

Unit 8

PHYSIOLOGY AND SPORTS

key points

- gender differences on physical and physiological parameters
- Physiological factors for determining components of Physical Fitness
- Effects of exercise on Cardiovascular, Respiratory and muscular system
- Physiological changes due to ageing
- Role of exercise in slowing ageing process

Gender differences between physical and physiological parameters

There are following physical differences between males and females:

Body size: there is a lot of difference in body size of males and females. The size of body of males is larger in comparison to females.

Body shape: In males 'V' Shaped body is considered the best whereas in females slim constitution of body is considered the best.

Vertebrae, legs and knees: The vertebrae in females is long in comparison to hands and legs whereas in males the vertebra is small in comparison to hands and legs .

Centre of gravity: The height of female is usually found is less in comparison to males. The centre of gravity of females is less high and the height of centre of gravity of males is high. This is the reason why the stability in females is more than males.

Abdomen: females have larger abdominal cavity than males. This is due to the fact that females have additional organs of reproduction.

Bones of shoulders: The shoulder bones of females are found to be weak in comparison to shoulder bones of males. Due to this reason, females are provided low weight equipments in

throwing events.

The physiological difference in females and males are follows:

Muscular strength: The muscular strength of females is less than males. The contraction and extension of muscles of females is less forceful whereas males have more forceful contraction and extension of muscles.

Blood circulation: The size of heart in females is smaller in comparison to males and also there is less amount of blood in females than males. Generally the heart rate of females remain more than males.

Respiratory organs: Lungs of females are smaller in comparison to males. That's why, females have less endurance than males. In fact, lung capacity of normal healthy female is 10% less in comparison to male of similar shape and size.

Menstrual cycle: Females should not perform strenuous and vigorous works during menstrual cycle whereas in males there is no such type of cycle.

Physiological factors for determining strength.

The following are the factors for determining strength:

- **Muscle composition:** There are two types of fibres in muscles i.e. fast twitch fibres and slow twitch fibres. The muscles which consist of more percentage of fast twitch fibres will produce more strength.
- **Size of the muscle:** The strength of an individual depends on the size of muscle. As larger and bigger muscle produce more force and with the help of different methods of strength training, the size of the muscle can be increased.
- **Body weight:** there is a positive relation between body weight and strength. The individuals who are heavier are stronger than the individuals who are lighter in weight.
- **Intensity of nerve impulse:** A muscle is composed of no. of motor units. The total force of muscle depends upon the number of contracting motor units. Whenever, a stronger nerve impulse from central nervous system excite more number of motor units, the muscle will contract more strongly or it can be said that the muscle will produce more force or strength.



Physiological factors for determining speed.

The following are the factors for determining speed:

- **Muscle composition:** The muscles which consist of more percentage of fast twitch fibres contract with more speed and produce a greater speed. Different muscles of the body have different percentage of fast twitch fibres.
- **Explosive strength:** it depends on the shape, size and coordination of muscles. For very quick and explosive movement, explosive strength is required. The related proportion of fast twitch fibres and slow twitch fibres determines the maximum possible speed with which the muscle can contract.
- **Flexibility:** It also determines the speed. Good flexibility allows maximum range of movements and also enables complete utilization of explosive strength.
- **Biochemical reserves and metabolic power:** muscles require more amount of energy and high rate of consumption for maximum speed performance. For this purpose the stores of ATP & CP in the muscles should be enough. If the store is less, the working process of the muscles slows down after short time.

Physiological factors for determining flexibility.

The physiological factors for determining flexibility are:

- **Muscle strength:** Flexibility depends on the level of strength. Weak muscles can become a limiting factor for achieving higher range of movement. Muscle strength is highly trainable therefore, it can enhance flexibility.
- **Joint structure:** There are several different types of joints in human body. Some of the joints intrinsically have a greater range of motion. eg. the ball and socket joint of the shoulder has the greatest range of motion.
- **Age and gender:** flexibility decreases with the advancement of age. It can be enhanced with the help of training. Gender also determines the flexibility as females tend to be more flexible than males.
- **Internal environment:** The internal environment of an athlete influences the flexibility. If internal temperature increases flexibility increases; if it decreases flexibility decreases.

Previous injury: Injuries to connective tissues and muscles ultimately lead to reduced



flexibility

Physiological factors determining endurance.

Aerobic capacity:-

- (1) oxygen intake
- (ii) oxygen transport
- (iii) oxygen uptake
- (a) Energy reserves,
- (b) Lactic acid tolerance,
- (c) Movement economy,
- (d) Muscle composition

Oxygen Uptake:- It is highest rate at which oxygen can be taken up and consumed by the heart per minute.

Cardiac Output:- The cardiac output is simply the amount of blood pumped by the heart per minute.

Hydration and Endurance Exercise: - Sweating is normal physiological response to prolonged exercise, required for the dissipation of heat produced during energy metabolism

Effect of exercise on the cardiovascular system

- (i) Cardiac output is the amount of blood pumped by the heart in 1 min. This increases directly with increasing exercise intensity.
- (ii) The heart rate increases from a resting rate of 72 beats / min to 150 beats / min or even more.
- (iii) The stroke volume, meaning the amount of blood pumped into the Aorta with every heartbeat, increases from a resting volume of 70-90 mL to 100-120 mL per beat.
- (iv) Exercise increases the plasma volume of blood by 12% ; but total blood volume may



reduce slightly.

(V) Blood flow is redistributed with more blood going to the muscles, heart and skin, while blood in the kidneys and abdomen is reduced.

(vi) Blood pressure increases due to exercise because there is more blood flowing in the blood vessels.

Effects of exercise on muscular system.

- Size and shape of muscle changes: Regular exercise changes the shape and size of the muscle. Cells of the muscles are enlarged which change the shape and size of the muscle.
- Correct body posture; regular exercise keeps the correct posture of the body by strengthening the muscles. The postural deformities do not occur. If there is any physical deformity, then it is removed.
- Food storage increases: the capacity of food storage in body can be enhanced by doing regular exercises. This stored food can be utilized immediately when required.
- Toned muscles: regular exercise helps in keeping the muscles in toned position. Muscles become firm and maintain a slight, a steady pull on the attachments.
- Efficient movement of muscles: The movement of muscles becomes efficient and smooth. The movements during different activities become attractive.
- Change in connective tissues: the connective tissues become powerful. These tissues can bear the stress of strenuous activity.

Effects of exercise on respiratory system.

- Increase in Tidal air capacity: by doing regular exercise it has been noted that there is an increase in the amount of tidal air capacity of an individual.
- Decrease in rate of respiration: When a beginner starts exercising his rate of respiration increases. But when the same individual perform exercise daily, his rate of respiration decreases in comparison to the beginner at rest.
- Strong will power: regular exercise increases the will power of an individual. As pranayama, the specific exercise for lungs increases the will power of the doer.
- Unused alveolus becomes active : Regular exercise activates the unused alveolus because much amount of oxygen is required in vigorous activities of daily routine.



The passive alveolus become active.

- Increase in vital air capacity: The capacity of vital air capacity varies from 3500cc to 4500cc in a normal adult. Due to regular exercise its capacity increases upto 5500cc.

Ageing is the process of becoming older. It represents the accumulation of changes in a person over time. Ageing in humans refers to a multidimensional process of physical, psychological, and social change.

Role of regular exercise on ageing process,

Regular exercise keeps the human body livelier, fitter and In better condition, thus delaying the ageing processes. As Given below :

(I) exercise reduces the loss of elasticity from the lungs and chest wall agencies increase muscle strength and hypertrophy by increasing the cross-sectional area of the Slow Twitch Fibers (sm and Fast Twitch Fibers (FTF). This slows down ageing · The body composition changes due to exercise by reducing the fat content of the body, thus slowing down the ageing process. fu Exercise impel flexibility by strengthening the musculoskeletal systems, thereby preventing the bickering of joints. This also slows the ageing process.