

## **FITNESS AND EXERCISE**

### **STRENGTH**

Strength is the force you exert against resistance.

#### TYPES OF STRENGTH

- **Maximum strength:** it is the greatest force the neuromuscular system is capable of exerting in a single maximum voluntary contraction. Most people rarely need to exert it in everyday life. Total strength or force is the all-important factor, e.g. weightlifting. It does not matter how quickly or slowly you lift it and it is only done once.
- **Explosive strength (power):** This is the ability to do strength performances quickly. Explosive strength is important in nearly every sport (racket sports to give momentum to the ball; running and jumping actions for speed and height; gymnastics for height, lift and spring, etc. Power uses fast twitch fibres, and training for explosive strength makes the muscles thicker.
- **Endurance strength:** this is the ability to repeat and maintain contractions without getting tired. We use it in sports where you repeat the same movement, e.g. running, cycling, swimming, mountain walking, canoeing, etc.

#### STRENGTH TRAINING

Your strength will improve if you consider the following aspects:

- Exercise all of your body. Don't forget any part of your body but pay more attention to big muscles.
- The type of strength you want to develop. So if you want to improve maximum strength use a heavy load and a small number of repetitions, for endurance strength use a lighter load and many repetitions and for power use a medium load and low repetitions, but do it quickly. Don't lift heavy loads until you are at least 18 years old (you could injure your muscles and joints).
- The type of muscle contraction performed: concentric, eccentric or isometric.

Here are two different ways to train muscles, based on different kinds of muscle contraction. Both involve pulling or pushing or lifting a load.

#### **Isotonic training.**

To bend your arm at the elbow, your biceps muscle shortens. This is called an isotonic contraction. All your body movements depend on isotonic contractions, when muscles shorten and pull on bones. Isotonic contractions can also be called dynamic contractions.

In isotonic training you use isotonic contractions to improve your muscle strength and endurance. Press-ups, sit-ups, pull-ups, push-ups and weightlifting are isotonic exercises.

### **Advantages of isotonic training**

- It strengthens a muscle through the full range of movement.
- You can choose isotonic exercises to suit your sport.

### **Disadvantages**

- It can make muscles sore. This is caused by stress on muscles while they lengthen, overcoat with the eccentric contractions. For example, there is stress on your arm muscles when you lower your body during chin-ups. After 10-12 hours you could have stiff muscles.

### **Isometric training**

When you push against a closed door, your arm muscles contract but stay the same length. This is called an isometric contraction.

Isometric contraction produces static strength. This is the strength you need to push or pull a very heavy object or hold up a heavy load. You need it in sumo wrestling, a rugby scrum, gymnastics and weightlifting.

Isometric training uses isometric contractions to strengthen your muscles which could help for the above mentioned sports.

### **Advantages of isometric training**

- It is quick to do and does not hurt.
- It does not require expensive equipment.
- You can do it anywhere.

### **Disadvantages**

- A muscle gains strength only at the angle you use in the exercise. This might not help much in your sport.
- During isometric exercise, the blood flow to the muscle stops, blood pressure rises, and less blood flows back to the heart. This could be dangerous if you have heart problems.

Isometric training is best if you combine it with isotonic training.

For muscle training to have an effect, you need at least three sessions a week and should continue the programme for at least 10 weeks.

## **FLEXIBILITY**

Flexibility is the range of movement of a joint. Flexibility depends on the mobility of the joints and the elasticity of the muscles.

### **FACTORS LIMITING FLEXIBILITY**

- **Internal influences**

- The type of joint (some joints simply aren't meant to be flexible.)
- The internal resistance within a joint.
- Bony structures which limit movement.
- The elasticity of muscle tissue (muscle tissue that is scarred due to a previous injury is not very elastic).
- The elasticity of tendons and ligaments (ligaments do not stretch much and tendons should not stretch at all).
- The temperature of the joint and associated tissues (joints and muscles offer better flexibility at body temperatures that are 1 to 2 degrees higher than normal).
- The stage in the recovery process of a joint (or muscle). Injured joints and muscles will usually offer a lesser degree of flexibility than healthy ones).

- **External influences**

- The temperature of the place where one is training (a warmer temperature is more conducive to increased flexibility).
- The time of day (most people are more flexible in the afternoon than in the morning, peaking from about 2:30pm-4pm).
- Age (pre-adolescents are generally more flexible than adults).
- Gender (females are generally more flexible than males).
- One's ability to perform a particular exercise (practice makes perfect).
- The restrictions of any clothing or equipment .

## **ENDURANCE**

### **TYPES OF ENDURANCE**

The types of endurance are:

- **Aerobic endurance.**
- **Anaerobic endurance.**

### **AEROBIC ENDURANCE**

Aerobic means “with oxygen”. The aerobic system is an oxygen dependent energy producing system. It utilizes the oxygen produced by your breathing and distributed through your blood to your muscles. Your muscles require energy to move your bones and produce movement. During aerobic exercise the body is working at a level where the demands for oxygen and fuel (carbohydrates and fats) can be met by the body's intake. The only waste products formed are carbon dioxide and water. Aerobic endurance is related to long distance running, swimming or cycling but not very intense efforts. In general, all the activities which last more than three minutes depend on the aerobic energy production.

Aerobic endurance is developed through the use of continuous running and fartlek.

- Continuous duration runs (more than 20 minutes) improve maximum oxygen uptake (VO<sub>2</sub> max). The intensity is low or medium (60-80% of maximum heart rate) and there aren't stops for recovery.
- Continuous duration runs but introducing variations of intensity (Fartlek).

### **ANAEROBIC ENDURANCE**

Anaerobic means “without oxygen”. During anaerobic work, involving maximum effort, the body is working so hard that the demands for oxygen exceed the rate of supply, this period is named “oxygen debt” and the muscles get the energy only from carbohydrates through a set of chemical reactions without oxygen which provide a lot of energy but produce waste products. The chief one is lactic acid. This product is toxic and when the amount of lactic acid accumulated in muscles is high the activity has to cease or decrease. Activity will not be resumed until the lactic acid is removed and the oxygen debt repaid. Fortunately the body can resume limited activity after even only a small proportion of the oxygen debt has been repaid.

Anaerobic activities are related to short and very intensive exercises (less than 3 minutes duration) and sudden increases in intensity in aerobic exercises.

Anaerobic endurance can be developed by using:

- Repetition methods of relatively high intensity work with limited recovery (circuit training).
- Intervals to improve the heart as a muscular pump. The intensity is higher (70-90% of maximum heart rate) and there are stops for recovery.

#### THE EFFECTS OF AEROBIC TRAINING.

**On the heart and circulation.** After following an aerobic training programme for three months, these changes will take place

1. Your heart grows bigger. It holds more blood and contracts more strongly. More blood gets pumped out with each heartbeat. It becomes a more efficient pump.
2. Your resting heart rate falls, because now you can supply the same amount of blood with fewer heart beats.
3. After exercise, your heart rate returns to its normal resting rate faster than it did before.
4. The volume of blood in your body increases. You produce more red cells and more haemoglobin to help with oxygen delivery.
5. More capillaries grow around the muscles, which means more blood gets carried to them and more oxygen is picked up.
6. Arteries grow larger and more elastic so blood pressure falls.

**On the respiratory system.** Aerobic training also increases the fitness of your lungs and respiratory system.

- The rib muscles and diaphragm grow stronger. So the chest cavity gets bigger when you breathe in.

This means the lungs can expand further, taking in more air with each breath.

- Since the lungs expand further, more alveoli are available for gas exchange. So more oxygen is picked up at each breath and carbon dioxide removed.

- More capillaries grow around the alveoli, which means more blood gets carried to them.

To sum up, **you can move oxygen to the muscles faster and get rid of carbon dioxide faster. So you don't get tired quickly..**

