BSc II Year 2020-21

III SEMESTER

TRAINING AND PERFORMANCE

UNIT -I

Definition of Training

- **Training** means **learning** to do something. It includes practicing skills. The term is used for **learning** to do jobs, or play games.
- **Training** has specific goals of improving one's capability, capacity, productivity and performance.
- **Training** is teaching, or developing in oneself or others, any skills and knowledge or fitness that relate to specific useful competencies.

Sport performance is the manner in which **sport** participation is measured**.**

- What factors affect sports performance?
- Body proportions, skills training, **strength**, flexibility and **endurance and other physical characteristics**. These five factors will influence what sport we play, what position we play and how good we can be at either. Each of these factors may individually or as a **group affect** our sport performance.

AEROBIC TRAINING

- Brisk **exercise** that promotes the circulation of oxygen through the blood and is associated with an increased rate of **breathing**. Examples include **running**, **swimming**, and bicycling.
- **Aerobic training exercises** are any activities that raise heart rate and make breathing somewhat harder. The **activity** we are doing must be constant and continuous. Examples of **aerobic** activities are Walking or hiking, Jogging or running.

- The **aerobic system** uses glucose from the blood or glycogen from within the muscle cell and fatty acids as the main fuel. Protein can be used as a fuel but only tends to be used when carbohydrate and fat stores are particularly low. Oxygen is required for this **system** but no lactic acid is produced.
- **Aerobic means** that the energy **system** needs oxygen to function. This **means** that the **aerobic** energy **system** relies on the circulatory **system** (breathing in oxygen) in order to create adenosine triphosphate (ATP) for energy use. It also uses fats, glucose, carbohydrates and proteins.

What is training volume?

- **Volume** is a measure of the total amount of activity or work that we perform. If we're an aerobic athlete, we measure **training** in units like distance and time. Resistance **training volume** usually involves variables like: Reps - A Repetition or rep is performing an exercise once.
- In weight **training**, **volume** is the term used to describe how much work we **do**, such as the number of repetitions (reps) we perform of an exercise. Intensity describes the difficulty of an exercise, typically based on the amount of weight we lift. Take dead lifts as an example.

How is training volume calculated?

- **Volume** is a measurement of the total weight lifted, we get this by using the following equation: Sets x reps x weight. So if we perform three sets of 10 reps of 100 kg bench press, we have performed 30 reps of 100 kg for a total **volume** of 3,000 kg.

- **Training intensity** is the amount of effort we are putting in to whatever exercise we are doing. ... **Training intensity** refers to the level of effort a person exerts during exercise relative to his or her maximum effort.
- What does intensity mean in training?
- **Intensity** is the amount of physical power (expressed as a percentage of the maximal oxygen consumption) that the body uses when performing an activity. For example, exercise **intensity** defines how hard the body has to work to walk a mile in 20 minutes.

- What intensity should I work out at?
- The American Heart Association generally recommends a target heart rate of: Moderate exercise **intensity**: 50% to about 70% of your maximum heart rate. Vigorous exercise **intensity**: 70% to about 85% of your maximum heart rate.

- **Step 1: MHR-Age (220bpm - 45=175bpm)** **MHR-175 bpm**
- **Step2: Observe RHR** **75bpm**
- **Step3: Calculate HRR (MHR-RHR)** **HRR= 175bpm – 75bpm=100bpm**
- **Step4: Calculate TIs (Training intensity zone)** **TI=HRR X .30+RHR)**

  30% TI=(100 X .30+75=105bpm)

  85% TI=(100 X .85+75=160bpm)

(Hoeger and Hoeger 2014)

Training

- Adaptation
  - The physiological response to training
- Overload
  - Applying a greater load than previously experienced
    - FITT principle
    - F – frequency
      - Sessions per day, week, month or year
    - I – intensity
      - Training load applied per training session.
    - T – time
      - Duration of training sessions
    - T – Type of exercise
      - Specific exercises chosen to meet specific outcomes.
- Progression
  - Increases in training

The Principles of Training

Specificity
Progressive-
Overload
Recovery (rest)
Reversibility
Individual Needs

Frequency
Intensity
Time
Type

TRAINING PRINCIPLES AND PLANNING

- For a training program to be successful it must adhere to all essential training principles.
- **SPECIFICITY**
  - "You get what you train for"
  - Results from a games analysis of a specific playing position determines specific fitness components required and which areas of the body need developing
  - Specific training methods selected will develop the specific fitness component required
  - In the training program, specific exercises are chosen in each training method

Principles of Training (1)

I. Principle of overload

- A greater than normal load or intensity on the body system is required for training adaption or improved function to take place.

II. Principle of progression

- To ensure safety and effectiveness, the overload must be applied in a systematic and logical fashion over an extended period of time.

Training Principles

- Overload
  - Increased capacity in response to training overload
- Specificity
  - Specific muscle involved
  - Energy systems that provide ATP
- Reversibility
  - When training is stopped, the training effect is quickly lost

Influence of Gender, Initial Fitness Level, and Genetics

- Men and women respond similarly to training programs
- Training improvement is always greater in individuals with lower initial fitness
- Genetics plays an important role in how an individual responds to training.

Components of a Workout Session

- Warm-up
  - Increases cardiac output, blood flow to skeletal muscle, and muscle temperature
  - Believed to reduce risk of injury
- Workout
- Cool-down
  - Return blood “pooled” in muscles to central circulation

Training to Improve Aerobic Power

- Three methods
  - Interval training
  - Long, slow distance
  - High-intensity, continuous exercise
- Intensity appears to be the most important factor in improving VO_{2max}

- **Interval training** is a type of **training** that involves a series of high intensity workouts interspersed with rest or relief periods. The high-intensity periods are typically at or close to anaerobic exercise, while the recovery periods involve activity of lower intensity.

- **Interval training** has been **used** by athletes for years to build fitness. **Interval training** combines short, high-intensity bursts of speed, with slow, recovery phases, repeated during one exercise session.

- Jumping Rope.
- Stair Running.
- Burpees.
- Shuttle Sprints.
- Spinning.
- Dumbbell Squat to Press.
- Pull Ups.
- Push Ups.

How do I start interval training?

- **Interval training** can improve our **running** ability whether we **run** a 10-minute mile or a 20-minute 5K.

- Warm up for 10 minutes at an easy jog.
- **Run** at **interval** pace (a step up from our usual pace) for one minute.
- Jog for a two-minute recovery **interval**.
- Repeat four times.
- Cool down for five minutes and stretch.

Interval Training

- Repeated exercise bouts
  - Separated by rest periods
- Work interval
  - Intensity: 85-100% HR_{max}
  - Should last longer than 60 seconds to improve VO_{2max}
- Rest interval
  - Light activity such as walking
  - Should be as long as the work interval

Interval Training For 10-km Runners

Best 10-km time (min)	Reps	Interval distance (m)	Rest interval (s)	Time per interval (min)
46:00	20	400	60-120	2:00
43:00	20	400	60-90	1:52
40:00	20	400	60-90	1:45
37:00	20	400	60	1:37
34:00	20	400	60	1:30

- **Long slow distance running** is a constant pace of low to moderate intensity over an extended **distance** or duration, meant to minimize the effect of fatigue and risk of injury. The **distance** of **long slow distance** runs is up to the **runner**, ranging even up to about 20 miles for advanced **runners**.

Cardiovascular Training Principles

LONG SLOW DISTANCE RUNNING

- The long, slow distance (LSD) run is the cornerstone of any long distance runner's training program.
  - helps to adapt your joints and muscles
  - enhances the body's capacity to deliver oxygen to your muscles
  - it enhances your body's ability to burn fat as a source of energy
  - it teaches your body to store more energy as glycogen in your muscles
  - long slow runs teach the body to run efficiently

- **Long slow distance** (LSD) is a form of aerobic endurance training in running and cycling. The moderate training intensity of LSD is effective in improving endurance and maximum oxygen uptake in individuals who are undertrained or moderately trained.

Long, Slow Distance

- Low-intensity exercise
  - 57% VO_{2max} or 70% HR_{max}
- Duration greater than would be expected in competition
- Based on the idea that training improvements are based on volume of training

High-Intensity, Continuous Exercise

- Appears to be the best method of increasing VO_{2max} and lactate threshold
- High-intensity exercise
  - 80-90% HR_{max}
  - At or slightly above lactate threshold
- Duration of 25-50 min
  - Depending on individual fitness level

- We can **train** our **Vo2 max** most efficiently by working at a high **intensity**. Many running coaches recommend **training** at around 90 to 95 percent of our **maximum** heart rate. Working near our **max** heart rate helps strengthen the muscles in our heart and **increase** the **volume** of blood it can pump with each beat.

How does training affect VO2max?

- **Training** results in an increase in the efficiency of oxygen transport within the body. By lowering the resting heart rate (HR), and the HR at sub maximal loads, the heart pumps more blood with every heart beat. ... Such HR differences during **exercise** can be used to predict aerobic fitness.

Endurance Training and VO_2 Max

- **Training to increase VO_2 max**
  - Large muscle groups, dynamic activity
  - 20–60 min, 3–5 times/week, 50–85% VO_2 max
- **Expected increases in VO_2 max**
  - Average = 15%
  - 2–3% in those with high initial VO_2 max
    - Requires intensity of 95–100% VO_2 max
  - 30–50% in those with low initial VO_2 max
    - Training intensity of 40–70% VO_2 max
- **Genetic predisposition**
  - Accounts for 40%–66% VO_2 max
  - Prerequisite for VO_2 max of 60–80 $ml \cdot kg^{-1} \cdot min^{-1}$