

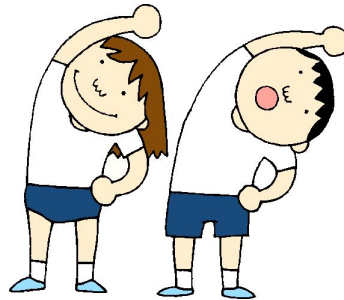
# TOPIC 6.4

## PRINCIPLES OF TRAINING PROGRAM DESIGN

## 6.4.1 Describe the essential elements of a general training programme

### Warm Up

- A warm up should prepare the body for exercise. It can prevent injury and muscle soreness and has the following physiological benefits :



• Wesson et.al 2005

### Warm Up Benefits

- Release of adrenaline: increased speed of oxygen delivery to the muscles.
- Decreased viscosity of blood due to increase in muscle temperature.
- Increased muscle temperatures which will facilitate enzyme activity and subsequent increased muscle metabolism leading to breakdown of glycogen
- Increased temperature leading to greater extensibility and elasticity of muscle fibres
- Increase speed of nerve impulse conduction.
- Increase production of synovial fluid, improving efficiency of joints.

To ensure the athlete gains as much from the warm up as possible, the following stages should be followed:

- **Warm Up Step 1:** Purpose to raise heart rate in order to increase body temperature and speed of oxygen delivery to the muscles. This can be achieved by performing some kind of cardiovascular exercise such as jogging.

## 6.4.1 Describe the essential elements of a general training programme

- **Warm Up Step 2:** Now the muscle temperature has increased, the athlete can perform some mobility or stretching exercises. Static and calisthenic type exercises are performed where the muscle is working over it's full range. Push ups, lunges, grape vine and sumo squats are all examples.

#### 6.4.1 Describe the essential elements of a general training programme

- **Warm Up Step 3**: The final stage of a warm up should involve a sport-specific or skill-related component where neuromuscular mechanisms related to the activity are worked. For example, practicing serving in tennis, tumble turns in swimming or shooting baskets in basketball.

- **Activity:**
- Using this 3 step procedure outlined, design a sample warm up for the sport of your choice.

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### **Cool down**

Following exercise a similar process must be followed in order to prevent unnecessary discomfort; this is a cool down.

It involves performing some kind of light continuous activity where heart rate remains elevated.



## 6.4.1 Describe the essential elements of a general training programme

### ● **Cool down**

The purpose is to keep metabolic activity high, and capillaries dilated so that oxygen can be flushed through muscle tissue, removing and oxidising any lactic acid that remains. This will prevent blood pooling which can cause dizziness if exercise is stopped abruptly.

It can also limit the effects of Delayed Onset Muscle Soreness (DOMS)

## 6.4.1 Describe the essential elements of a general training programme

### **Cool down**

The final step in the cool down should be stretching, which should hopefully facilitate and improve flexibility as the muscles are very warm at this stage.

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### **Stretching activities**

- Active Stretching: The athlete performs voluntary muscular contractions, and holds for a period 30-60 seconds. By consciously relaxing the muscle at the limit of the range of motion, muscle elongation may occur following regular contraction.

Wesson et.al 2005

## 6.4.1 Describe the essential elements of a general training programme

### **Stretching activities**

Read the article, “Acute stretch debate approaches consensus.”

Pros of Stretching

Cons of Stretching

Evidence in favor of stretching

Evidence against stretching

## 6.4.1 Describe the essential elements of a general training programme

### **Stretching activities**

- **Passive Stretching:** This refers to the range of movement achieved with an external force. This is generally performed with the help of a partner.
- e.g. Proprioceptive Neuromuscular Facilitation

## 6.4.1 Describe the essential elements of a general training programme

### **Stretching activities**

- A simple PNF technique is:
  - Step 1: Move slowly to your range of movement with a partner aiding stretch (passive stretch). Hold for a few seconds.
  - Step 2: Just before point of discomfort, isometrically contract the muscle being stretched for between 6 – 10 seconds.
  - Step 3: After the hold, the muscle will release, having stimulated a golgi tendon organ (GTO) response which causes further relaxation of muscle, enabling further stretching.

## 6.4.1 Describe the essential elements of a general training programme

- Flexibility Training
- Read and summarize the web link below. Google “Jen Review Flexibility Training”

<http://www.sport-fitness-advisor.com/flexibilitytraining.html>

## 6.4.1 Describe the essential elements of a general training programme

### Endurance Training

#### **Continuous Training**

Is also called “steady-state” training and involves an individual maintaining a steady pace for a long period of time.

To be effective it needs to be done over 20 minutes and within the aerobic training zone (70-85% Max HR). It is useful for developing a strong base of aerobic fitness.



## 6.4.1 Describe the essential elements of a general training programme

### **Endurance Training**

- Continuous Training

The FITT Principle can be useful in designing endurance programmes:

F = Frequency (3-4 times/week)

I = Intensity (70-85% MHR)

T = Time (20-40 minutes)

T = Type (Continuous)

## 6.4.1 Describe the essential elements of a general training programme

### **Endurance Training**

- Interval Training

Is described as having a structured period of work followed by a structured period of rest. When designing interval training sessions one needs to consider how long the periods of work are in relation to periods of rest. For aerobic training it should be 1 or a half unit of rest for every unit of work.

## 6.4.1 Describe the essential elements of a general training programme

### ● **Endurance Training**

- Interval Training

For a 20 year old:

Max HR =  $220 - \text{Age} = 200\text{bpm}$

70% MHR = 140bpm

80% MHR = 160bpm

Work = 4 minutes/Rest = 2 minutes

4 sets of 4 minutes @ 70% effort with 2 minutes rest in between.

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- **Endurance Training**

- Circuit Training

A basic circuit session should contain exercise to improve aerobic fitness or raise the pulse rate, exercises to work the upper body, lower body and the core.

The session should include: warm-up; main session; cool down; flexibility.

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## ● **Endurance Training**

### ● Circuit Training

Design an aerobic circuit training session of 8 stations for 16 people to work out in pairs. Choose a target audience and consider the amount of space and equipment you have available. Design a warm up and cool down specific to the session.

## 6.4.1 Describe the essential elements of a general training programme

- **Resistance Training**

Strength gains are sought by many athletes and usually occur through weight or resistance training methods.

Resistance training can be used to develop several components of fitness, including strength, strength endurance and explosive power.



## 6.4.1 Describe the essential elements of a general training programme

### **Resistance Training**

Which of these is stressed at a particular time is determined by manipulating the weight or resistance, the number of repetitions and the number of sets.

## 6.4.2 Discuss the key principles of training program design

### **Progressive overload**

The human body responds to stress caused by physical work. This adaptation is sometimes known as a training effect. As the adaptation takes place the body becomes comfortable with the new workload. Subsequently progressive overload is required to cause further change. Otherwise a plateau in performance levels will result.

Smyth et.al 2000

## 6.4.1 Describe the essential elements of a general training programme

### **Resistance Training**

Central to the devising of an effective weight training programme is the principle of one repetition maximum (1RM). The 1RM is the maximum amount of weight the performer can lift with one repetition. Once this has been determined for each exercise the coach can design a programme adjusting the resistance as a percentage of the athletes maximum lift.

## 6.4.1 Describe the essential elements of a general training programme

### **Resistance Training**

Maximum Strength = very high resistance, low repetition exercise.

e.g. 3 sets of 2-6 reps @ 80-100% of 1RM, with a full recovery (2 minutes between sets)

Strength Endurance = greater repetitions, lighter load.

e.g. 3 sets of 20 reps @ 50-60% of 1RM with a full recovery.

## 6.4.2 Discuss the key principles of training program design

### Variables to apply progressive overload.

- Distance of the work
- **Time of the work (duration)**
- Time of recovery periods
- Number of repetitions
- Number of sets
- **Number of sessions/week (Frequency)**
- **Amount of resistance/% MAX HR (Intensity)**
- Range of motion

## 6.4.2 Discuss the key principles of training program design

Progressive Overload relies on 4 factors:

1. The initial workload is appropriate to the level of fitness of the subject
2. The amount of overload is sufficient to cause adaptation and improvement without causing the subject to feel an inability to complete the session.
3. The overload maintains the original aims of training.
4. Not all the variables are applied at once. Rather one or two that are most appropriate in order to avoid physical fatigue, joint and muscle soreness.

## 6.4.2 Discuss the key principles of training program design

### **Specificity**

Is the process of replicating the characteristics of physical activity in training to ensure it benefits performance. The 4 categories to consider are:

1. Muscle group used
2. Skills performed
3. Fitness components used
4. Predominant energy systems used

## 6.4.2 Discuss the key principles of training program design

- Specificity

e.g. For example, it would be highly inappropriate for a swimmer to carry out the majority of his/her training on land. Although there are certainly benefits gained from land-based training, the majority of the training programme should involve pool based work.

i.e. it is specific to the demands of the sport.



## 6.4.2 Discuss the key principles of training program design

- Reversibility

Also known as “regression” or detraining, explains why performance deteriorates when training ceases or the intensity of training decreases for extended periods of time. Quite simply, if you don’t use it you lose it!

## 6.4.2 Discuss the key principles of training program design

- **Reversibility**

Seven weeks of inactivity has been shown to have the following physiological effects:

- Significant decreases in Max oxygen uptake have been recorded – up to 27%.
- In particular, stroke volume and cardiac output can decrease by up to 30%.
- Muscle mass and strength decrease. Particular if a limb has been immobilised due to injury/surgery.

## 6.4.2 Discuss the key principles of training program design

- Variety

Is all about providing different activities, formats and drills in training while still addressing the aims of the training programme. Training can become boring, and the athlete may drop out of the programme if there is insufficient variety.

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- Variety

Changes to training activities and drills stimulate and challenge participants, who are therefore more likely to train at optimal levels.

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Variety in training helps to decrease boredom and make training more interesting and enjoyable. The aim is to achieve original training goals while maintaining interest. This can be achieved by:

- Changing the training environment
- Change the training activity
- Introducing competition/games/group work

## 6.4.2 Discuss the key principles of training program design

A programme of weight training could substitute free weights for machine weights or include a “pump” session at the gym. Even the use of different lift angles can be useful e.g. incline press, as this provides an alternate stimulus to the muscle thereby promoting adaptation.



## 6.4.3 Outline ways in which exercise intensity can be monitored.

### Research Task/Practical Task:

Outline the use of the following and design a lab to test their validity and reliability.

- Use of heart rate based upon it's relationship with oxygen uptake, i.e. target heart rate that coincides with a given percentage of maximal oxygen uptake.
- The Karvonen heart rate method
- Ratings of perceived exertion (Borg scale)