
Exercise Prescription In Diabetes

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Abstract

Exercise is an important aspect of diabetes management. This paper focuses on a few aspects of exercise prescription. It discusses the three phases of an exercise program, and explains different methods of training (continuous, interval and circuit training). It also differentiates between isotonic and isometric exercises and details the methods or equipment required for these exercises.

INTRODUCTION

Exercise or physical activity is an important aspect of diabetes management. If properly prescribed, an exercise regime helps in management of blood glucose and associated complications. An importantly designed prescription, however, may worsen health.

PHASES OF AN EXERCISE PROGRAM

An appropriate exercise programme for any with diabetes patient should include three periods. Correct prescription regarding these periods is important to ensure safe and efficient use of this therapeutic modality. The phases are warm up, aerobic exercise, and cool down period. (1,2)

WARM UP PERIOD

Physiologically, this is the time lag which exists between the onset of activity and the adjustments needed to meet the physical requirements of the body. Changes during this period include:

Increase in muscle temperature. Higher temperature increases the efficiency of the muscular contraction by reducing muscular viscosity and increasing rate of nerve conduction .

Increased need for oxygen to meet the energy demands for the muscles. Extraction of oxygen from hemoglobin is greater at higher muscle temperatures.

Dilation of the previously constricted capillaries. This increases the circulation, thus augmenting oxygen delivery to the active muscle fibers and minimizing oxygen deficit as well as formation of lactic acid.

Adaptation in sensitivity of the neural respiratory center to various exercise stimulants.

Increase in venous return. This increases muscle flexibility and hence reduces the chances of injury to the muscles.

A 10-minutes period of total body movement exercises as static stretching or running slowly with attainment of a heart rate of 20 beats per minute above basal rate is adequate warm up. This prepares the individual for the next phase.

AEROBIC EXERCISE PERIOD

This is the conditioning part of the exercise program. The main consideration while assessing a specific method of training is that the intensity be great enough to stimulate an increase in stroke volume and cardiac output, and to enhance local circulation and metabolism in the appropriate muscles groups.

Different methods of aerobic exercise include:

Continuous training: Sub- maximal energy requirement is imposed continuously upon the patient. The muscle obtains energy by means of aerobic metabolism. Stress is placed on slow twitch fibers. Activity can be prolonged for 20-60 minutes without exhausting oxygen transport system. This is the most effective way to improve endurance in healthy individuals, but may not be suitable for elderly persons or those with heart disease, kidney disease or hypertension.

Interval training: In this type of exercise, work or exercise is followed by a properly prescribed relief or rest intervals. It is less demanding than continuous training. Relief can be rest relief (passive recovery) or work relief (active recovery

whereby the activity is continued but at a reduced level). During relief period, muscular stores of ATP and O₂-myoglobin are replenished. A work recovery of 1:1 or 1:5 is appropriate; i.e., 15 minutes of work/exercise is followed by 15 minutes or 75 minutes of relaxation. This method is preferred by most people with diabetes (and their doctors as well)

Circuit training: This includes a series of exercise activities. Several exercise modes can be used involving large and small muscle groups. It improves strength and endurance by stressing both aerobic and anaerobic systems.

COOL DOWN PERIOD

The purpose of this period is to:

- a) To prevent pooling of blood in the extremities by continuing to use the muscles to maintain venous return.
- b) To prevent fainting by increasing return of blood to the heart and brain as cardiac output and venous return decrease.
- c) To enhance recovery period with oxidation of metabolic wastes and replacement of energy stores.
- d) To prevent myocardial ischemia, arrhythmias or other cardiovascular complications.

This period should last 5-8 minutes. Total body exercises are appropriate for this period. These include simple stretching exercises, Walking, and slow pace jogging, slow isotonic exercises.

TYPES OF EXERCISE (1,2)

ISOTONIC EXERCISE

Isotonic exercise is a dynamic form of exercise which is carried out against a constant or variable load as a muscle lengthens or shortens through the available range of movement. It is used to build up dynamic strength, muscular endurance and power.

Isotonic means constant tension, e.g. quadriceps strengthening exercises using free weight or sand bags, biceps strengthening using dumbbells etc.

Isotonic exercises can be performed against manual or mechanical resistances, or using a fixed load such as free weights. New machines like the Eagle or Nautilus systems are now in use in which the contracting muscles is subjected to varying amounts of resistance to more efficiently load the muscle at multiple points in the range.

Isotonic exercise can also be performed concentrically i.e. when the muscle shortens, or eccentrically i.e. when the muscles lengthens, or both, using resistance. The equipment require for isotonic exercise include free weights, e.g, Dumbbells, cuff weights, sand bags, weight boots etc, elastic resistance materials e.g, as there band and rehabilitation exercise tubing, pulley system, e.g, variable resistance equipment e.g, Gym kits, and exercise bicycle.

ISOMETRIC EXERCISE

Isometric exercise is a static form of exercise which occurs when a muscle contracts without an appreciable change in the length of the muscle with or without visible joint motion. Although, there is no physical work done, a great amount of tension and force output are produced by the muscle. If adaptive changes in muscle, such as increases in strength and endurance are to occur, isometric contractions should be held against resistance for at least 10 seconds. This allows time for peak tension to develop and for metabolic changes to begin to occur in the muscle with each contraction.

Different forms of isometric exercises include:-

Muscle setting exercise it is a low intensity, isometric exercise performed against little or no resistance. It is used to promote muscle relaxation and circulation and to decrease muscle pain and spasm after injury to soft tissues during acute phase of healing. e.g, Isometric exercises for quadriceps and gluteal muscles. It retards muscle atrophy but there is no gain in strength.

Resisted Isometric exercise are performed against manual or mechanical resistance and are used to develop muscle strength when joint movement is painful or inadvisable after injury. 60-80 % of muscle's force developing capacity is used to gain strength. Resistance must be applied when joint is in different positions.

Stabilisation exercise are used to develop joint or postural stability by activating co-contractions of muscles surrounding proximal joints. They are performed in weight bearing postures in a closed kinematic chain.

When isometric exercise is performed against resistance, it is associated with a pressor response as a result of the Valsalva manoeuvre, causing a rapid increase in blood pressure. The magnitude of this response varies with patient's age and medical condition. Rhythmic breathing should always be performed during isometric exercise to minimize the pressor

response. High resistance is contra indicated in patients with history of cardiovascular disease or cardio vascular accident and retinopathy.

Isometric regimes include brief repetitive isometric exercises of up to 20 maximal contractions, each held for 6 seconds, performed daily with a 20 second rest after each contraction as well as rhythmic breathing during contraction to keep blood pressure under control. Multiple angle isometrics can also be performed: 10 sets of 10 repetitions of 10 seconds contractions every 10 degrees in the range of motion is the best suggested regimen. 10 seconds include 2 seconds rise

time, 6 seconds hold time and 2 seconds fall time.

CONCLUSION

A correct and appropriate exercise prescription helps in the management of diabetes. Knowledge of the phases of exercise and types of exercise help the chiropractitioner or physiotherapist prepare an optimal exercise prescription for her or his patients.

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