



## **Classification, Therapeutic effects and uses of the following: Active Exercises (Free, Assisted and Resisted exercises) & Passive Exercises (relaxed and forced exercises)**

### **Introduction**

Therapeutic exercises are the bodily movement prescribed to correct impairment, improve musculoskeletal function or maintain a state of well-being. It may vary from highly selected activities restricted to specific muscles or parts of the body, to general and vigorous activities that can return a convalescing patient to the peak of physical condition. Therapeutic exercise are classified into two types of exercises namely, Active Exercises (Free, Assisted and Resisted exercises) & Passive Exercises (relaxed and forced exercises)

### **Active exercise**

#### **Free Exercise:**

Free exercises are those which are performed by the patient's own muscular efforts without the assistance or resistance of any external force, other than that of gravity. This type of exercise can be used to obtain any of the effects which are produced by exercise as a whole. The great advantage of free exercises lies in the fact that once the patient has mastered the technique of the performance and is aware of the purpose, it depends on oneself to practice when and where he wants.

#### **Classification of free exercises:**

Free exercises may be classified according to the extent of the area involved, they may be

- a) Localized
- b) General

a) Localized: Localized exercises are designed primarily to produce some local and specific effects, e.g. to mobilize a particular joint or to strengthen particular muscle groups. Movement is localized to one or more joints, either by the use of suitable starting position or by voluntary fixation of other areas by the patient's own muscular effort.

b) General exercises: It usually involves the uses of many joints and muscles all over the body and the effect is widespread e.g. as in running.

**The characters of free exercise are:**

- a) Subjective
- b) Objective

a) Exercise which is subjective is usually formal and consists of more or less anatomical movements performed in full range. The attention of the patient is deliberately focused on the form and pattern of the exercise.

b) Objective exercises are those during the performance of which the patient's attention is concentrated on the achievement of a particular aim which will result from his effort.

**The techniques of free exercises:**

1) The starting position is selected and taught with care to ensure the maximum postural efficiency as a basis for movement.

2) Instruction is given in a manner which will gain the interest and cooperation of the patient and lead him to understand both the pattern and purpose of the exercise.

3) The speed at which the exercise is done depends on the effects required. It is usually slow during the period of learning and later the patient is either allowed to find his own natural rhythm or the speed required is dictated by the physiotherapist.

4) The duration of the exercise depends very largely on the patient's capacity.

**The effects and uses of free exercises:**

1) Relaxation: Rhythmical swinging movements and those which are pendular in character assist the relaxation of hypertonic muscles in the region of the joint moved.

2) Joint mobility: The normal range of joint movement is maintained by exercises performed in full range.

3) Muscles power and tone: The power and endurance of the working muscles are maintained or increased in response to the tension created in them. The tension is greater when the exercise is performed at any speed which is slower or more rapid, than when the natural speed of movement is employed.

4) Neuromuscular coordination: Coordination is improved by the repetition of an exercise. As the pattern of movement is established, it is simplified and becomes more efficient, and the conduction of the necessary impulses along the neuromuscular pathways is facilitated.

5) Confidence: The achievement of coordinated and efficient movement assures the patient of his ability to maintain subjective control of his body.

6) Circulatory and respiratory cooperation: During vigorous or prolonged exercises, it is apparent that the speed and depth of respiration is increased, that the heart beat is faster and more powerful.

### **Assisted exercises:**

When the force exerted on one of the body levers by muscular action is insufficient for the production or control of movement, an external force may be added to augment it. The magnitude of the assisting force must be sufficient to augment the muscular action and must not be allowed to act as a substitute for the movement.

Techniques: The general plan is to ensure that the inefficient muscles exert their maximum effort to produce movement under conditions designed to facilitate their action. The assisting force is applied neither only to augment this maximum effort nor to act as a substitute for the movement.

### **Effects and uses of assisted exercises:**

1) The working muscles cooperate in the production of movement which they are incapable of achieving unaided, provided the maximum effort of which they are capable is demanded from the weak muscles and the assisting force utilized is only complimentary, these muscles will gain in strength and hypertrophy.

This type of exercise may be used in early stages of neuromuscular re-education.

2) The memory of the pattern of the coordinated muscle is stimulated by the correct performance of a movement which the patient is unable to achieve without assistance.

Assisted exercise may therefore be helpful in training coordination.

3) Confidence in the ability to move is established when the patient observes the movement and the fact that each muscles cooperate in producing the movement.

When movement must be maintaining in spite of pain in joint, this exercise is very useful eg. In R.A. (Rheumatoid Arthritis)

4) The range of effective joint movement may be increased by assisted exercise, however as both range and control are often dependent on the efficiency of the muscles working over that joint.

### **Resisted exercise:**

#### **The principles of resistance:**

An external force may be applied to the body lever to oppose the force of muscular contraction. The tension is increased within the muscles by the opposing force and the muscles respond by an increase in their power and hypertrophy.

There are factors which contribute to the development of muscular efficiency i.e. power, endurance, volume, speed of contraction and coordination.

1) Power: Power develops in response to the application of the maximum resistance which is consistent with the ability of the muscles to overcome it. As the essential factor in power

development is the magnitude of the resistance the method used to promote is called progressive resistance exercise.

2) Endurance: Endurance is a quality which develops in response to repetitive contraction therefore it is the number of contractions which is the essential factor, the method used in this case is called low resistance- high repetition exercise.

3) Volume: Which can be observed or measured as an indication of hypertrophy, usually develops in proportion to power. It serves as a means of demonstrating progress to the patient although, it is not invariably a reliable indication of successful treatment.

### **Effect and uses of resisted exercises:**

1) Muscle power can only be maintained or increased by contraction, and in this exercises the working muscles are strengthened and hypertrophied in response to tension created in them by the resistance. Their power and endurance is increased.

Resisted exercises are used to build up weak muscles and so to restore the balance of muscle power which is essential for stability and coordinated movement.

2) The blood flow to the working muscles is increased in proportion to the amount of work they are called upon to do thus providing the materials for repair and hypertrophy.

Although the flow is impeded during the actual contraction, the amount of blood contained in the muscles immediately after contraction may be as much as ten times as great during strenuous exercise as the amount contained during rest.

This increase in the blood flow to the muscles continues for some time after exercise, bringing oxygen and nutrition to the part and assisting the removal of metabolic product.

3) A general rise in blood pressure frequently anticipates exercise and may be increased by the mental effort required to perform these exercise correctly.

4) Heat, which is produced as the result of strenuous muscular activity, stimulates the heat-regulating centre causing vaso-dilatation in the skin. This follows as constriction of these vessels which occurs in the first place to compensate for the increase in the blood flow to the muscles.

### **Passive movement:**

These movements are produced by an external force during muscular inactivity or when muscular activity is voluntarily reduced as much as possible to permit movement.

### **Principles of relaxed passive exercises:**

Relaxation: A brief explanation of what is to happen is giving to the patient, who is then taught to relax voluntarily, except in cases of flaccid paralysis when this is unnecessary. The selection of a suitable starting position ensures comfort and support, and the bearing of the physiotherapist will do much to inspire confidence and co-operation in maintaining relaxation through the movement.

**Fixation:** Where movement is to be limited to specific joint, the bone which lies proximal to it is fixed by the physiotherapist as close to the joint line as possible to ensure that the movement is localized to that joint: otherwise any decrease in the normal range is readily masked by compensatory movement occurring at other joints in the vicinity.

**Support:** Full and comfortable support is given to the part to be moved, so that the patient has confidence and will remain relaxed. The physiotherapist grasps the part firmly but comfortably in her hand, or it may be supported by axial suspension in slings. The latter method is particularly useful for the trunk of heavy limbs, as it frees the physiotherapist's hands to assist fixation and to perform the movement. The physiotherapist's stance must be firm and comfortable. When standing, her feet are apart and placed in the line of the movement.

**Traction:** Many joints allow the articular surfaces to be drawn apart by traction, which is always given in the long axis of a joint, the fixation of the bone proximal to the joint providing an opposing force to a sustained pull on the distal bone. Traction is thought to facilitate the movement by reducing interarticular friction.

**Range:** The range of movement is as full as the condition of the joints permit without producing pain or spasm in the surrounding muscles. In normal joints slight over pressure can be given to ensure full range, but in flail joints care is needed to avoid taking the movement beyond the normal anatomical limits.

**Speed and duration:** As it is essential that relaxation be maintained throughout the movement, the speed must be uniform, fairly slow and rhythmical. The number of times the movement is performed depends on the purpose for which it is used.

#### **Effects and uses of relaxed passive movements:**

- 1) Adhesion formation is prevented and the present free range of movement is maintained. One passive movement, well given and at frequent intervals, is sufficient for this purpose, but the usual practice is to put the joint through two movements twice daily.
- 2) When active movement is impossible, because of muscular inefficiency, these movements may help to preserve the memory of movement patterns by stimulating the receptors of kinesthetic sense.
- 3) When full-range active movement is impossible the extensibility of muscles is maintained, and adaptive shortening prevented.
- 4) The venous and lymphatic return may be assisted slightly by mechanical pressure and by stretching of the thin-walled vessels which pass across the joint moved. Hence, quick rhythmical and continued passive movements are required to produce this effect. They are used in conjunction with elevation of the part to relieve oedema when the patient is unable to or unwilling, to perform sufficient active exercise.

5) The rhythm of continued passive movements can have a soothing effect inducing further relaxation and sleep. They may be tried in training relaxation. If successful the movement is made imperceptibly and progressively slower as the patient relaxes.

## **Conclusion**

Therapeutic exercise is a key component of any rehabilitation program. Physical therapists have been utilizing therapeutic exercises with great success. From the above discussion, we can well understand that there are several exercises, which are of great value in treating a patient with several dysfunctions.