

# ACTIVE MOVEMENTS



# Voluntary movements

- Movement performed or controlled by voluntary action of muscle, working in opposition to external force.

# Classification

These are classified as

- Free
- Assisted
- Assisted-resisted
- Resisted

- **FREE EXERCISES**

work is performed only against gravity

- **ASSISTED EXERCISES**

When muscle strength or coordination is inadequate to perform the movement an external force is applied to compensate the deficiency

- **ASSISTED RESISTED EXERCISES**

At one point strength is high at the other muscle is weak

- **RESISTED EXERCISES**

Force of resistance is offered to the action of working muscle  
resistance may be mechanical or it may be manual

# Free exercise

Exercises performed by patients own muscular efforts with out any assistance or resistance against gravity.

Free exercises can induce

- Relaxation because of rhythmical or pendular nature of exercise
- Muscle tone maintenance
- Coordination by natural pattern
- Confidence to perform and control movement

# Advantage

- Free exercises help to cure or mean of cure for the patient
- Patient can master the technique once performed
- Free exercises has great role in rehabilitation

# Disadvantages

- Insufficient demand on Neuro Muscular System **NMS**
- Patient with brain damage or muscle paralysis can't cooperate



# Classification of free exercises

Classified according to extent of area into two

- **Localized**

Produce some specific or local effect e.g. for particular joint or muscle, flexion of elbow joint

- **General**

Use of many joints e.g. walking running

# General exercises

They are further classified into two types

- **Subjective exercises**

These are formal or general anatomical movements performed in full range.

- **Objective exercises**

Patients attention is required for particular aim or there is presence of goal i.e standing, arm stretching upward

# EFFECT AND USES

**It depend upon 4 factors**

1. Nature of exercise
2. Extent of exercise
3. Intensity of exercise
4. Duration

# Effect and uses (indications)

- **RELAXATION:** Rhythmical swing and pendular movements help in relaxation of hypertonic muscles. Reciprocal inhibition help in relaxation of opposing muscles i.e. scapular retractors and shoulder extensors movement help to relax Pectoral muscles.

# JOINT MOBILITY AND FLEXIBILITY are maintained and improved by free exercise.

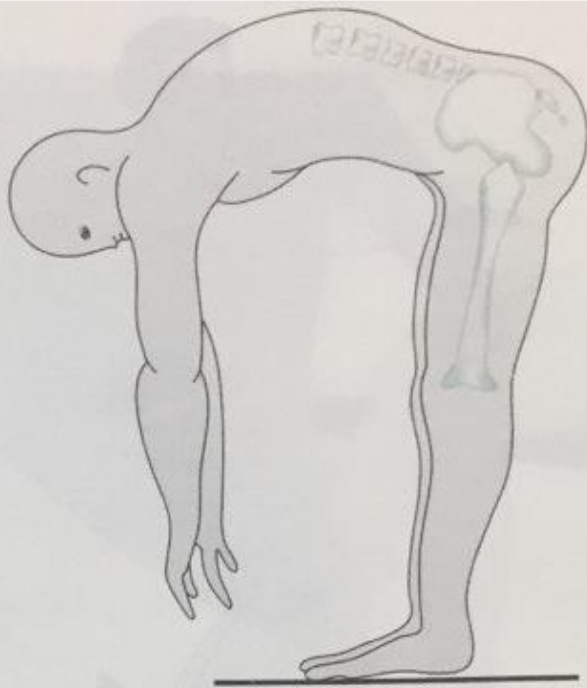


Fig. 9.1A: Forward bending

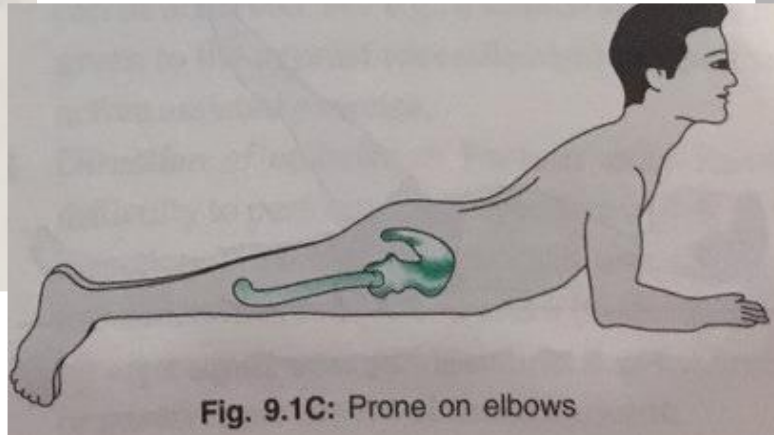


Fig. 9.1C: Prone on elbows



Fig. 9.1B: Running

# MUSCLE POWER AND TIME

- Power and endurance is build up by increasing response to tension.
- Tension is greater when performed at a speed greater on lesser then normal.
- Normally muscle power is maintained in every day activity in **middle range.**



Fig. 9.2A: Squating

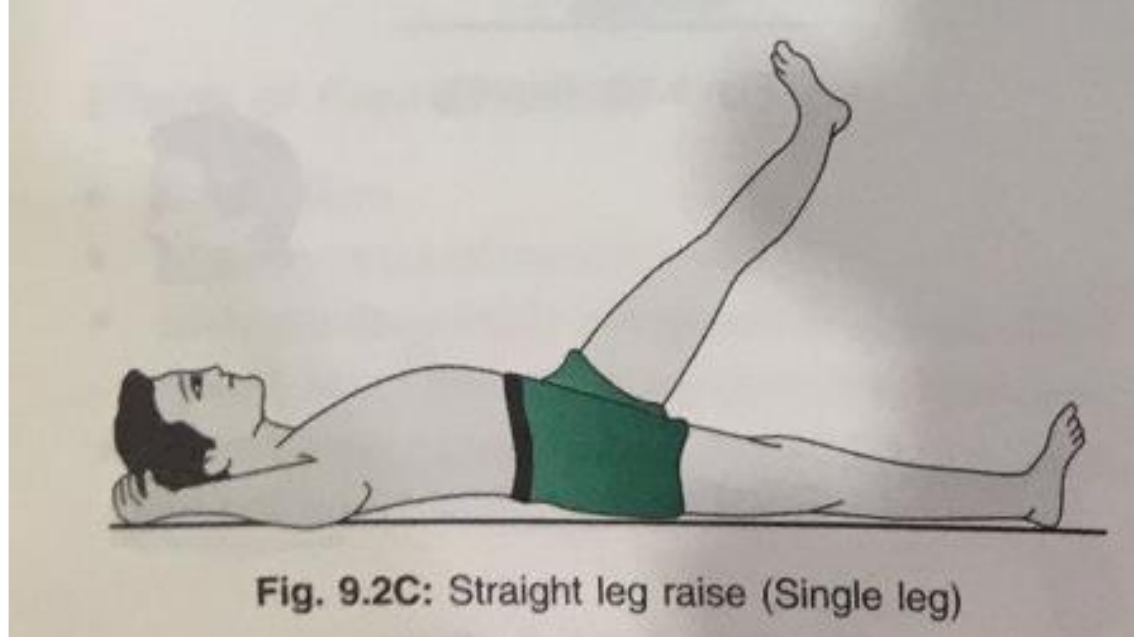


Fig. 9.2C: Straight leg raise (Single leg)



Fig. 9.2B: Spinal extension

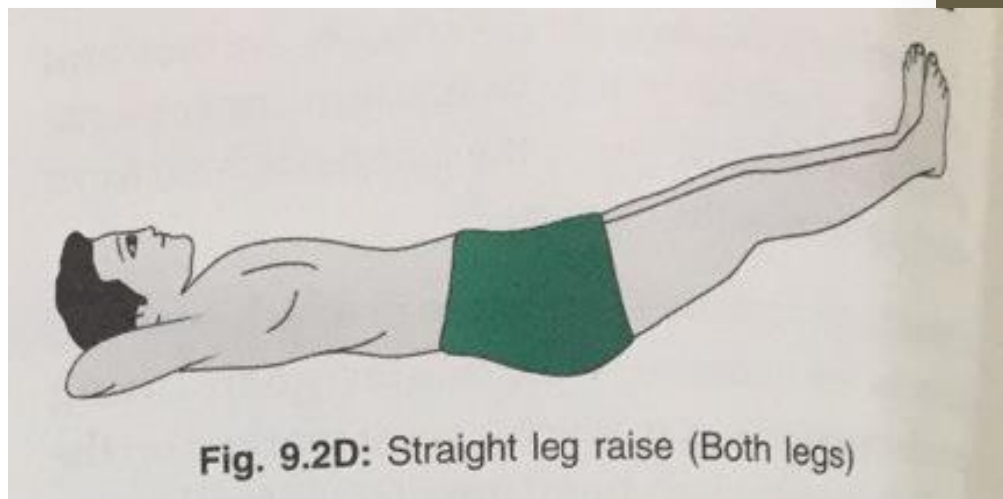


Fig. 9.2D: Straight leg raise (Both legs)

**Tone:** muscles are toned up, when free exercises performed. On contrary it also reduces the tone in hypertonic muscle groups.



- **NEUROMUSCULAR COORDINATION:**

- it is improved by repetition of exercises.

Activities that require concentration or much effort become easy with the passage of time i.e. playing piano

- **CONFIDENCE:** achievement of coordinated and effective movement give confidence to the patient. Objective exercises are used for this purpose.

# Circulatory and Respiratory cooperation

## **During prolonged and vigorous exercises**

- speed and depth of respiration increase
- Heart beat is faster and more forceful
- Heat is produced

## **This include following changes**

- a) The need of active tissue
- b) Preparation for activity
- c) Local circulatory changes in muscle
- d) Regulation of circulatory and respiratory function during exercise

# Regulation of circulatory and respiratory function

- Venous return to heart increase
- Increase in cardiac output

Both these happen due to pressure variation in the abdominal and thoracic cavities resulting from increased respiratory movement

Muscular contraction result in increased

- Carbon dioxide
- Temperature of blood

So overall effect of active exercises is

- Increase respiration
- Increase local and general circulation
- Provide work for heart muscles

## Indications of Active Assisted Exercises/Movements

1. *Strengthening of the weak muscles:* Prolonged immobilisation of joint can cause disuse atrophy of muscles and patient finds difficulty

to perform the movement in available ROM against gravity or in gravity eliminated positions. An external assistance by the hands of therapist or suspension therapy unit is given to complete the ROM. To strengthen the muscles an assistance is given to support the movement and during this period patient is asked to contract the muscle as maximum as possible. After 1-2 weeks an external assistance may be eliminated as patient starts moving the joint without any assistance against the gravity or in gravity eliminated position.

*Example:* Post fracture disuse atrophy, post tendon transfer muscle weakness.

2. *Co-ordination of movement*: It has been observed that prolonged immobilisation of joint can cause loss of memory of brain to the movement and patient finds difficulty to initiate the movement. Passive or Active movement of the same joint of contralateral limb is performed to stimulate motor pathway. The patient may re-learn the movement as the conduction of impulses is facilitated in the neuro-muscular pathway. As patient re-learns the movement an external assistance is given to perform the movement in available range of movement.



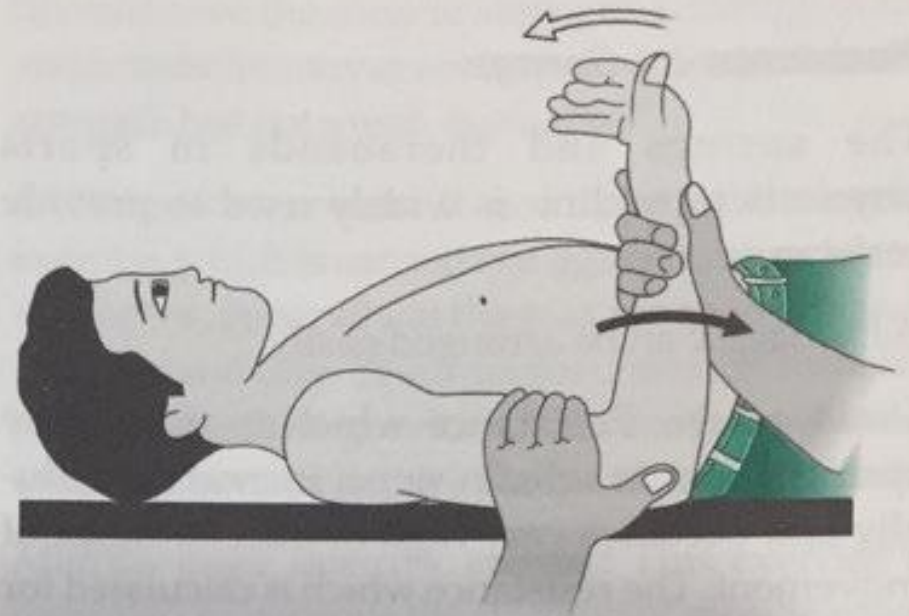
## Active Assisted Resisted Movement

Active assisted-resisted is a combination of both assisted and resisted movement in which

an assistance is given to initiate the movement and resistance is given in the middle range where patient has strong contraction of muscle (Figs 9.4 and 9.5).



**Fig. 9.5:** Active assistive movement, white arrow shows movement and black resistance against movement terminal extension of the knee joint



**Fig. 9.6:** Active-resistive elbow flexion white arrow shows movement and black resistance against the movement (flexion)

## Resisted Movement or Exercise

A movement or exercise is carried out against the resistance in available range of motion. The intramuscular tension is increased as the resistance is applied against isometric or isotonic contraction of muscle (Fig. 9.6).

## *Methods/Apparatus Used to Provide Resistance Include*

1. Multygymnasium apparatus-weights, pulley, dumbbells
2. Highly sophisticated coinputer driven-iso-kinetic.
3. Suspension therapy unit
4. Hydrotherapy
5. Therabands
6. Sponge balls and medicinal ball.

Resistance can also be applied by:

- Therapist (Manual resistance) - Patient (auto resistance)
- Springs.



## *Resistance by the Therapist*

- a. *The position of patient:* Should be comfortable.
- b. *Stabilisation:* The proximal part of the joint should be stabilised by straps or therapist's hand or body weight.
- c. *Pattern of movement:* Explain the direction of movement to the patient to perform the smooth and coordinated movement in anatomical range. This can be taught by passive or active movement of same limb.
- d. *Resisting force:* Therapist stabilizes the proximal part of joint by one hand while other hand is used to apply resistance.

## *Resistance by the Patient*

The patient can apply resistance by his/her contralateral limb.

## *Types of Resisted Exercises*

1. Isotonic resistance exercise
2. Isometric resistance exercise
3. Isokinetic resistance exercise.

Uses of isotonic resistance exercise-Isotonic resisted exercise is designed to increase:

- Muscle power
- Muscle strength
- Muscle endurance
- Cardio-pulmonary endurance.

The following isometric exercises are being in current use.

- Muscle setting exercises
- Stabilization exercises
- Multiple angle isometric exercise.

*Muscle setting exercises:* It is a type of isometric exercise in which little or no resistance is applied.

*Stabilization exercise:* It is a type of isometric exercise which is carried out against submaximal resistance, generally at the mid range to enhance postural stability. The muscles contract isometrically against the gravitational resistance (force) or resistance applied by the hands of therapist.

*Multiple-angle isometric exercise:* This exercise is indicated to improve the strength of muscle when the isotonic resistance exercise is not recommended because of pain or instability.



## *Progressive Resisted Exercises (PRE)*

PRE was developed by De Lorme in 1946, which is based on 10 RM (RM = Repetition maximum). He calculated 10 RM and executed on soldiers suffering from muscle weakness following trauma in second world war. A set of exercise was repeated from 7 to 10 times during treatment session. Exercises prescribed 5 days a week and in the last day of week (Friday) 10 RM was to be calculated and new exercise programme used to introduce for the next week. De Lorme called this method "Heavy Resistance Exercises".

THANK  
YOU

