Abstract

Physical exercise is the performance of some activity in order to develop or maintain physical fitness and overall health. It is often directed toward also honing athletic ability or skill. Frequent and regular physical exercise is an important component in the prevention of some of the diseases of affluence such as heart disease, cardiovascular disease and obesity.

Exercises are generally grouped into three types depending on the overall effect they have on the human body:

- flexibility exercises such as stretching improve the range of motion of muscles and joints.
- aerobic exercises such as walking and running focus on increasing cardiovascular endurance; anaerobic exercises such as weight training, functional training or sprinting increase short-term muscle strength.

Physical fitness is a result of regular physical activity, proper diet and nutrition, and proper rest for physical recovery within the parameters allowed by the genome.

Physical fitness is often divided into following types:

- flexibility;
- cardiovascular endurance;
- muscular strength & endurance;
- body composition;
- agility;
- balance;
- speed.

Many sources also cite mental and emotional health as an important part of overall fitness. This is often presented in textbooks as a triangle made up of three sub-sections which represent physical, emotional, and mental fitness. Hence, one may be physically fit but may still suffer from a mental illness or have emotional problems. The “ideal triangle” is balanced in all areas.

Drill instructors often focus on military style calisthenics and group runs. The courses are often held very early in the morning and will meet in almost any weather. Military students can expect push-ups, sit-ups, pull-up, and jumping jacks, as well as more obscure drills such as flutter kicks,
sun worshippers and flares. Almost invariably a workout will include short runs while longer runs are more scheduled.

Next I will talk about two basic types of physical fitness: muscular strength and endurance (stamina).

The magnitude of physical strength, often referred to as the ability of a person or animal to exert force on physical objects using muscles. The common definition of strength is the ability to exert a force against a resistance. Increasing physical strength is the goal of strength training.

Strength can be divided into two categories: short-term endurance and long-term endurance. This therefore implies that there are different types of strength.

The classifications of strength are:

- **maximum strength** – the greatest force that is possible in a single maximum contraction;
- **elastic strength** – the ability to overcome a resistance with a fast contraction;
- **strength endurance** – the ability to express force many times over.

A muscle will only strengthen when it is worked beyond its normal operation, it is overloaded. Overload can be progressed by increasing the:

- number of repetitions of an exercise;
- number of sets of the exercise;
- intensity-reduced recover time.

Maximum strength can be developed with:

- weight training.

Elastic strength can be developed with:

- conditioning exercises;
- complex training sessions;
- medicine ball exercises;
- plyometric exercises;
- weight training.

Strength endurance can be developed with:

- circuit training;
- dumbbell exercises;
- weight training;
- hill and harness running.

Strength training is a blanket term for all exercises that develop the strength and size of skeletal muscles. Properly performed, strength training can provide significant functional benefits and improvement in overall health and well-being. There are many different ways of strength training, the most common being the use of gravity (see weight training) or elastic/hydraulic (see resistance training) forces to oppose muscle
contraction. Strength training and resistance training are terms often used interchangeably, resistance training is used to refer to elastic/hydraulic training alone.

Properly performed, strength training can provide significant functional benefits and improvement in overall health and well-being including increased bone, muscle, tendon and ligament strength and toughness, improved joint function, reduced potential for injury, improved cardiac function and elevated good cholesterol. Training commonly uses the technique of progressively increasing the force output of the muscle through incremental increases of weight, elastic tension or other resistance, and uses a variety of exercises and types of equipment to target specific muscle groups. Strength training is primarily an anaerobic activity, although some proponents have adapted it to provide the benefits of aerobic exercise. This is more evident is Circuit Training.

Strength training differs from bodybuilding, weightlifting, and powerlifting, which are sports rather than forms of exercise. Strength training, however, is often part of their training regimen.

A repetition (or “rep”) is the act of lifting and lowering a weight once in a controlled manner. A “set” consists of several repetitions performed one after another with no break between them. The number of repetitions per set depends upon the aims of the individual performing the exercise. Sets with fewer reps are generally performed using more weight. Repetition tempo is also an important factor.

According to popular theory:
 – sets of one to five repetitions primarily develop strength, with less impact on muscle size and none on endurance.
 – sets of six to twelve repetitions develop a balance of strength, muscle size and endurance.
 – sets of thirteen to twenty repetitions develop endurance, with some increases to muscle size and limited impact on strength.
 – sets of more than twenty repetitions are considered to be an aerobic exercise.

Individuals typically perform one to six sets per exercise, and one to three exercises per muscle group, with short breaks between each set – the specific combinations of reps, exercises, sets and break duration depends on the goals of the individual program. The duration of these breaks determines which energy system the body utilizes: for example, performing a series of exercises with little or no rest between them is referred to as “circuit training”, and the body will draw most of its energy from the aerobic energy system (as opposed to the anaerobic systems which use either phosphagens or glycolysis for energy).
It has been shown that for beginners multiple-set training offers minimal benefits over single set training with respect to either strength gain or muscle mass increase, but for the experienced athlete multiple-set systems are required for optimal progress.

Beginning weight-trainers are in the process of training the neurological aspects of strength, the ability of the brain to activate the maximum strength a muscle is capable of producing without training.

In one common method, weight training uses the principle of progressive overload, in which the muscles are overloaded by attempting to lift at least as much weight as they are capable of. They respond by growing larger and stronger. This procedure is repeated with progressively heavier weights as the practitioner gains strength and endurance.

However, performing exercises at the absolute limit of one's strength (so-called “one rep max” lifts) is considered too risky for all but the most experienced practitioners, or novices under expert supervision. Moreover, most individuals wish to develop a combination of strength, endurance and muscle size. One repetition sets are not well suited to these aims. Practitioners therefore lift lighter (sub-maximal) weights, with more repetitions, to fatigue the muscle – and all fibres within that muscle – as required by the progressive overload principle.

Three important principles of weight training, as well as exercise in general, are intensity, volume and frequency. Intensity refers to the amount of force required to achieve the activity, and in this case, refers to the outright weight being lifted (lifting 20 kg requires more force or intensity than lifting 10 kg, regardless of how many reps/sets etc are done), volume refers to how much you do in a particular session, and includes the number of sets, reps and exercises you do for each muscle, whereas frequency refers to how many sessions per week you do. A good analogy is the exercise of running, with the intensity being how fast you run, the volume being how far you run, and the frequency being how many times a week you run.

Types of exercises: isotonic, isometric and plyometric exercises.

These terms combine the prefix “iso” (meaning “same”) with “tonic” (strength) and “metric” (distance). In “isotonic” exercises the force applied to the muscle does not change, and in “isometric” exercises the length of the muscle does not change.

Weight training is primarily an isotonic form of exercise, because the muscles are used to push or pull weighted objects. Any object can be used for weight training, but dumbbells, barbells and other specialised equipment are normally used because they can be adjusted to specific weights, and are easily gripped. However, some exercises are not strictly
isotonic because the force on the muscle varies as the joint moves through its range of motion, even though the force of the exercise remains constant.

Some forms of weight training use isometric contractions to further stress the muscles after or during a period of isotonic exercise. In this case the muscles flex and hold a stationary position, and no movement of a load takes place.

Another form of training that often uses weights has a different goal. Plyometric exercises exploit the stretch-shortening cycle of muscles to enhance the myotatic (stretch) reflex. This involves rapid alternation of lengthening and shortening of muscle fibers against a resistance. The resistance involved is often a weighted object such as a medicine ball, but can also be the body itself as in jumping exercises. Plyometrics is used to develop explosive speed, and focuses on power instead of maximal strength, and may be used to improve the effectiveness of a boxer’s punch, for example, or to increase the vertical jumping ability of a basketball player.

Examples of calisthenic exercises include:

*Sit-ups/crunches:* Start with your back on the floor, knees bent, bottoms of feet against the floor. Lift shoulders off the floor by tightening abdominal muscles bringing your chest closer to your knees. Lower back to the floor with a smooth movement.

*Push-ups:* Start face down on floor, palms against floor under shoulders, toes curled up against floor. Push up with arms keeping a straight line from head through toes. Lower to within a few inches off floor and repeat. You should keep your head tilted upward, your back straight. Do not rest on your shoulder blades, even when you feel fatigue.

*Squats:* Stand with feet shoulder width apart. Squat as far as possible bringing your arms forward parallel to the floor. Return to standing position. Repeat. Again, if you feel like this is not a challenge, there are other forms of squats. One method is lifting one leg off the floor in front of you, putting both arms in front of you for balance, and squatting. This is a one-legged squat or pistol. Squats are deemed by many health experts to be unsafe, because they put too much stress on the knee joints.

Isometric Action Training is a new dimension in strength training.

An isometric muscle action refers to exerting muscle strength/muscle tension without producing an actual movement or a change in muscle length. Examples of isometric action training include:

1. Holding a weight at a certain position in the range of motion. Example: Holding a hammer curl statically at about mid-range for a certain amount of time.

2. Pushing or pulling against an immovable external resistance. Example: The iso-pull shown below.
Before I tell you how to use isometrics to gain muscle, it’s important that you understand the various types of isometric training. First we have two isometric regimens: overcoming isometrics and yielding isometrics. Overcoming isometric: you’re pushing or pulling against an immovable resistance (e.g. pushing against the pins in a rack). Thus there’s no external movement but your intent is to move the resistance (even though that’s impossible). Yielding isometric: you're holding a weight and your objective is to prevent it from going down. Once again there's no external movement; however, your intent is no longer to move the load but to prevent its movement.

These methods will allow you to reach a new level of muscularity in a short period of time. However, understand this doesn't take the place of regular training. It should be seen as a supplementary training method only, but with proper application it’ll make your training more effective than ever.

Endurance or aerobic exercise consists of performing low-to medium-intensity exercise for very long periods of time. E.g., jogging or running several miles to hundreds of miles; cycling dozens of miles to thousands of miles; swimming hundreds of yards to dozens of miles.

Physical endurance is differentiated from other forms of physical stress in that in endurance exercise fatigue of the muscles and cardiovascular system do not force the effort to end. The need for sleep, the buildup of non-recyclable waste chemicals, the depletion of convertible energy stores and other needed chemicals (e.g., water, sodium), physical injury, psychological failure, or attainment of the goal will bring the effort to an end.

There are two methods to develop endurance (stamina): continuous and interval training.

Continuous training is when an athlete exercises in a steady aerobic way and interval training is characterised by repetitions of work with a recovery period following each repetition. Continuous training can be broken down into the following sub-divisions which have slightly different effects upon the energy pathways:

- Running at 50 to 60% of maximum heart rate or 20 to 36% of V02 Max. Very easy pace, it metabolises fat and is aerobic. Duration 60 minutes plus. Useful for joggers & ultra distance runners.
- Running at 60 to 70% of maximum heart rate or 36 to 52% of V02 Max. Slightly faster pace, it burns glycogen and fat and is aerobic. Duration 45 to 90 minutes. Useful for marathon runners. Improves cardiovascular system and capillarisation.
Running at 70 to 80% of maximum heart rate or 52 to 68% of VO2 Max, 10 km pace, it burns glycogen and is aerobic. Duration 30 to 45 minutes. Useful for 10 km and marathon runners. Improves cardiovascular system, capillarisation and is glycogen burning.

Running at 80 to 90% of maximum heart rate or 68 to 83% of VO2 Max. 5 km pace, it burns glycogen and is anaerobic. Duration 10 to 20 minutes. Useful for 5 km to marathon runners. Improves cardiovascular system, capillarisation, glycogen burning, lactate tolerance and removal.

Running at 90 to 100% of maximum heart rate or 83 to 99% of VO2 Max. 800/1500 m pace, it burns glycogen and is anaerobic. Duration 1 to 5 minutes. Useful for 800 to 5 km runners. Improves glycogen burning, lactate tolerance and removal.

Interval running enables the athlete to improve the workload by interspersing heavy bouts of fast running with recovery periods of slower jogging. The athlete runs hard over any distance up to 1 km and then has a period of easy jogging. During the run lactic acid is produced and a state of oxygen debt is reached. During the interval (recovery) the heart and lungs are still stimulated as they try to pay back the debt by supplying oxygen to help break down the lactates.

Before undertaking interval training a few simple rules should be understood:

- undertake a period of continuous running before starting interval running
- consider the various elements of the session and ensure that they are within the scope of the athlete
- the length of the work interval, longer gives a better effect.

Circuit training is a common method of interval training.

The objective of endurance training is to develop the energy production system(s) to meet the demands of the event.

The types of endurance are: aerobic endurance, anaerobic endurance, speed endurance and strength endurance. A sound basis of aerobic endurance is fundamental for all events.

Physical exercise is considered important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; reducing surgical risks; and strengthening the immune system.

In its most general meaning, physical fitness is a general state of good physical health. A person with a physical impairment may be physically fit and healthy, though their performance on tasks requiring full bodily function in the area of impairment will be affected.