps



## **Strengthening exercises:**

Biceps curls and tricep extensions

# TRICEPS BRACHII

## **EXTENSION**

**Origin:** Scapula and humerus

**Insertion:** Ulna

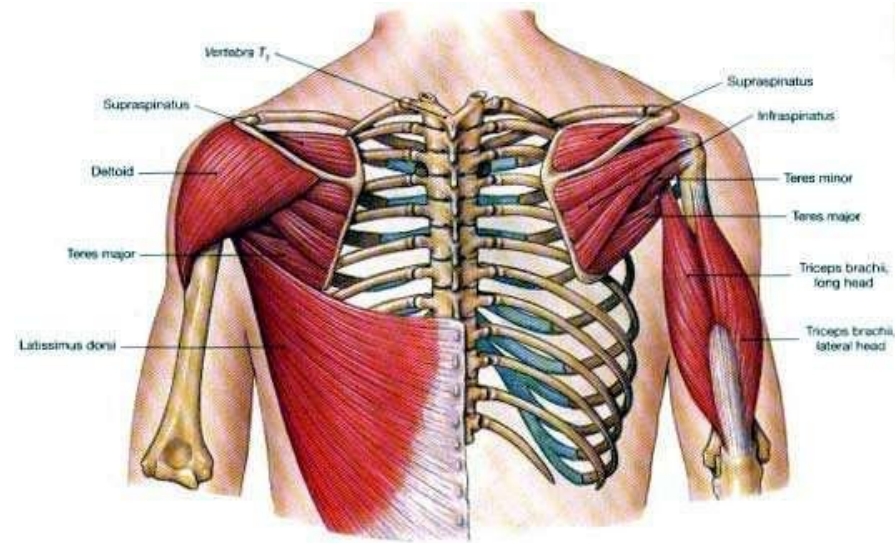


## LATISSIMUS DORSI

**ORIGIN:** sacrum, ileum, thoracic and lumbar vertebrae

**INSERTION:** Humerus

**MOVEMENT:** Adduction and extension of the shoulder



**STRENGTHENING EXERCISE:** Chin ups

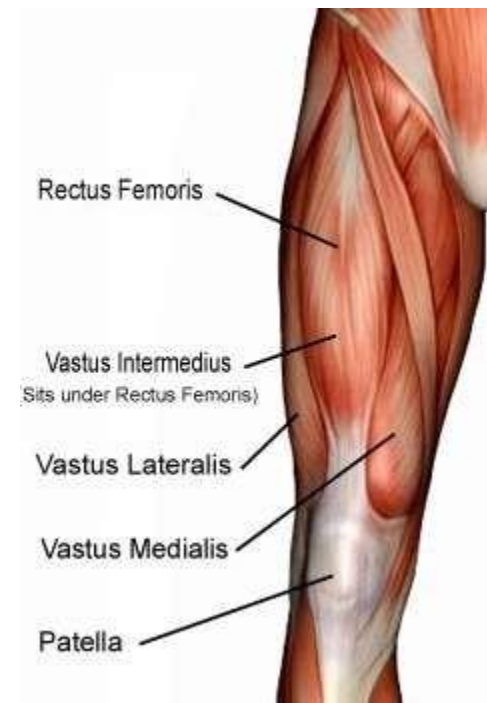
# QUADRICEPS

**Movement:** Flexion, extension

<b>Muscle</b>	<b>Origen</b>
Rectus femoris	Ilium
Vastus lateralis	Femur
Vastus medialis	Femur
Vastus intermedius	Femur

**Insertion:** Tibia

**Strengthening exercises:**  
Dumbbell squats





## GLUTEUS MAXIMUS

**MOVEMENT:** Extension and rotation of the hip

**ORIGIN:** posterior ilium,  
sacrum and coccyx

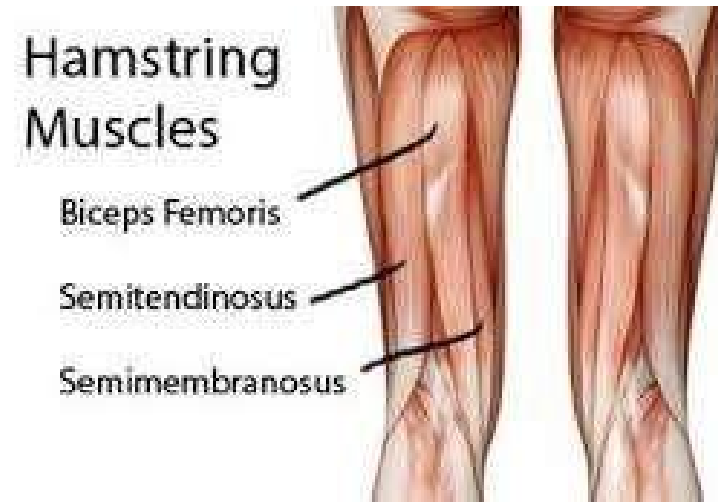
**INSERTION:** Femur

**Strengthening exercises:** one legged dead lifts



# HAMSTRINGS

**Movement:** Flexion, extension



<b>Muscle</b>	<b>Origen</b>	<b>Insertion</b>
femoris	Ischium, femur	Fibula, lateral tibia

**Strengthening exercises:**  
Leg curls





# GASTROCNEMIUS

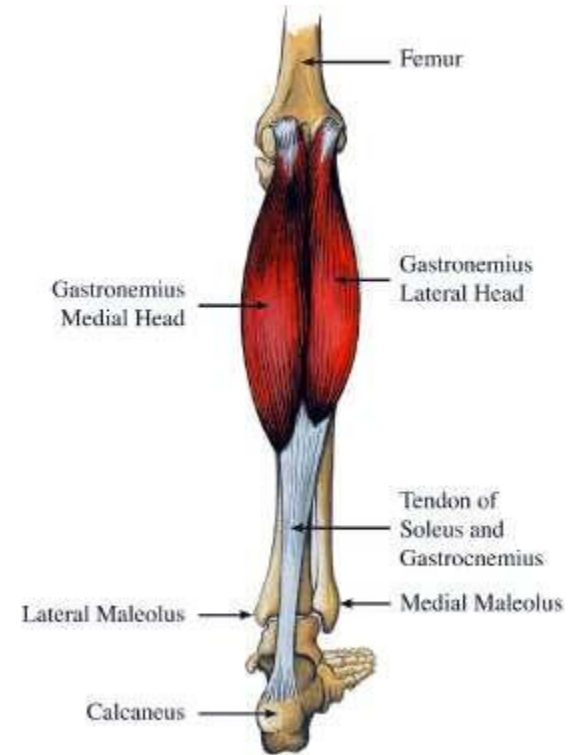
## **Movement:**

Dorsiflexion and plantarflexion

**Origin:** Posterior femur

**Insertion:** Calcaneus via Achilles tendon

**Strengthening exercises:** Calf raises



# SOLEUS

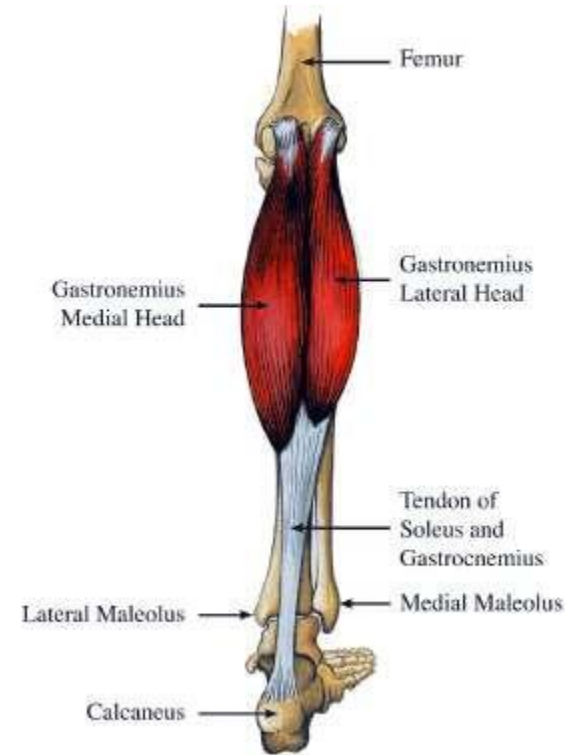
## **Movement:**

Dorsiflexion and plantarflexion

**Origin:** Posterior tibia and fibula

**Insertion:** Calcaneus via Achilles tendon

**Strengthening exercises:** Seated calf raise



## Dorsiflexion vs. Plantar flexion



(e)