



# **Physiotherapy for Nursing Students**

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## **What is physiotherapy?**

**Physical therapy or physiotherapy** (often abbreviated to PT) is effective treatment for injury and illness.

Physiotherapy is a branch of medical science where physical measures such as heat, light, ultrasound, water, electricity and exercises are used in the diagnosis and treatment of orthopedic injuries.

Physical therapy is performed by a therapist and sometimes services are provided by a physical therapist assistant (PTA) acting under their direction. Physical therapists and occupational therapists often work together in conjunction to provide treatment for patients.

**Therapists (PTs)** are healthcare professionals who diagnose and treat individuals of all ages, from newborns to the very oldest, which have medical problems or other health-related conditions, illnesses, or injuries that limit their abilities to move and perform functional activities.

**The physiotherapist** is provides a service physical therapy for patients in a scientifically sound, and is working on a scientific basis and a strong level of understanding with the doctors and medical staff.

Physiotherapists help people affected by injury, illness or disability through movement and exercise, manual therapy, education and advice.

**Physiotherapists** are skilled in the hands-on management of medical problems.

## **Role of Physiotherapy**

- 1- To treat disability and deformity.
- 2- To correct disability and deformity.
- 3- To prevent disability and deformity.

## **Role of a Physiotherapist**

The primary role of a physiotherapist is to assess a patient's condition and to find the underlying causes of pain, whether it be in the joints, muscles or nerves. They also advise the patients on ways to manage their condition and show them how they can prevent further pain or injury.

### **What exactly do physiotherapists do?**

- 1- Assess, manage and treat a broad range of medical conditions from sprained ankles to strokes.
- 2- Relieve physical pain and help heal injuries.
- 3- Increase mobility, build strength, improve balance, and enhance cardiovascular performance.
- 4- Help you to help yourself.
- 5- Engage clients by prescribing therapeutic exercises.
- 6- Teach clients to better manage their own health.

**Categories:-** Depending on severity of the ailment

**1. Short term physiotherapy:** Includes patients with minor neuromuscular-skeletal injuries like.

- a- Simple soft tissue injuries.
- b- Simple fractures.
- c- Non traumatic injuries.

**2. Long term physiotherapy:** Refers to more complicated diseases of musculoskeletal origin. Includes condition like

- a- Fractures of major bones.

b- Spinal trauma resulting in physical disability and complications like paraplegia.

c- Surgical procedures involving major joints.

d- Chronic conditions like Rheumatism.

### **Short and Long Term physiotherapy Goals**

- 1- Protect the involved area
- 2- Reduce pain and inflammation
- 3- Reduce intra or extra capsular effusion
- 4- Increase range of joint movement
- 5- Increase musculotendinous flexibility
- 6- Increase muscle strength power and endurance
- 7- Restore normal biomechanical functions
- 8- Increase balance

### **Passive and Active Physiotherapy:-**

**Passive Physiotherapy** directed toward the alleviation of symptoms.

**Active Physiotherapy** directed toward restoration of function by activity.

### **Therapeutic exercises:**

Therapeutic exercises are movements meant for healing and restoration of health. Its dosage, repetition is considered in respect of the condition of the patient, age, sex, climate etc.

**Therapeutic exercise** the scientific use of bodily movement to restore normal function in diseased or injured tissues or to maintain a state of well-being; called also **corrective exercise**. As with any type of therapy, a therapeutic exercise program is designed to correct specific disabilities of the individual patient. The program is evaluated periodically and modified as indicated by the patient's progress and response to the prescribed regimen. Exercises affect the body locally and systemically and bring about changes in the nervous, circulatory, and endocrine systems as well as the musculoskeletal system.

**Classification of therapeutic exercises:** Therapeutic movements are classified according to their nature as under:

**1- Negative exercises: (Passive exercises)**

It exercises that need to be performed by a person to the patient and use these exercises in the case of very weak Parkinson or patients with severe heart disease.

**Passive** - Here major role is played by the therapist.

**2- Assistive exercises:**

And in it's the patient by moving the parts of his body to the extent that its performance can then physiotherapist to help him to get the full range of movement.

The patient can perform but still needs assistance. Assistance is provided by therapist or another person.

**3- Active exercises:** when the patient himself can perform.

In this type of exercise performed by an infected person himself and without help, use these exercises in injuries that the patient can move the affected its parts without injury or pain.

## **Benefits of Physical Exercise**

1. Improved cardiopulmonary function
2. Reduced blood pressure
3. Increased muscle tone and strength
4. Greater physical endurance
5. Increased weight loss
6. Reduced blood glucose level
7. Decreased low-density blood lipids
8. Improved physical appearance
9. Increased bone density
10. Regularity of bowel elimination
11. Promotion of sleep
12. Reduced tension and depression

## **Paraffin Wax Bath**

**Paraffin wax bath** therapy (P.W.B) is an application of the molten paraffin wax on the body part.

The melting point of wax is 51-55°C. If the molten wax at 51-55°C is poured on the body part, it may cause burn. Some impurity like liquid paraffin or mineral oil is added to lower the melting point for safe application. Thus the temperature of the paraffin wax is maintained at **40-44°C**

**Characteristics of PWB Paraffin:** has a slow thermal conductivity

- Slow heat diffusion (6 times lower than water).
- Paraffine wax has a low melting point (55°).
- When the oil is added, the paraffin will remain at a temperature of 40° to 44°C.
- This low specific heat will enhance the patient to tolerate heat from the paraffin better than from water of the same temperature.
- Application time is 20 to 30 minutes or till wax cools.

**Physiological Effects** of heat are Hemodynamic effect, Neuromuscular effect, Metabolic, affect Tissue extensibility, Pain and muscle spasm: especially in the distal extremities.



Figure 1 Paraffin Wax Bath

### **PWB Methods of Application: Dipping and Wrap**

- 1- PWB Methods of Application Direct pouring method: The molten Wax is directly poured by a mug or utensil on the part to be treated and wrapped around by a towel. The wax is allowed to solidify for about 10-20 minutes. Several (4-6) layers can be made over the body tissues.
- 2- PWB Methods of Application Brushing method: It is a less commonly used method of paraffin wax application. Sometimes we use Coatings by brush for areas that are difficult to flooding in the basin, such as lower back and neck. The area is then wrapped with towel for 10-20 minutes and after this time, paraffin wax is removed and discarded.

### **Indications:-**

- 1- Pain and muscle spasm: especially in the distal extremities.
- 2- Post-traumatic swelling of the hands and feet
- 3- Swelling of the hands in rheumatoid arthritis.
- 4- Swelling of the hands in degenerative joints disease.
- 5- Joint pain and Joint stiffness



### **Contraindications:-**

- 1- Ischemia. e.g., arterial insufficiency Haemorrhage. there is an increased arterial and capillary blood flow with heat Impaired sensation. e.g., spinal cord injury (SCI) may predispose to burns Inability to communicate or respond to pain.
- 2- Malignancy: May increase tumor growth acute trauma or inflammation.
- 3- The open wound
- 4- The deterioration of the skin.

### **Advantages**

- 1- Deal with the pain and stiffness in the joints
- 2- The skin becomes smooth and wet
- 3- causing effects comfortable

### **Disadvantages: -**

- Effective only for distal extremities in the terms of ease of application.
- No method of temperature controls once applied.
- Heating last only about 20 minutes.
- It is a passive treatment: exercise may not be performed simultaneously.

**Heat therapy:-** heat therapy, or “Thermotherapy” is one of the most effective forms of treatment.

**It has two primary therapeutic effects:**

- 1- An increase in metabolism resulting in relaxation of the blood capillaries (vasodilation)
- 2- An increase in blood supply to cool down the heated area.

**How does it work?** Heat helps the blood vessels dilate which in turn increases the flow of oxygen rich blood to the affected area. This the flow of oxygen rich blood to the affected area. This helps with better healing as well as quick regeneration of the damaged tissues. In addition this increased flow of blood also provides lots of nutrients and oxygen.

### **Types of Heat Therapy**

Tow options for heat therapy include **moist** heat and **dry heat**

- 1- Dry heat, such as electric heating pads and saunas
- 2- Moist heat, such as hot baths steamed or moist heating packs

## **Infrared radiation (IR)**

Infrared radiation is a convenient system to heat parts of our body. Since heat conduction needs a temperature gradient to proceed, there is a maximum temperature that can be safely used (around 42°C), this means lower temperature where warming is needed.

Infrared (IR for short) is the part of the electromagnetic radiation spectrum comprised between 0.78 micrometer ( $\mu\text{m}$ ) and 1 Millimeter (mm) wavelength. It is usually divided into three segments:

**IR-A**, from 0.78 to 1.4  $\mu\text{m}$ .

**IR-B**, from 1.4 to 3  $\mu\text{m}$ .

**IR-C**, from 3  $\mu\text{m}$  to 1 mm.

IR radiation is more useful for heating our body, because we absorb most of it, Penetration depth of infrared radiation in our skin is dependent of wavelength. IR-A is the most penetrating, and reaches some millimeters, IR-B penetrates into the dermis (about 1 mm), and IR-C is mostly absorbed in the external layer of the epidermis. For this reason the infrared lamps used for therapeutic purposes produce mainly IR-A radiation.

**Mechanism of action, and indications:** Heat creates higher tissue temperatures, which produces vasodilation that increases the supply of oxygen, and nutrients and the elimination of carbon dioxide and metabolic waste.

Heat therapy is useful for muscle spasms, myalgia, fibromyalgia, contracture and bursitis.

Because heat is a vasodilator, it should be avoided in tissues with inadequate vascular supply, in case of acute injury, in bleeding disorders (because heat would increase bleeding), in tissues with a severe lack of sensitivity, in scars.

Another use is the treatment of infection and cancers by the use of heat. Cancer cells and many bacteria have poor mechanisms for adapting to and

resisting the physiological stresses of heat, and are more vulnerable to heat-induced death than normal cells.

For **headaches**: Heat therapy can be used for the treatment of **headaches and migraines**. Many people who suffer from chronic headaches also suffer from tight muscles in their neck and upper back. The application of constant heat to the back/upper back area can help to release the tension associated with headache pain.

**Notes:-**

- 1- Infrared penetrates the body a distance about (7) cm .
- 2- Distance of light about 30-60 cm from patient's body, depending on the severity of heat to be get it.
- 3- Best cover hair and the eyes of the patient when we apply infrared close to the face.

**Indications:-**

- 1- Stress and muscle pain

**Contraindications:-**

- 1- Ischemia (in cases such as diabetics)
- 2-Loss of blood (bleeding)
- 3-Lack of sensation in the skin (nerve injury)
- 4- Drying of the skin

**Advantages**

- 1-To remove the pain
- 2- To relax the muscles

**Disadvantages** that may occur from the use of this method

- |                    |                                      |
|--------------------|--------------------------------------|
| 1-burns            | 4- loss of awareness (consciousness) |
| 2-electrical shock | 5- excessive Headache                |
| 3-eye injury       |                                      |

**Diathermy:** is a therapeutic treatment commonly prescribed for muscular and joint associated pains. The term 'diathermy' means 'through heating' or producing deep heating directly in the tissues of the body. 'Dia' through (also means two) 'thermy' heat or temperature.

**Diathermy** uses an electric current to produce heat deep inside a targeted tissue. It can reach areas as deep as two inches from the skin's surface.

- The diathermy machine does not apply heat directly to the body. Instead, the current from the machine allows the body to generate heat from within the targeted tissue.
- As the heat increases, it promotes blood flow. It can also help improve flexibility in stiff joints and connective tissue.

### **Principle of diathermy**

- 1- Before injury, the dipole molecules of the body tissue are arranged on the basis of polarity.
- 2- When the tissue is damaged the dipoles distribution become irregular
- 3- Under the influence of an electric field, they get rearranged and tend to acquire its previous stage of polarity.

### **Benefits of diathermy**

- 1- Intense heat delivered provides pain relief and better flexibility.
- 2- Reduces inflammation.
- 3- Improves circulation.
- 4- Accelerate healing.

## **Types of diathermy:**

- 1- Short wave diathermy
- 2- Microwave diathermy
- 3- Ultrasound diathermy
- 4- Long wave diathermy
- 5- Laser diathermy

## **Shortwave** Has Three Main Frequencies:

27.12 MHz, wavelength 11 M (most common used one).

13.56 MHz wavelength 22 M.

40.68 MHz 7.5 M

**Shortwave diathermy** uses high-frequency electromagnetic energy to generate heat. It may be applied in pulsed or continuous energy waves.

## **It is used to treat**

- 1- pain from sinusitis
- 2- kidney stones
- 3- Pelvic infections.
- 4- It is effective for conditions that cause pain and muscle spasms.

## **Treatment time**

**Phase I:** 5 -10 minutes (without touching the injured part).

**Phase II:** 10 - 20 minutes (without touching the injured part).

**Phase III:** 20 - 30 minutes (without touching the injured part).

**Microwave diathermy:** - uses microwaves to generate heat in the body.

It can be used to evenly **warm deep tissues without heating the skin.**

Since it can't penetrate deep muscles, it is best suited for areas that are closer to the skin, such as shoulders.

**Ultrasound treatment** is the part of the electromagnetic radiation. It is usually divided into two effects:

**The first** is the deep **thermal effects** resulting from absorption of the deep tissues for generated energy from vibration.

Thermal effects is to increase the flexibility of the collagen fibers in the tissue, increase of the blood pumping, reduce of pain, reduce of the muscle tension, treatment of joints stiffness.

**The second** is the **mechanical effect** which is produced by the moving of the waves.

Mechanical effect is to kill bacteria and viruses in the affected area, activate of cellular tissue and re-repair.

**Ultrasound diathermy:**-uses sound waves to **treat deep tissues.**

Heat is generated by the **vibration of the tissue.**

This promotes **blood flow into the area.**

It is used for many types of **musculoskeletal sprains, strains, and fractures.**

**Long wave diathermy:** - is based on capacitor field method.

Long wave can be used as an alternative for **shortwave** diathermy applications.

**Diathermy provides relief in:**

- 1- Arthritis
- 2- Back pain
- 3- Muscle spasms
- 4- Neuralgia
- 5- Myositis
- 6- Sprains and Strains
- 7- Tendonitis
- 8- Bone injuries
- 9- Bursitis



## **Laser Therapy**

Laser treatment is used in two ways

- 1- Direct contact (On the surface of the skin)
- 2- indirect contact (Distance of 5 cm away from the skin surface )

### **Indications:-**

- 1- To Open wounds
- 2- Pressure ulcers
- 3- sugar ulcers
- 4- pain

### **contraindications:-**

- 1- A person with epilepsy
- 2- Patient with heart problems
- 3- People who use industrial organizations as pacemakers

### **Advantages**

- 1- Pain management
- 2- Speed of healing

### **Disadvantages**

must use protective eyes when in use.

## **Ultraviolet radiation**

It is the electromagnetic waves where sources of ultraviolet radiation are (sun and mercury lamps).

Source of ultraviolet radiation is placed at a distance (**35-45 cm**) from the infected area.

### **When it is used?**

- 1- General weakness
- 2- Lack of vitamin (D)
- 3- Underweight
- 4- Skin diseases
- 5- Hair Loss

### **Where should not be used?**

- 1- The skin is highly sensitive
- 2- Inflammatory skin diseases
- 3- Tuberculosis of the lungs
- 4- cancer

### **Advantages**

- 1- Composition of vitamin D.
- 2- Resistance of infection
- 3- Catalytic effect

### **disadvantages**

- 1- Conjunctivitis
- 2- redness of the skin
- 3- electric shock
- 4- burns
- 5- should not be used in combination with other treatments.

## Electrotherapy

**Transcutaneous Electrical Nerve Stimulation (TNES):-** is a method of electrical stimulation which primarily aims to provide a degree of pain relief. It Delivers electricity across the intact surface of the **skin** to activate underlying nerves.

### Neurophysiology background

- 1- The brain can secrete its own analgesic substance such as endorphins to modulate pain
- 2- Endorphins are neuropeptides that act on the CNS and peripheral nervous system to reduce pain
- 3- They have the similar pharmacological effect as morphine

### Functional electrical Stimulation (FES)

Type of physical therapy includes the use of low frequency of treatment. It uses electrical stimulation to activate and training the muscles, which lost movement or in the training of the muscles that have lost their ability after injury or surgery.

### Types of electrical activation

#### 1-Modified Galvanic

In these methods of treatment are ***always periods and continuous***

**For-time: 10 - 200** milliseconds

**Frequency: 50-100** pulse / second

**Used in cases** of nerve damage and its injuries.

#### 2- Surged Faradic

With a ***short period of time and intermittent*** for treatment

**For-time: 1 - 10** millisecond

**Frequency: 50** cycles / second

**used in cases** of partial injury of the nerve or pressing on a nerve.

**When it is used?**

- 1- All nerve injuries
- 2- Atrophy and muscle weakness
- 3-Facial nerve injury
- 4-Osteoporosis resulting from the lack of movement

**Where should not be used?**

Especially with those who have

- 1- Modern Amputation
- 2- opening wound.
- 3-ulceration
- 4-modern fracture
- 5-modern surgery

## **Cryotherapy (use of ice)**

Cryotherapy is a method of surface treatment applications that use the ice. It is using treatment temperature on the skin about 10 Celsius Degrees.

### **The Physiological effects of cold**

#### **The hemodynamic effects**

- 1- Constriction of skin vessels, after directly application.
- 2-Expansion of blood vessels is late.
- 3- Reduce the acute inflammation

#### **The Neuromuscular effects**

- 1- Slow the neurotransmission
- 2- Reduce the muscular tiredness
- 3- Reduce of pain

#### **Effects at the joints and loose tissues**

- 1- Increase in stiffness of joint
- 2- Reduce flexibility of tendons

### **When it is used?**

- 1-twisting the joints and muscle pain
- 2- inflammation of the tendons and the articular capsule
- 3- treatment the small burns
- 4-after any surgery
- 5-bed ulcers
- 6- to prevent of bleeding

### **Forms of cold treatment:-**

1- Cold compresses are like hot with the temperature difference.

2- Ice massage is applied to the affected area by a piece of ice covered with cloth.

3- Compression Unit is composed of the room passes through which cold water is rotary and can be pump up the affected area, used mainly after musculoskeletal injuries, and after some bony operations.

4-Sprayer of cold: It is a spray used especially before procedure stretch for some special cases, such as muscle pain syndromes.

### **Where should not be used?**

- 1-psychological fear of ice
- 2-arterial ischemia
- 3-injury to nerves and lack of sense
- 4-the Sensitivity of the cold

**Treatment time:** Continuation of treatment time of about **1-15 minutes** (depends mostly on the condition of the patient himself)

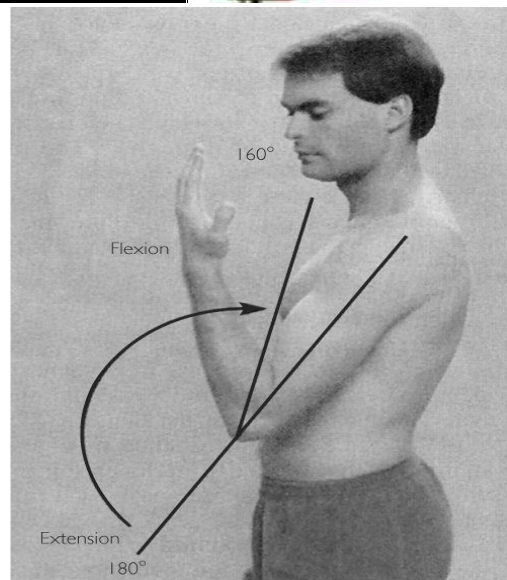
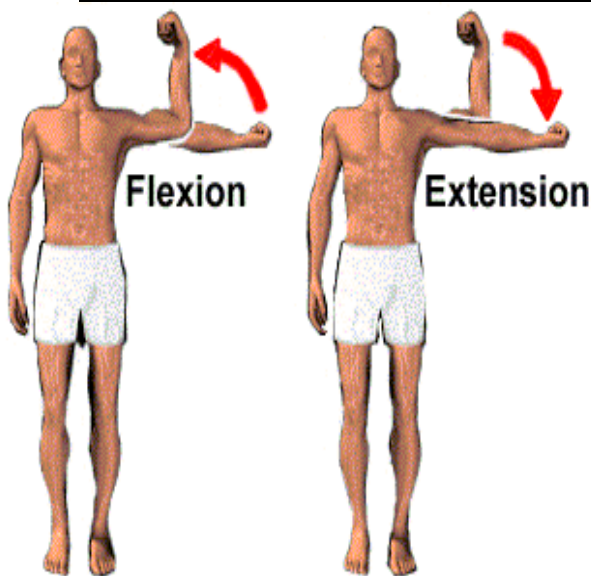
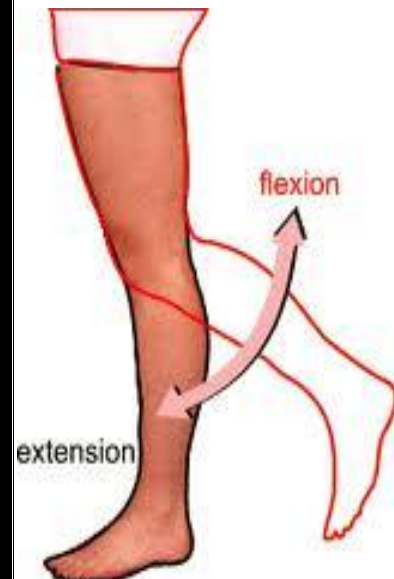
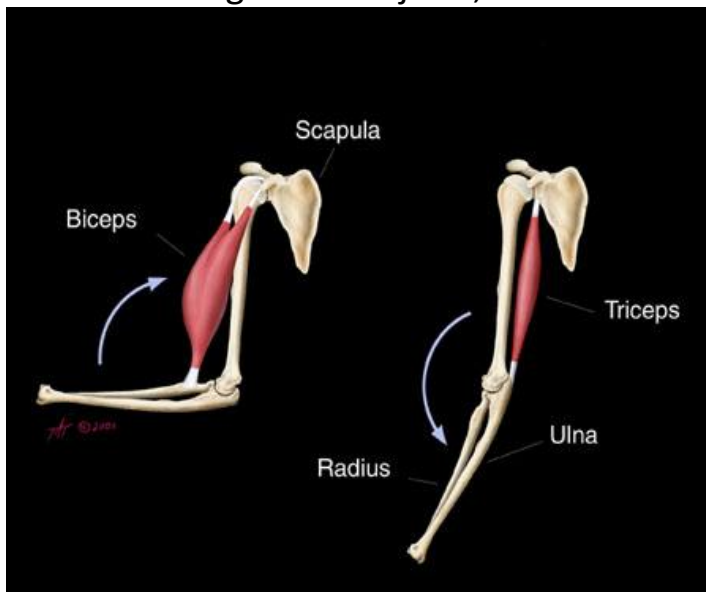
## Fundamental a movements in the human body:

**1-Flexion** is movement allowed by certain joints of the skeleton that decreases the angle between two adjoining bones, such as bending the elbow, which decreases the angle between the humerus and the ulna.

2- **Extension** is the opposite term is flexion, or bending. Flexion shortens a joint angle and extension increases it.

**Flexion** is to bend at a joint, or to reduce the angle.

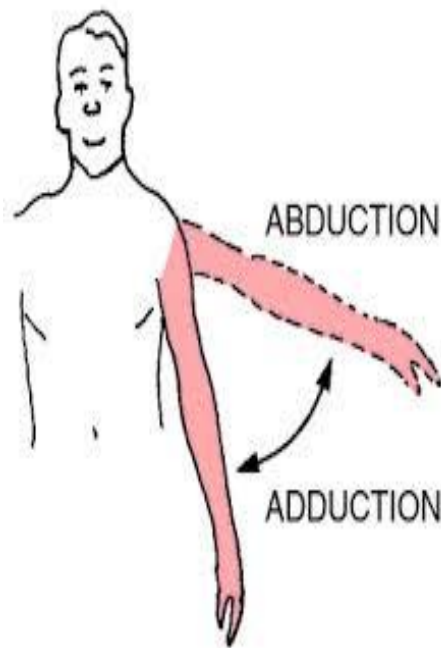
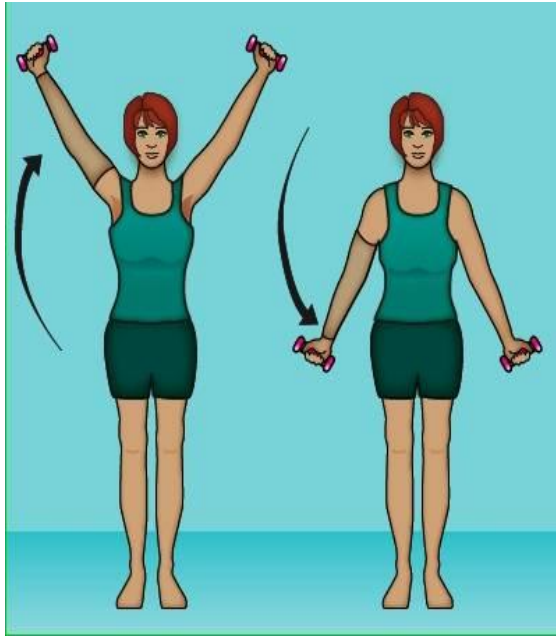
**Extension** is to straighten at a joint, or to increase the angle.



Figure; Shows Flexion and Extension exercise

3-**Adduction** is moving toward the midline of the body or to the central axis of a limb.

4- **Abduction** is a movement of a limb away from the midline axis of the body.

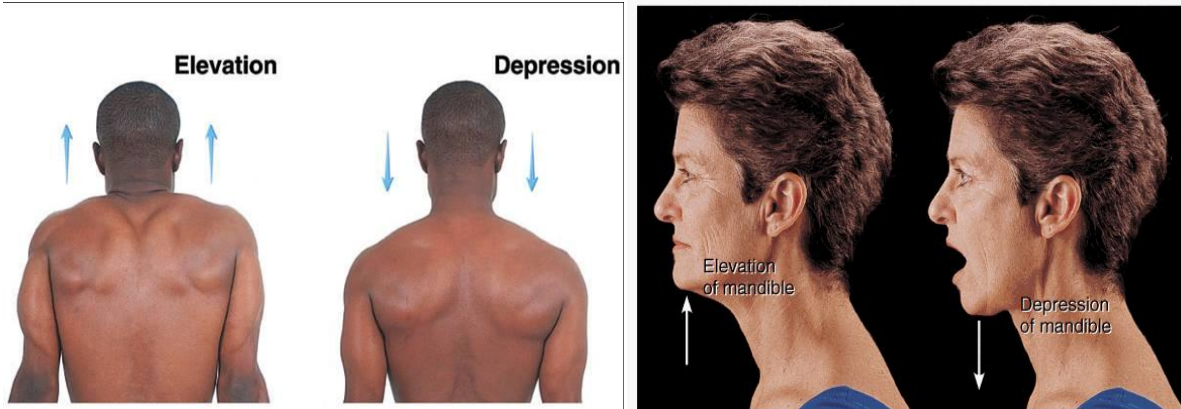


Figure; Shows Adduction and Abduction exercise



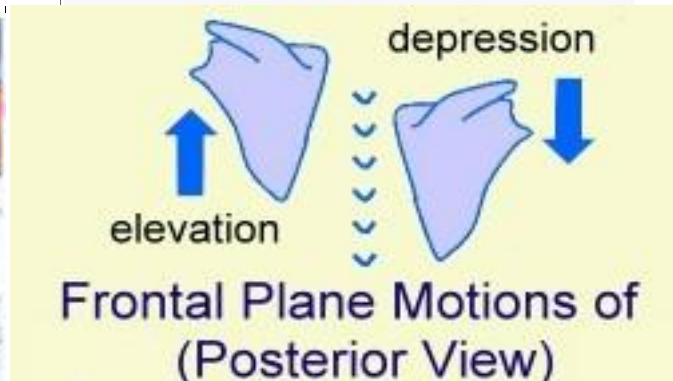
5- **Elevation** is lifting the part of the body towards the top.

6- **Depression** is reducing a part of the body toward the down.



(d) Elevation and depression

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Figure; Shows Elevation and Depression exercise

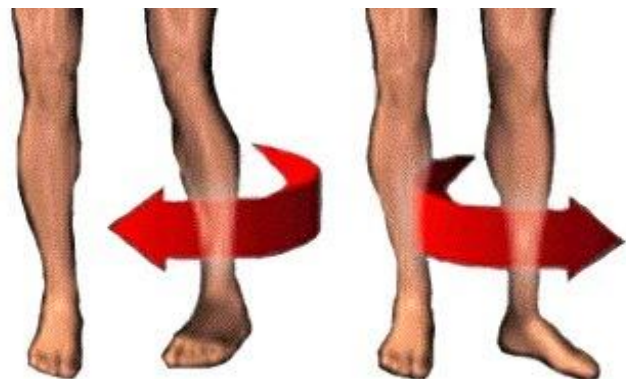
7- **Rotation** is a movement about the longitudinal axis of the bone.

\* **Medial rotation** is to turn inward.

\* **Lateral rotation** is to turn outward.



Forearm Rotation

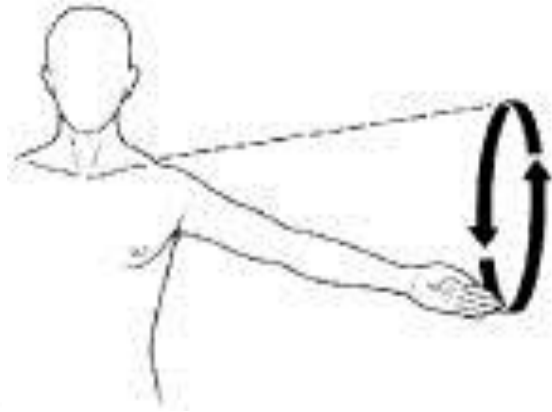
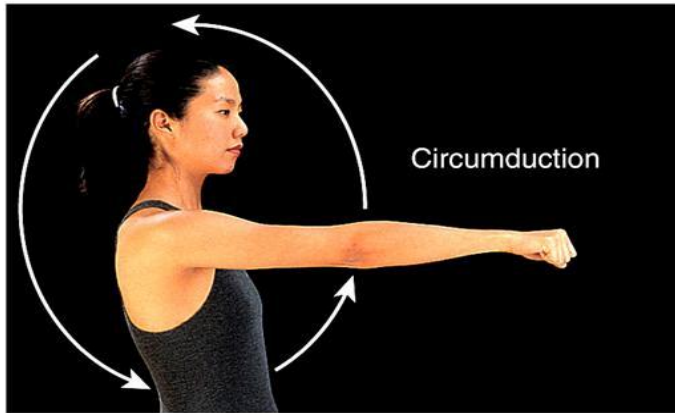


Medial Rotation

Lateral Rotation

Figure; Shows rotation exercise

8- **Circumduction** is a combination of movements that cause a body part to move in a circular shape.



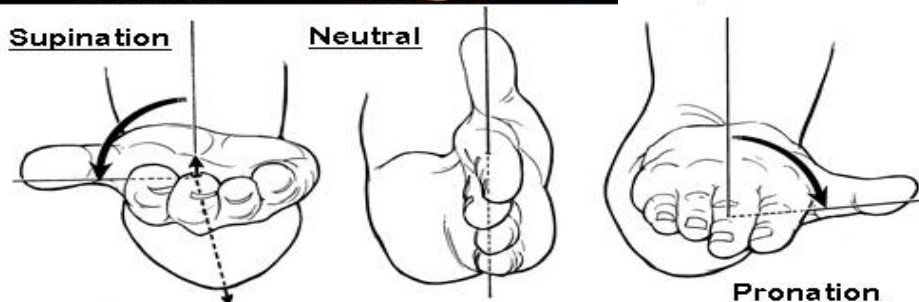
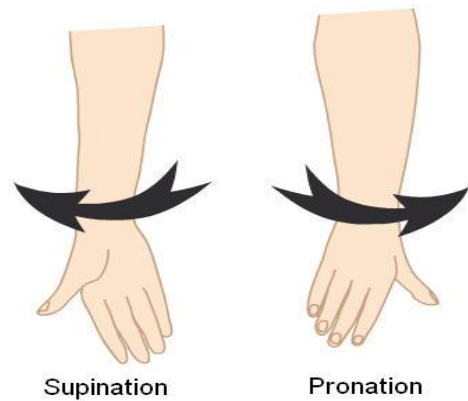
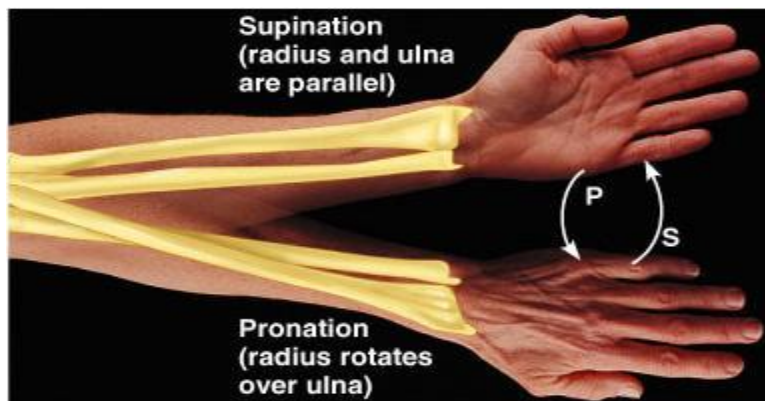
Figure; Shows circumduction exercise

9- **Supination** is rotate the forearm from the elbow joint outward, with the palm is facing the upward.

10- **Pronation** is rotate the forearm from the elbow joint inward, with the palm is facing the downward.

**Supination** of the forearm occurs when the forearm or palm are rotated outwards.

**Pronation** at the forearm is a rotational movement where the hand and upper arm are turned inwards.



Figure; Shows supination and pronation exercise

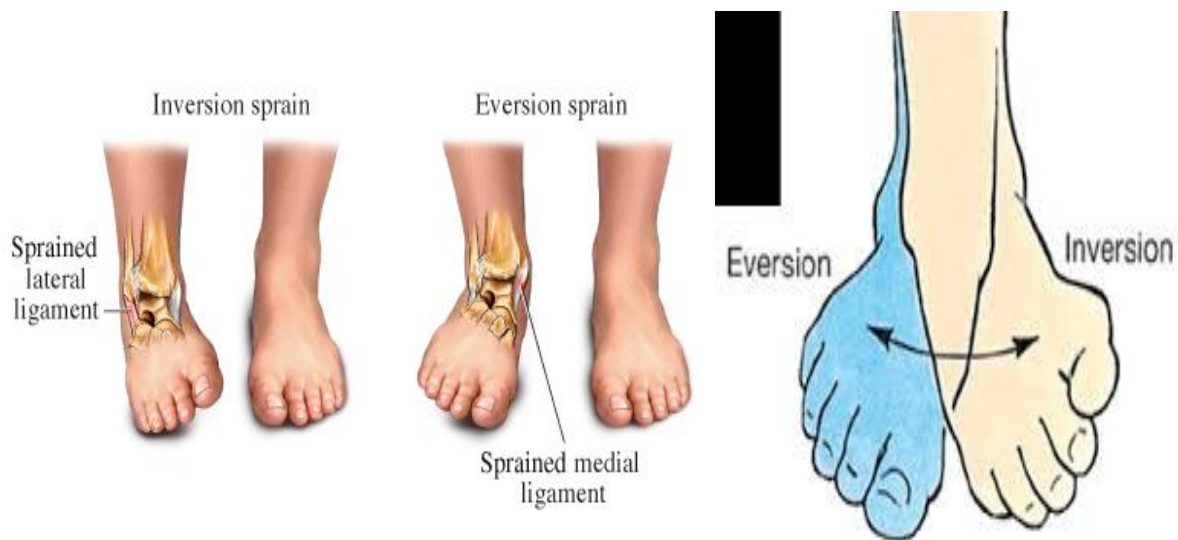
11- **Inversion** is Movement of the ankle to turn the sole of the foot medially.

12- **Eversion** is Movement of the sole of the foot laterally.

### Inversion and eversion

*Inversion* is the movement of the sole towards the median plane (as when an ankle is twisted).

*Eversion* is the movement of the sole of the foot away from the median plane.



Figure; Shows inversion and eversion exercise

## Muscles contractions

**Muscle contraction** is the activation of tension-generating sites within muscle fibers. In physiology, muscle contraction does not necessarily mean muscle shortening because muscle tension can be produced without changes in muscle length such as holding a heavy book or a dumbbell at the same position.

### Structural components required:

1. A skeletal muscle
2. A nerve innervating this muscle
3. Tendons at both ends of the muscle

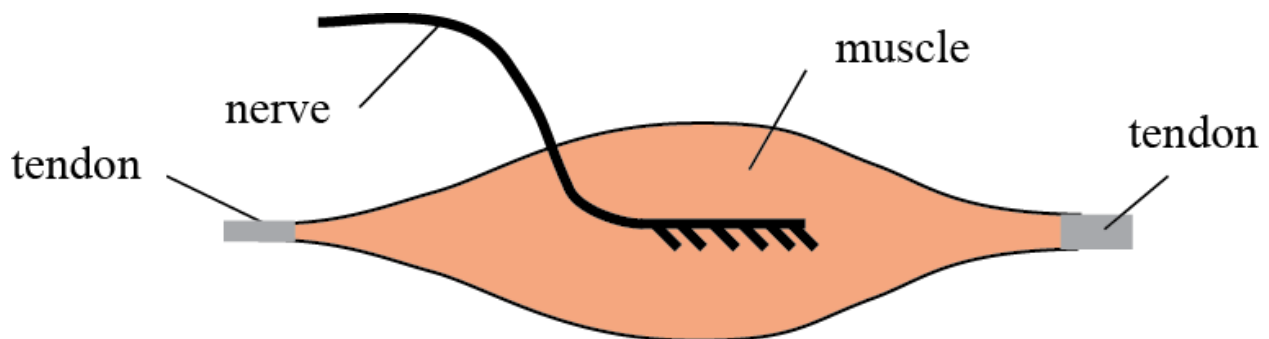


Figure shows components of muscle contraction

### Muscle Length and muscle Tone:

1. When a muscle contract, two things can change in that muscle: the **length** of the muscle and/or the **tone** of the muscle.
2. But what is **tone**?  
A change in the length of the muscle is easy to understand but **tone** is maybe more difficult as most people don't know the meaning of the word "tone".
3. The easiest way to sense tone is to feel your muscles (such as your biceps in the upper arm) when it is relaxed and when it is contracting.
4. When contracting, the muscle feels 'stronger'. That is the **tone**.



## Types of Contractions:

### 1. Isotonic Contraction

The simplest contraction is when the muscle contract without any or little attachment. The length of the muscle is then reduced but the tone has not changed. This is called isotonic (= same tone). An example of an isotonic contraction is 'waving your hand' (like the royalties!) or waving your finger at a bad student!

Isotonic (meaning same tension)

Isotonic contractions serve to bring about movement or change in body position.

Example = flexion, extension, adduction, abduction, etc

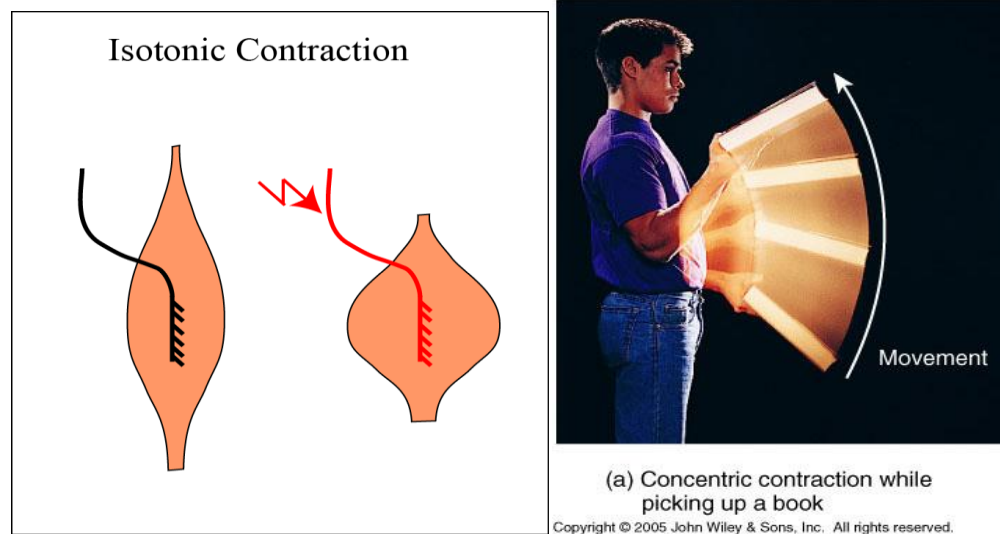


Figure shows isotonic contraction

### 2. Isometric Contraction

The opposite situation occurs when the muscle is fixed at both ends by its tendons. Then, when contraction occurs, the muscle cannot change its length but the tone will increase. This is called **isometric** (iso = same; metric = length). An example of an **isometric** contraction is pushing your hand and arms against a wall (which will not budge), or, carrying a football in your hand with your arm flexed. **Isometric** (meaning same distance or not moving)

**Isometric Contractions:** occur when there is no change in the length of the contracting muscle.

**Isometric Contractions:** Tension but no shortening of the muscle occurs. Energy is still used!

**Example:** contractions that serve to keep the body **fixed in position as in**

1. Maintaining posture
2. Maintaining balance
3. Fixing a proximal joint so a distal joint may move
4. Maintaining muscle tone.

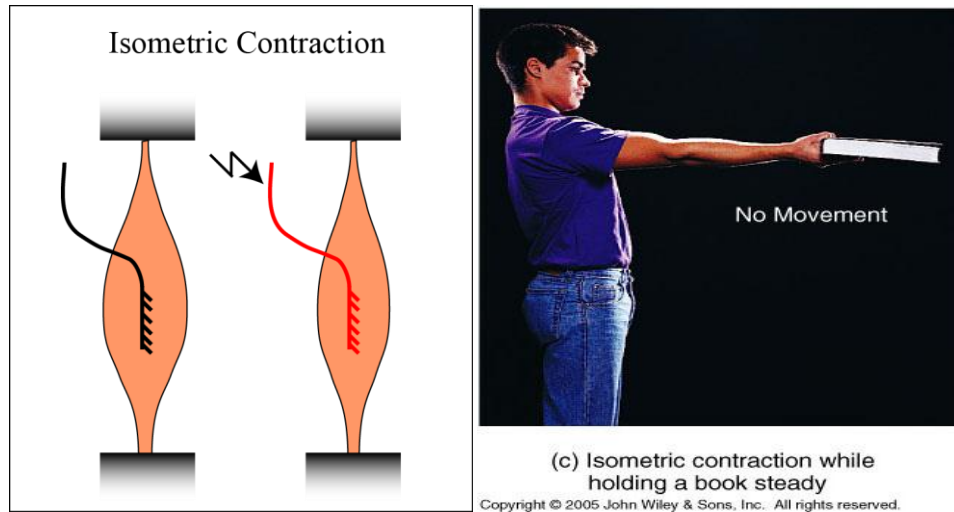


Figure shows isometric contraction

### 3. Auxotonic Contraction

most contractions in daily life show some change in length and some change in tone; these are called **auxotonic**. Since most daily contraction involves both changes in **tone** and in **length** nearly all contractions are **auxotonic**.

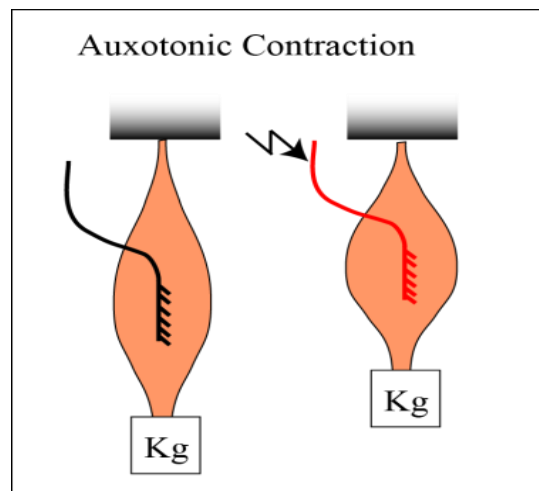


Figure shows auxotonic contraction

## Another type of Contraction:

### 1. Concentric Contractions

usually, when a muscle contracts, the length of the muscle decreases; this is called a **concentric** contraction. This is often used to flex a joint. For example, when you lift a suitcase from the floor.

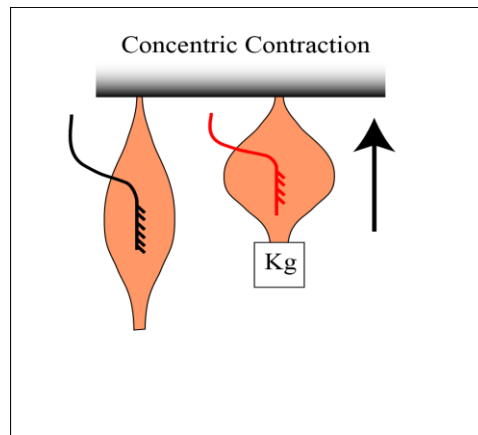


Figure shows concentric contraction

### 2. Eccentric Contractions

But sometimes, you use your muscles to control **extension**, such as when you carefully lower a suitcase back onto the floor; then the muscle length increases while contracting at the same time. This is called an **eccentric** contraction.

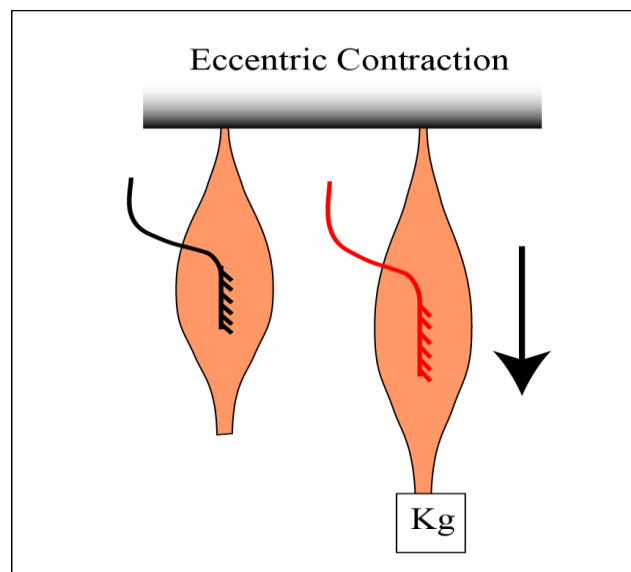


Figure shows eccentric contraction

## Phasic Contractions

When the muscle contracts and relaxes in a rhythmic manner; this is called **phasic** contraction. This occurs for example when you are walking. Your leg muscles alternatively contracts and relax while you walk.

## Tonic Contractions

The opposite situation occurs when the muscle is contracting all the time but only varies in tone. This is called **tonic** contraction. Typical muscles that perform tonic contractions are the muscles in the **back**. They hold the vertebra column (and therefore your back) upright all the time.

## Tonic + Phasic contractions

Many muscles, depending upon the situation, can also perform tonic and phasic contractions **simultaneously**. For example, when you hold a ball in your hand with your elbow bend at ninety degrees (tonic contraction) and you also, at the same time, move your lower arm up and down (phasic contraction).

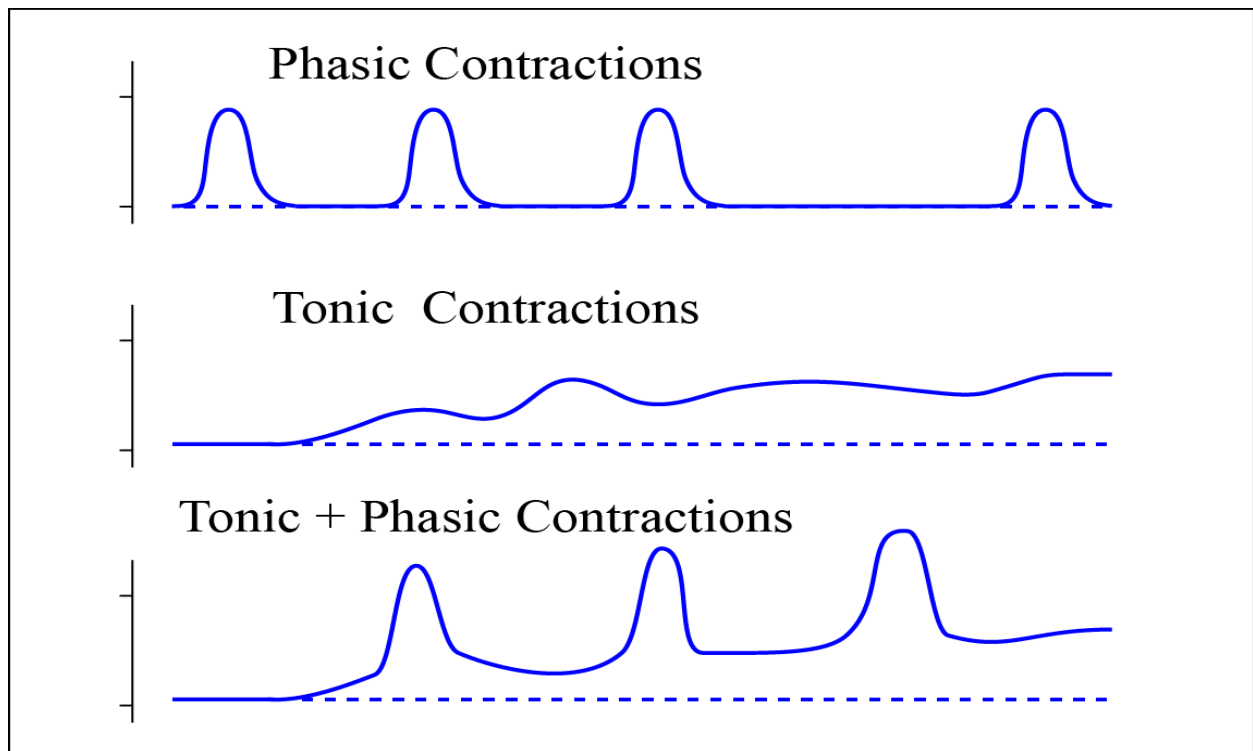


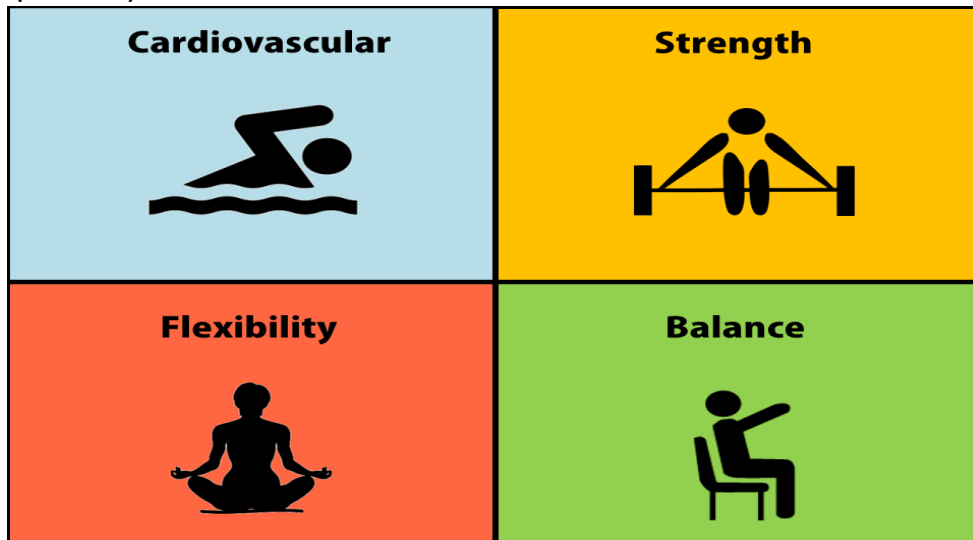
Figure shows concentric contraction



## The four essential parts of an effective senior exercise program:

### First: - **cardiovascular exercise**

- 1- Gets your heart pumping
- 2- ( 3-5) times per week
- 3- ( 25-45) minute



Figure; Shows cardiovascular, strength, flexibility and balance exercise

### Second: - **strength training**

- 1- Keeps your muscles strong
- 2- (2-3) times per week
- 3- About 10 exercise for the whole body
- 4- (15) reps each exercise

### Third: - **balance training**

- 1- Helps prevent falls
- 2- Four or more times per week
- 3- Several exercise
- 4- Thirty seconds each

### Fourth: - **flexibility**

- 1- For better posture and healthy joints
- 2- Daily
- 3- (5-7) minutes

**Passive Range-of-Motion** If you' re unable to move against gravity, a caregiver or physical therapist can help you fully stretch your muscles and move the joints to prevent contractures associated with immobility. For maximum benefit, it' s important that you continue to participate as fully as possible.

The following illustrations indicate normal range-of-motion of each joint. If strong resistance or pain occurs, stop the movement.

This exercise is used for the following cases (Pain, impingement, bursitis, tendonitis, arthritis, after surgery and frozen).

**Note:** The following instructions are written to the caregiver.

Shoulder

Elbow

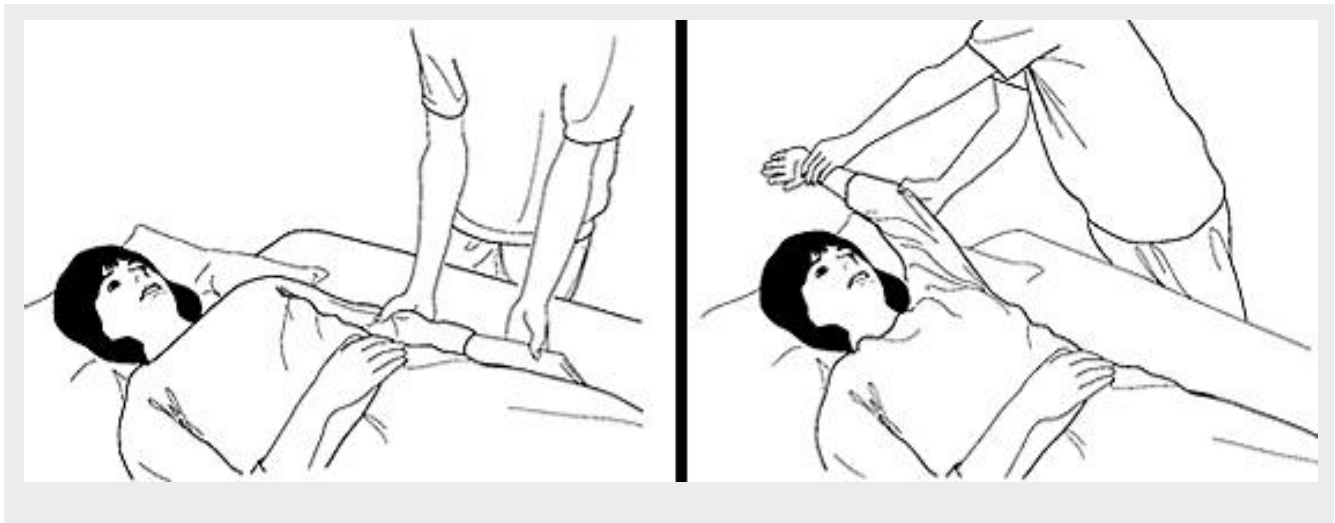
Wrist

Fingers

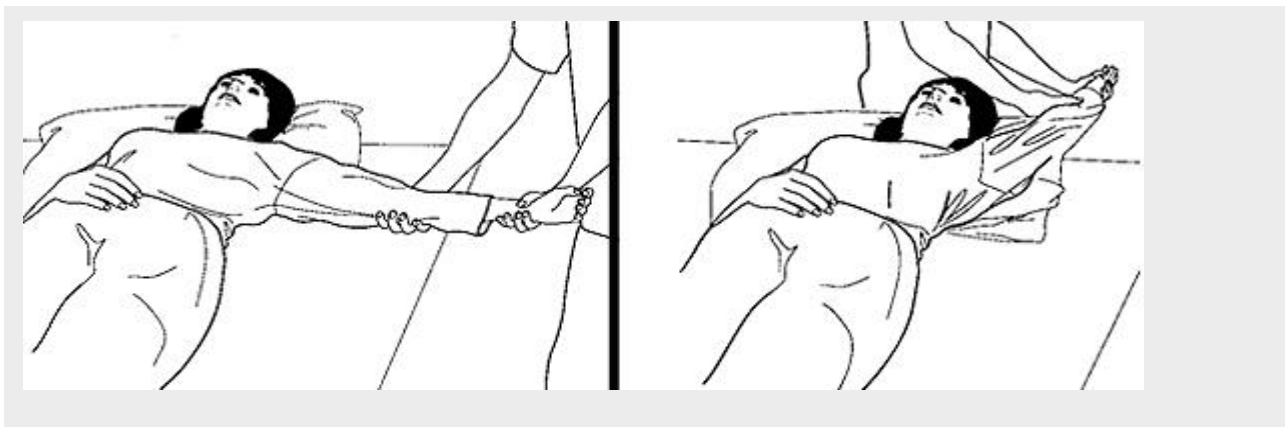
Hip

Ankle and toes

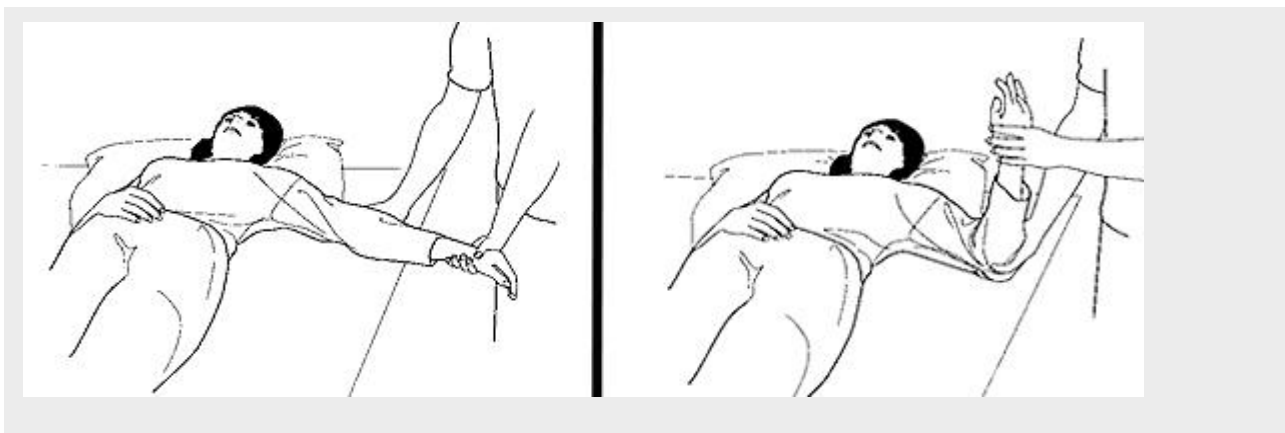
**Arm exercises:** - Shoulder



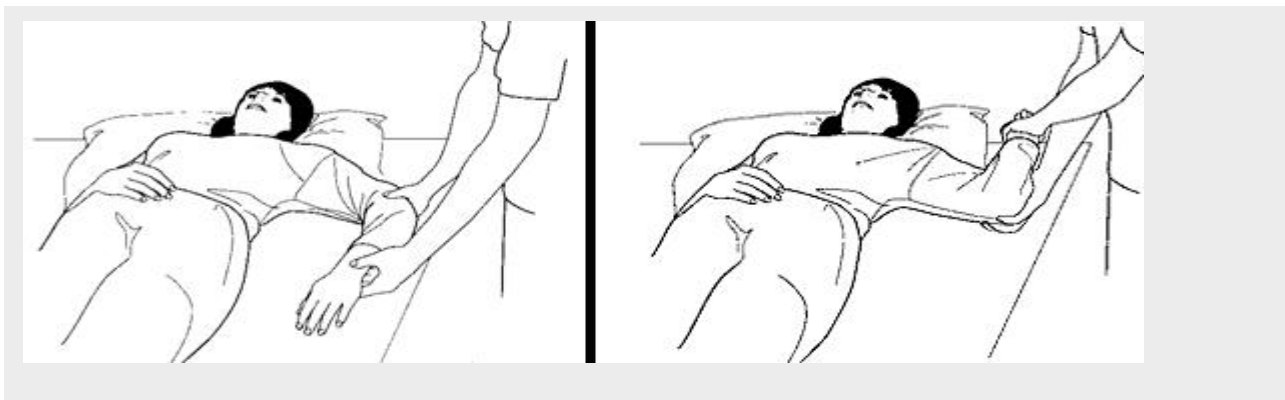
Help the person with ALS lie comfortably on his or her back. Place the person's arm at his or her side. Supporting the elbow and wrist, pick the arm up and over the head to a position behind the ear. Return the arm to the person's side.



Supporting the elbow and wrist, move the arm along the bed to a position above the person's head and next to his or her ear. Return the arm to the person's side.



Move the arm along the bed to shoulder level. Bend the elbow to 90 degrees (hand pointing toward ceiling). Support the elbow and wrist and keep elbow stabilized.

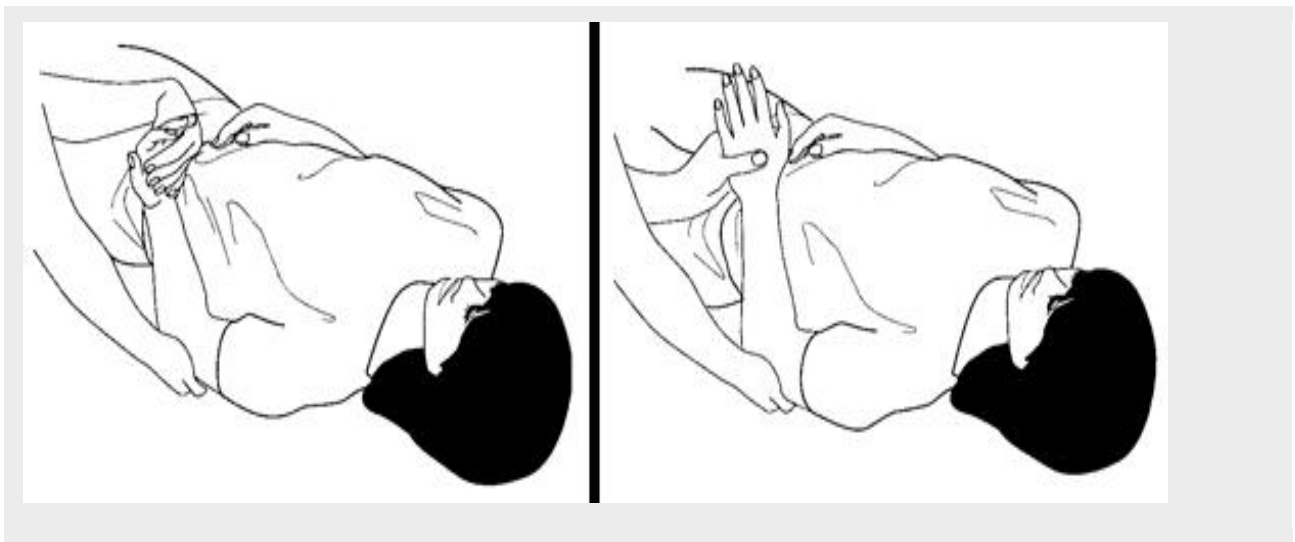


Rotate the arm until the hand and wrist touch the bed near the hip and rotate the arm back until the wrist touches the bed near the head.

## Elbow

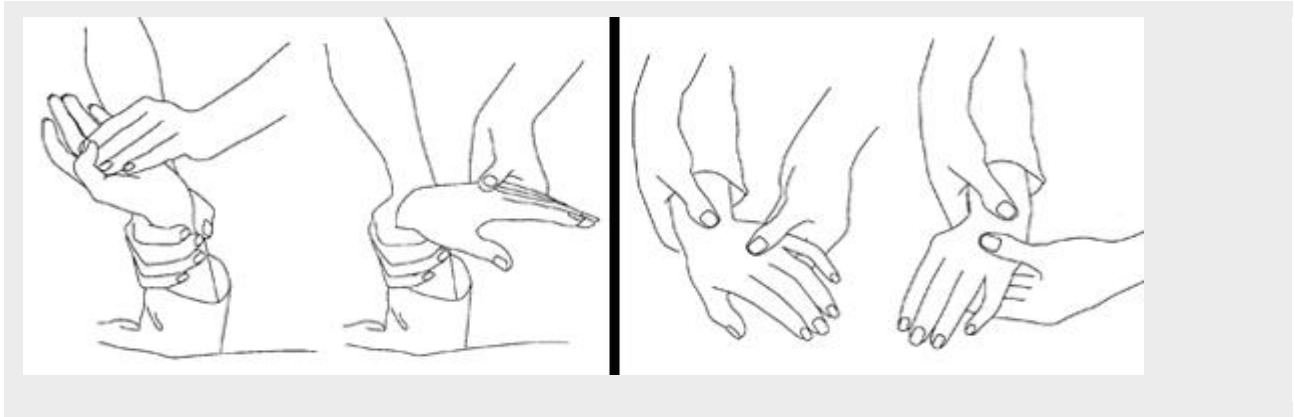


Stabilize the elbow and bend and straighten it in three positions: palm down, thumb down and palm up.



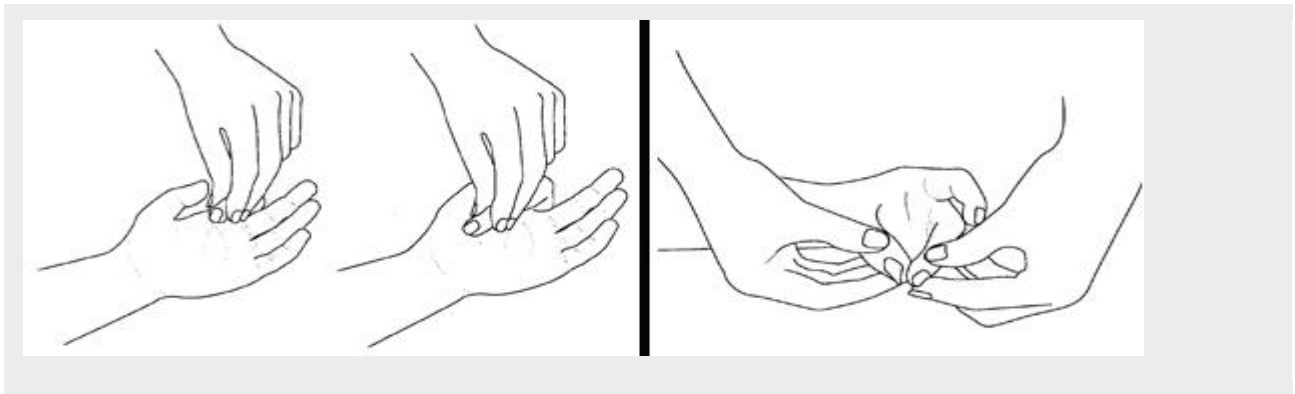
With the elbow bent at the person's side, rotate the palm toward and away from the person's face.

## Wrist

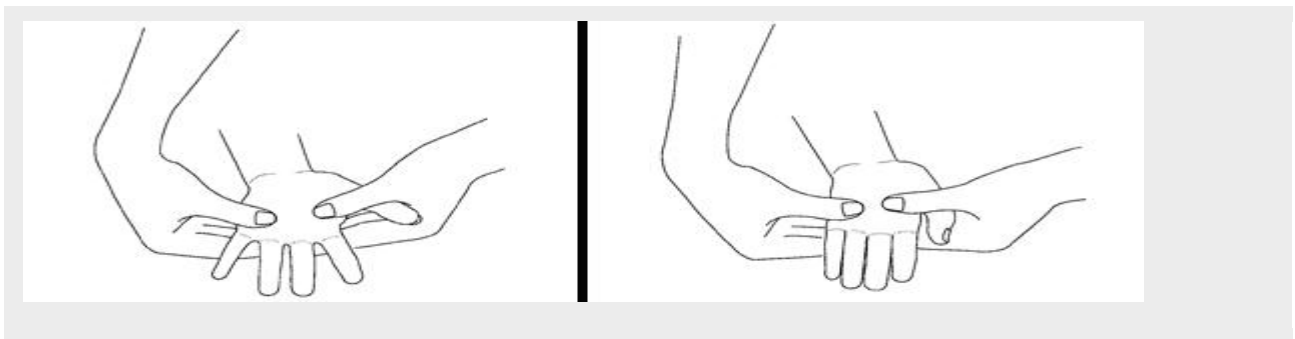


Holding the wrist and hand, bend the wrist up and down as if waving. Holding the arm and hand, with the wrist straight, bend the hand to one side and then the other.

## Fingers



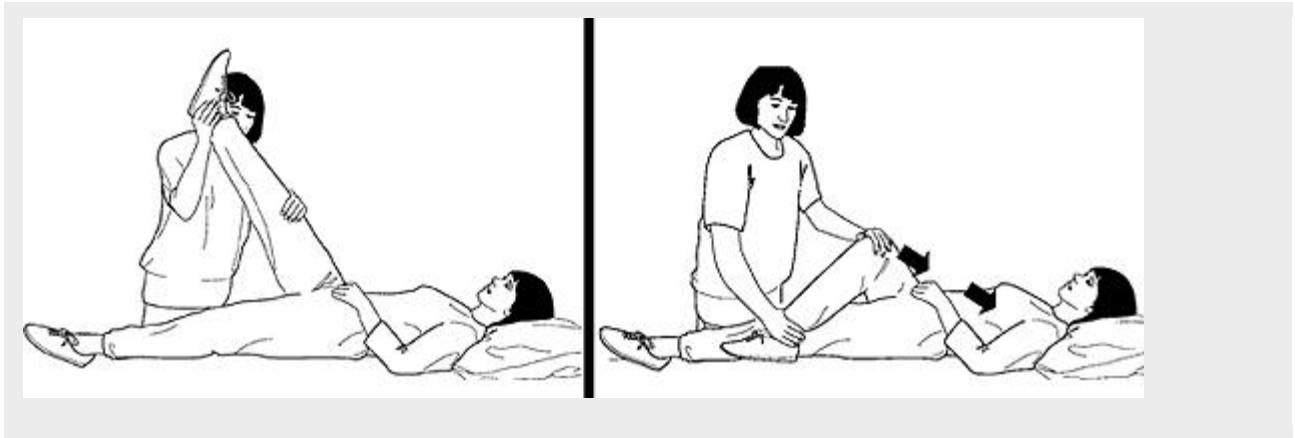
Take each finger and pull gently to touch the base of the finger and then the heel of the hand. Touch the tip of each finger to the tip of the thumb.



Straighten each finger. Spread the fingers apart and back together.

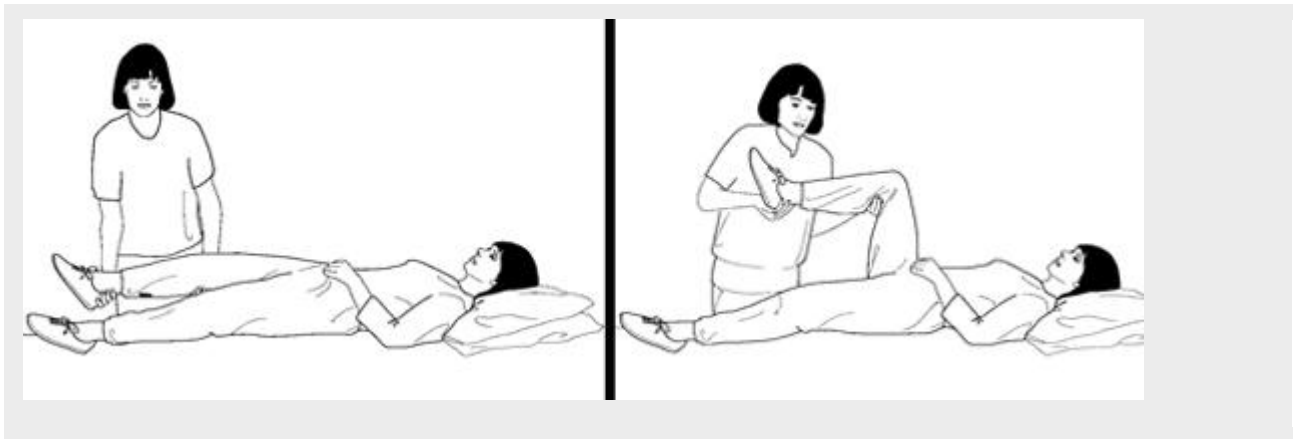
## Leg exercises

### Hip



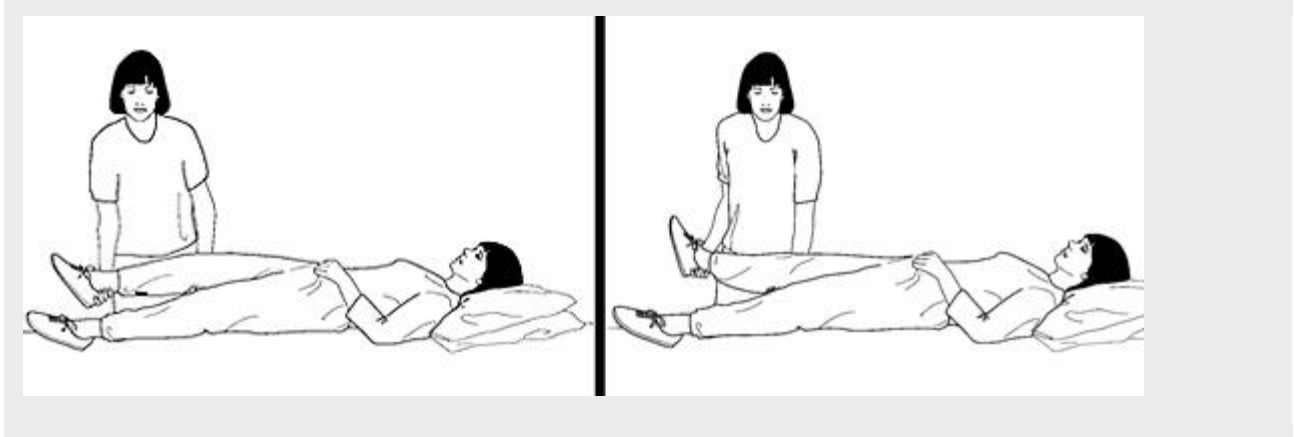
Help the person with ALS to lie on his or her back with legs straight and relaxed. Stand beside the leg to be exercised, and place one hand above the knee to keep it straight and the other hand under the heel.

Bend the knee of one leg and cross the foot over the thigh of the other leg. Push the knee toward the opposite shoulder. Repeat with the other leg.



Keeping the leg straight, slowly raise the leg until the person you're assisting feels a stretch. Be sure to keep the other leg flat during the stretch.

Support the leg at the knee and heel, and bring the knee toward the chest. Return the leg to the bed, and repeat with the other leg.

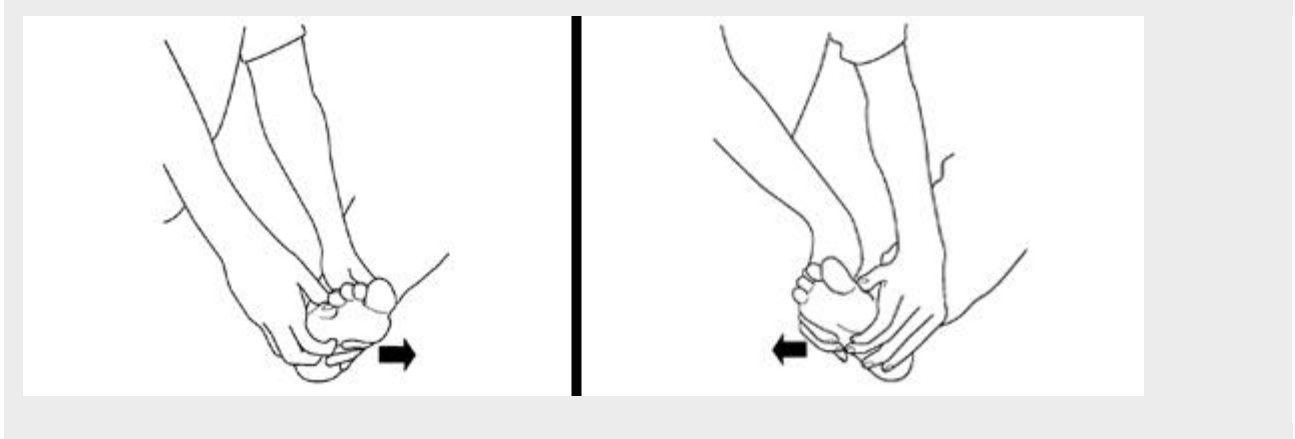


Bring the leg out to the side. Return the leg to the center. Repeat with the other leg.

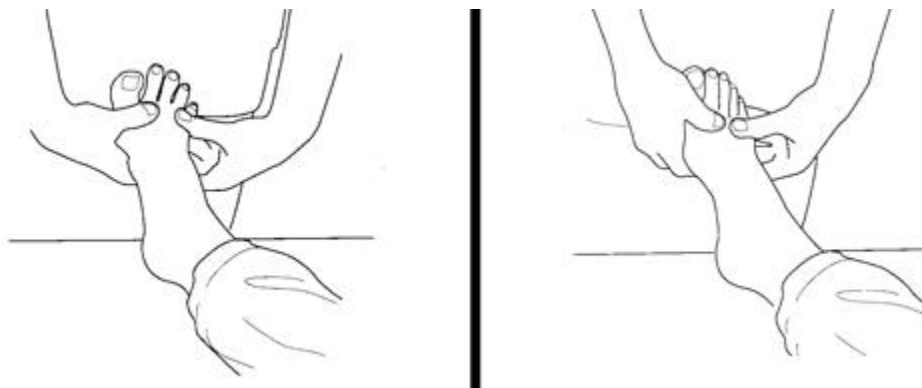
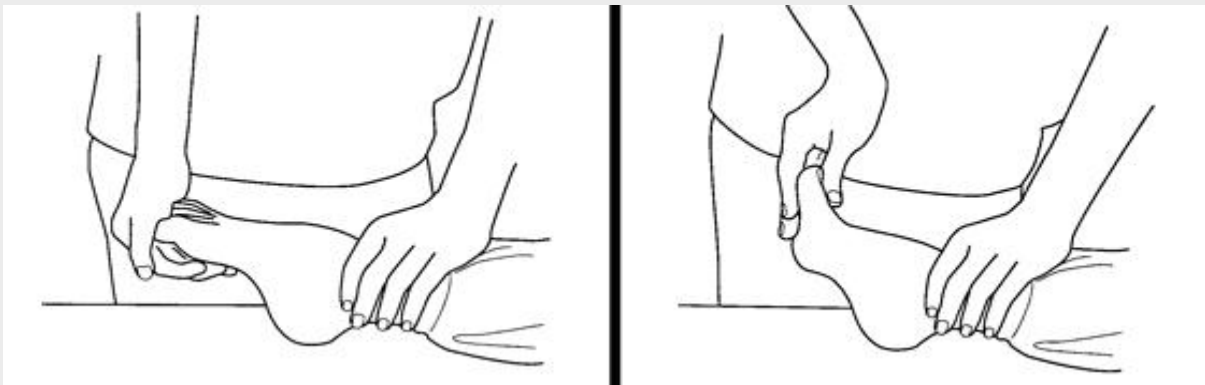
### **Ankle and toes**



Place one hand on the person's shin and cup the heel in your other hand. Gently bend the ankle upward by pushing against the bottom of the foot with your forearm. Don't allow the foot to turn in or out.



Grasp the foot and turn the bottom of the foot toward the inside and then the outside.



Bend and straighten each toe. Spread the toes apart and then return them to the original position.