PHYSICAL FITNESS

SPORT SCIENCE DEPARTMENT

CHAPTER ONE

CONCEPTS OF PHYSICAL FITNESS

CONT.

- **1.1. Meanings and Definitions of Terms**
- **1.1.1 Physical fitness**
- It is an ability to meet the ordinary, as well as unusual demands of daily life safely and effectively without being overly fatigued.
- Simply it is the body‘s ability to function effectively and efficiently, and contributes the total quality of life.

CONT.

- The totally fit person has a healthy and happy outlook towards life.
- It breeds self- reliance and keeps man mentally alert.
- Physical fitness is essential for human beings to adjust well with his environment as his mind and body are in complete harmony.
- Through research and scholarly inquiry, it is clear that the multi-dimensional characteristics of physical fitness can be divided into two areas: health related physical fitness and skill related physical fitness.

CONT.

- **physical fitness** is not a static factor and it varies from individual to individual and in ***the same person*** from time to time depending on factors.
- The most important objective of physical educators is to develop physical fitness.
- **physical fitness** as the ability to carry out daily task with vigor and alertness, without undue fatigue, with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies.

CONT.

- General **fitness** implies the ability of a person to live most effectively with his and her potentials, which depend upon the ***physical, mental, emotional, social and spiritual components of fitness*** which are highly interrelated.

- Activity 1.1
- Dear Student, discuss on the following questions with your partners.
- 1. Would you try to provide a very simple working definition for the term physical fitness?
- 2. How do you further classify physical fitness?
- 3. Tell the conceptual dimensions of fitness in general.

1.1.2 Physical Activity

- It is bodily movement produced by skeletal muscles that results in energy expenditure. The term, physical activity, does not require or imply any specific aspect or quality of movement.
- The term encompasses all ***types, intensities, and domains***.
- physical activity has been used often as a short-hand description for moderate-to-vigorous-intensity forms of physical activity,

- More specific descriptors such as sedentary behavior, light, moderate, vigorous, or moderate-to-vigorous should be used when talking about a specific range of intensities.
- Based on predominant physiologic effect, physical activity can be categorized in to ***aerobic physical activity*** and ***anaerobic physical activity***.
- **Aerobic physical activity** includes forms of activity that are intense enough and performed long enough to maintain or improve an individual‘s *cardiorespiratory fitness*.

- Aerobic activities such as walking, basketball, soccer, or dancing, commonly require the use of ***large muscle groups***.
- The connection between aerobic activities such as these and cardiorespiratory fitness is sufficiently close that the term aerobic capacity is considered equivalent to cardiorespiratory fitness.
- ***Technically***, aerobic physical activity includes any activity that could be maintained using only oxygen-supported metabolic energy pathways and could be continued for more than a few minutes.

- Aerobic activity has come to mean physical activity that would be expected to maintain or improve cardiorespiratory fitness or Physical Fitness.
- Anaerobic physical activity refers to high-intensity activity that exceeds the capacity of the cardiovascular system to provide oxygen to muscle cells for the usual oxygen consuming metabolic pathways.
- Anaerobic activity can be maintained for only about 2 to 3 minutes.
- Sprinting and power lifting are examples of anaerobic physical activity.

1.1.3 Physical Exercise

- The term "exercise" has been used interchangeably with "physical activity".
- Both physical activity and exercise involve any bodily movement produced by skeletal muscles that expends energy, are measured by kilocalories ranging continuously from low to high, and are positively correlated with physical fitness as the intensity, duration, and frequency of movements increase.

- Exercise is physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective.
- The formula relating physical activity and exercise is:

$$\text{kcal}_{\text{Exercise}} + \text{kcal}_{\text{Nonexercise}} = \text{kcal}_{\text{Total daily Physical activity}}$$

- For example, almost all conditioning and many sports activities are performed to improve or maintain components of physical fitness. In such instances they are planned, structured, and repetitive.
- **Activities** such as ***occupational***, ***household*** and many ***daily tasks*** are typically performed in the most efficient manner possible.

- Generally, Exercise describes as planned structured and repetitive bodily movement done to improve or maintain one or more components of **physical fitness** and is *subset of physical activity*.
- Exercise is usually ***goal related*** and designed in the sense that the improvement or maintenance of one or more components of physical fitness (i.e., *endurance, strength, flexibility* etc…).

1.1.4 Sport

- It is an *organized, competitive* form of play. Some persons view sport simply as an organized form of play, which might put it closer to physical education as we have defined it.
- When we refer to sport as :-
- organized competitive activity, we mean that the activity has been refined and formalized to some degree- that is, some definite form or process involved.

- Rules, whether they are written or not, are involved in this form of activity, and these rules or procedures can not be changed during the competition, though new ones may involve from one episode to the next.
- Sport is, above all, competitive activity.
- We cannot think of sport without thinking of competition, for without the competition, sport becomes simply play or recreation.

- Play can at times be sport, but strictly speaking, sport is never simple play; the competitive aspect is essential to the nature of sport.

1.2 General Principles of Fitness Training

- The human body adapts well when exposed to stress.
- The term stress, within the context of exercise, is defined as an exertion above the normal, everyday functioning.
- The specific activities that result in stress vary for each individual and depend on a person‘s level of fitness.
- There are guiding principles in exercise that can help individuals manage how much stress they experience to avoid injury and optimize their body‘s capacity to adapt.

- Knowing a little about these principles provides valuable insights needed for organizing an effective fitness plan.

- What does mean **“No pain, No gain.” ???**

1.2.1 Principle of Overload

- Consider the old saying, "No pain, No gain." Does exercise really have to be painful, as this adage implies, to be beneficial? Absolutely not. If that were true, exercise would be a lot less enjoyable.
- Perhaps a better way to relay the same message would be to say that "improvements are driven by stress."
- Physical stress, such as walking at a brisk pace or jogging, places increased stress on the regulatory systems that manage increased heart rate and blood pressure, increased energy production, increased breathing, and even increased sweating for temperature regulation.

- As these subsequent adaptations occur, the stress previously experienced during the same activity, feels less stressful in future sessions.
- As a result of the adaptation, more stress must be applied to the system in order to stimulate improvements, a principle known as the overload principle.
- For example, a beginning weightlifter performs squats with 10 repetitions at 150 pounds.
- After 2 weeks of lifting this weight, the lifter notices the 150 pounds feels easier during the lift and afterwards causes less fatigue.

- The lifter adds 20 pounds and continues with the newly established stress of 170 pounds.
- The lifter will continue to get stronger until his/her maximum capacity has been reached, or the stress stays the same, at which point the lifter‘s strength will simply plateau.
- The same principle can be applied, not only to gain muscular strength, but also to gain flexibility, muscular endurance, and cardiorespiratory endurance.

1.2.2 FITT Principle

- In exercise, the amount of stress placed on the body can be controlled by four variables: Frequency, Intensity, Time (duration), and Type, better known as FITT.
- The FITT principle, as outlined by the American College of Sports Medicine (ACSM) falls under the larger principle of overload.

A. Frequency and Time

- Each variable can be used independently or in combination with other variables to impose new stress and stimulate adaptation. Such is the case for frequency and time.
- Frequency relates to how often exercises are performed over a period of time. In most cases, the number of walking or jogging sessions would be determined over the course of a week.
- A beginner may determine that 2–3 exercise sessions a week are sufficient enough to stimulate improvements.

- On the other hand, a seasoned veteran may find that 2–3 days is not enough to adequately stress the system.
- According to the overload principle, as fitness improves, so must the stress to ensure continued gains and to avoid plateauing.

B. Time

- The duration of exercise, or time, also contributes to the amount of stress experienced during a workout. Certainly, a 30-minute brisk walk is less stressful on the body than a 4-hour marathon.
- Although independent of one another, frequency and time are often combined into the blanket term, volume.
- The idea is that volume more accurately reflects the amount of stress experienced. This can be connected to the progression principle.

- For example, when attempting to create a jogging plan, you may organize 2 weeks like this:

  - Week 1: three days a week at 30 minutes per session
  - Week 2: four days a week at 45 minutes per session

- Doing too much, too soon, will almost certainly lead to burnout, severe fatigue, and injury.
- The progression principle relates to an optimal overload of the body by finding an amount that will drive adaptation without compromising safety.

C. Type of Exercise

- Simply put, the type of exercise performed should reflect a person‘s goals.
- In cardiorespiratory fitness, the objective of the exercise is to stimulate the cardiorespiratory system. Other activities that accomplish the same objective include swimming, biking, dancing, cross country skiing, aerobic classes, and much more.
- As such, these activities can be used to build lung capacity and improve cellular and heart function.

- Thus athletes know the importance of training the way they want their body to adapt. This concept, called the principle of specificity, should be taken into consideration when creating a training plan.
- Stress, as it relates to exercise, is very specific. There are multiple types of stress.
- The three main stressors are metabolic stress, force stress, and environmental stress. Keep in mind, the body will adapt based on the type of stress being placed on it.

- Metabolic stress results from exercise sessions when the energy systems of the body are taxed.
- For example, sprinting short distances requires near maximum intensity and requires energy (ATP) to be produced primarily through anaerobic pathways, that is, pathways not requiring oxygen to produce ATP.
- Anaerobic energy production can only be supported for a very limited time (10 seconds to 2 minutes).

- However, distance running at steady paces requires aerobic energy production, which can last for hours.
- As a result, the training strategy for the distance runner must be different than the training plan of a sprinter, so the energy systems will adequately adapt.
- Likewise, Force stress accounts for the amount of force required during an activity. In weightlifting, significant force production is required to lift heavy loads.
- The type of muscles being developed, fast-twitch muscle fibers, must be recruited to support the activity.

- Slow twitch fibers, which are unable to generate as much force as the fast twitch fibers.
- Environmental stress, such as exercising in the heat, places a tremendous amount of stress on the thermoregulatory systems. As an adaptation to the heat, the amount of sweating increases as does plasma volume, making it much easier to keep the body at a normal temperature during exercise.
- The only way to adapt is through heat exposure, which can take days to weeks to properly adapt.

D. Intensity

- Intensity, the degree of difficulty at which the exercise is carried out, is the most important variable of FITT.
- More than any of the other components, intensity drives adaptation. Because of its importance, it is imperative for those beginning a fitness program to quantify intensity, as opposed to estimating it as hard, easy, or somewhat in between.

- Not only will this numeric value provide a better understanding of the effort level during the exercise session, but it will also help in designing sessions that accommodate individual goals.
- How then can intensity be measured? Heart rate is one of the best ways to measure a person‘s effort level for cardiorespiratory fitness. Using a percentage of maximum lifting capacity would be the measure used for resistance training.

Heart rate

- The **heart rate** is simply the number of heart beats per minute.
- **Stroke volume** Amount of blood pumped by the heart in one beat.
- **Cardiac output:** Amount of blood pumped by the heart in one minute.
- *Cardiac output***:** The amount of blood the heart pumps through the circulatory system in a minute.

1.2.3 Principle of Rest, Recovery, and Periodization

- The principle of rest and recovery (or principle of recuperation) suggests that rest and recovery from the stress of exercise must take place in proportionate amounts to avoid too much stress.
- One systematic approach to rest and recovery has led exercise scientists and athletes alike to divide the progressive fitness training phases into blocks, or periods.

- The principle of periodization suggests that training plans incorporate phases of stress followed by phases of rest.
- Training phases can be organized on a daily, weekly, monthly, and even multi-annual cycles, called micro-, meso-, and macrocycles, respectively.

Table 1.1:- Periodization Example

Week	Frequency	Intensity	Time	Type
1	3 days	40% HRR	25 min	Walk
2	4 days	40% HRR	30 min	Walk
3	4 days	50% HRR	35 min	Walk
4	2 days	30% HRR	30 min	Other

- Without periodization, the stress from exercise would continue indefinitely eventually leading to fatigue, possible injury, and even a condition known as overtraining syndrome. Overtraining syndrome is not well understood.
- However, experts agree that a decline in performance resulting from psychological and physiological factors cannot be fixed by a few days‘ rest.

- Instead, weeks, months, and sometimes even years are required to overcome the symptoms of overtraining syndrome. Symptoms include the following:
- □ weight loss
- □ loss of motivation
- □ inability to concentrate or focus
- □ feelings of depression
- □ lack of enjoyment in activities normally considered enjoyable
- □ sleep disturbances
- □ change in appetite

1.2.4 Principle of Reversibility

- Chronic adaptations are not permanent. As the saying goes,

"Use it or lose it." The principle of reversibility suggests that activity must continue at the same level to keep the same level of adaptation. As activity declines, called detraining, adaptations will recede.

- In cardiorespiratory endurance, key areas, such as VO2max, stroke volume, and cardiac output all declined with detraining while submaximal heat rate increased.

- In one study, trained subjects were given bed rest for 20 days. At the end of the bed rest phase, VO2max had fallen by 27% and stroke volume and cardiac output had fallen by 25%.
- Not only is endurance training affected, but muscular strength, muscular endurance, and flexibility all show similar results after a period of detraining.

1.2.5 Principle of Individual Differences

- While the principles of adaptation to stress can be applied to everyone, not everyone responds to stress in the same way.
- Some experts estimate genes to contribute as much as 47% to the outcome of training.
- In addition to genes, other factors can affect the degree of adaptation, such as a person‘s age, gender, and training status at the start of a program.
- As one might expect, rapid improvement is experienced by those with a background that includes less training, whereas those who are well trained improve at a slower rate.

- Health related components of fitness: types of activities dedicated to improving physical fitness categorized as cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition.
- Skills related components of fitness: types of activities dedicated to improving physical skills categorized as speed, agility, coordination, balance, power, and reaction time.

- **Overload Principle**: a principle of adaptation to stress suggesting the amount of stress applied during exercise must exceed a threshold level to stimulate adaptation.
- **Volume**: the term used to describe how much stress is being applied by combining the duration and frequency of exercise.
- **Progression principle**: a principle relating to how much additional stress that can safely be introduced to gradually improve fitness without risking injury or overuse.

- **Specificity**: the principle of stress suggesting activities should be closely centered around the primary outcome goal, i.e. train the way you want to adapt.
- **Periodization:** a method of organizing workouts into blocks or periods. These cycles consist of work/stress periods and rest periods.

CHAPTER TWO

- **THE HEALTH BENEFITS OF PHYSICAL ACTIVITY**