INTRODUCTION

- **Strength** is the ability of a muscle or muscle group to exert a force against a resistance.

- **Strength training** is a general term that encompasses all types of exercise designed to improve strength and increase muscle size.

- Strength training can be applied to a range of programs including the development of muscular endurance, general strength, power, body bulk and muscle tone.
STRENGTH TRAINING VARIABLES

- Repetitions
- Repetition Maximum
- Set
- Resistance
- Rest
- Periodisation (the process of varying the training load over discrete periods of time)
• Strength training program will not be effective, nor will appropriate strength gains be made, unless the train program;

• Is exercise specific

• Employs the overload principle

• Uses progressive resistance
SAFE PERFORMANCE REQUIRES:

- APPROPRIATE LEVEL
- ADEQUATE WARM UP AND COOL DOWN
- FOCUS ON MAJOR MUSCLE GROUPS
- CORRECT TECHNIQUE
- USING HIGH REPS EARLY IN THE PROGRAM
- CHECKING EQUIPMENT IS ADEQUATELY MAINTAINED
- ENSURE BOUNCING MOVEMENTS ARE AVOIDED
- ENSURE THAT SPOTTERS ARE USED
RESISTANCE TRAINING

- The 2 most popular ways of generating resistance are hydraulic and elastic forces.

- **Isotonic** movements are characterised by muscles shortening and lengthening against resistance.

- Muscle strength develops through programs that progressively increase the resistance.
• In elastic resistance training, tension increases as the band is stretched

• Muscle is strengthened greatest at the end of the movement

• Bands are coloured to specify different levels of resistance

• Elastics are versatile, portable and adaptable
HYDRAULIC RESISTANCE

• Hydraulic resistance equipment generates resistance response to the speed of movement i.e. The faster you move the greater the resistance.

• Hydraulics provide resistance in both phases of a movement e.g. Pushing and pulling.

• Specialised equipment is not needed to perform hydraulic actions, a pool can act as a good substitute.
WEIGHT TRAINING

• Weight training is a preferred form of strength training that utilises set reps & specific units of weight to create progressive resistance, ultimately strengthening muscles.

• Free weights/weight training machines are coupled with a range of specialised techniques & exercised, designed to overload muscles & enhance adaptations.

• Uses both concentric and eccentric contractions.
Table 12.1 shows how the variables can be adjusted. For example, strength gains require few repetitions with heavy weights, while the development of strength endurance requires the opposite.

**Table 12.1: Prescription for a weight training program for trained athletes**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Weight resistance</th>
<th>Repetitions</th>
<th>Sets</th>
<th>Exercise speed</th>
<th>Time between sets (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>Very heavy 80–100% RM*</td>
<td>4–6</td>
<td>5–6</td>
<td>Slow</td>
<td>Long 3–5</td>
</tr>
<tr>
<td>Lean body mass</td>
<td>Heavy 70–90% RM</td>
<td>6–12</td>
<td>3–6</td>
<td>Slow to medium</td>
<td>Short 1–3</td>
</tr>
<tr>
<td>Strength endurance</td>
<td>Light-medium 40–60% RM</td>
<td>20–30</td>
<td>3–6</td>
<td>High</td>
<td>Short 1–3</td>
</tr>
</tbody>
</table>

Best results are achieved at 4–6 RM. Note that 100% = 1 repetition, 90% = 5 repetitions and 60% = 8 repetitions. Train on 3 days per week with a day’s rest between each session.

The aim here is to increase muscle bulk (muscle hypertrophy) and decrease relative fat mass. This will provide better muscle definition. Needs to be combined with a nutrition program. Train on 3–5 days per week.

Strength endurance is developed using low-intensity resistance combined with high repetitions — that is, about 20–30 repetitions per minute. Training needs to take place on 3–4 days per week.

* RM = repetition maximum = the maximum weight a person can lift a specific number of times (e.g., 8 RM is the maximum weight that can be lifted eight times).

**Plates**

Weight discs or plates anchored to barbells comprise free weights. The weight of the barbell can be set at the exact load required, ensuring that the overload is effective.
PLATES

• Weight discs/plates anchored to barbells comprise free weights.

• Weight of the barbell can be set, ensuring that overload principal is implemented & resistance is gradual & progressive.

• Additional plates can be added to increase resistance as a muscle performing are specific exercise adapts to a level of resistance.

• As weights become heavier athletes engage spotters. It is important that when performing an exercise e.g curl, it is lifted full range to ensure motor unit recruitment is maximised.
DUMBBELLS

- Weight consisting of 2 discs attached to a short bar and made for lifting with one hand.
- Dumbbells provide versatility.
- Used extensively in exercises that develop small muscle groups i.e. wrist.
- Important in rehabilitation where a specific joint/muscle needs to be strengthened, i.e. tennis elbow recovery.
- Ensure that elbows and knees are not fully locked at the end of each movement, as it can cause injury.
EXERCISES COMMONLY USED IN WEIGHT TRAINING PROGRAMS

- Exercise: squats; muscle group: legs; description: use an over grip. Keep head up an back flat. Squat until the thighs are parallel to the floor.

- Exercise: heel raise; muscle group: calves; description: bar across shoulders, and back straight, place balls of feet on a board. Keeping the body erect, rise on toes as high as possible and lower until heels touch the floor.
ISOMETRIC TRAINING

- During isometric training (aka static training), muscles develop tension but do not change in length.

- Though, not as popular as isotonic programs, resistance is fixed regardless of the amount of effort.

- A difficulty with isometric training is that isometric gains cannot be measured using isometric equipment.
• Best strength gains are made using six to eight reps, each lasting six seconds. Training should occur four to five each week.

• Exercises must be performed at joint angles i.e. At the beginning of the contraction

• Advantages: minimal equipment and helpful to overcome weaker points in the muscle, little time, simple to learn, easy to perform and valuable to rehabilitation and can be performed in a variety of places.

• Disadvantages: causes rise in blood pressure, speed is reduced through strengthening in a static position, others method must be used to measure progress, doesn't produce muscular endurance an most benefits occurs early in training.
FLEXIBILITY TRAINING
FLEXIBILITY

- The range through which joints and body parts are able to move
- Muscle strength and length directly related to the number of muscle fibres engaged
- When a muscle is stretched some fibres lengthen while others remain at rest
- Improved flexibility is important for injury prevention, rehabilitation, improved skill execution, minimising DOMS, and reducing discomfort
- The stretch reflex is an inbuilt safety mechanism that warns if a muscle is stretched too far
- This mechanism helps to protect the body from injury
CONT...

- Stretching programs should be done 3-4 times per week.
- Muscles should be warmed up before stretching.
- Stretching should stop when you are in pain.
- The muscle must be stretched beyond its normal length, to cause changes to take place, aka the overload principle.
Safe flexibility exercises require stretches to be slow, controlled and sustained.

Stretching on a regular basis is recommended to allow greater lengthening of muscles.

Flexibility is affected by:

- Age
- Gender
- Temperature
- Exercise
- Specificity
STATIC STRETCHING

• Static stretching is a safe form of stretching, in which the stretch is held for 10-30 seconds.

• Commonly used because it is safe and doesn't require equipment.

• The movement is smooth and performs slowly.

• Used extensively in rehabilitation of injury and the warm up and cool down phases of training.

DYNAMIC STRETCHING
Dynamic stretching is the ability to perform extensive muscular movements, causing joints to go through a full range of motion.

Specific parts of the body are moved in a gradual controlled manner, while speed is increased, e.g. Arm circling.

Jerking motions should be avoided.

The stretch reflex is important in discovering the safe limit to the range of motion.

It is effective in raising muscle temperature and core body temperature.

Effectively decreases the risk of injury.

Useful when muscles need to be stretched in preparation for forceful movements, e.g. Kicking.

Ballistic flexibility
• Ballistic stretching involves repeated movements such as, punching and bouncing to gain extra stretch.
• Should only be practiced by elite athletes
• It is potentially dangerous, as it activates the stretch reflex.
• Should follow a thorough warm-up and another form of stretching.
• Movements must be controlled to avoid jerky actions.
• Violent ballistic stretching causes tears in muscle fibres, weakening the tissue.
• E.g. Touching toes in a bouncing action