

PHYSIOLOGICAL EFFECTS OF PHYSICAL EDUCATION

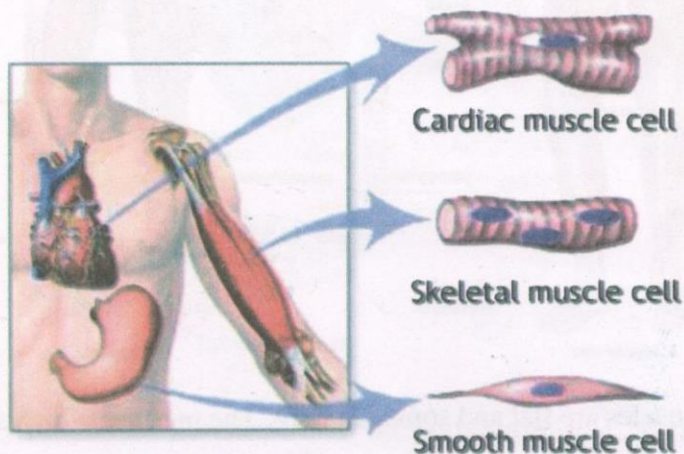
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2. PHYSIOLOGICAL EFFECTS OF PHYSICAL EDUCATION

2.1 (i) MEANING OF MUSCULAR SYSTEM, TYPES OF MUSCLES

The muscular system is a set of tissues in the body with the ability to change shape. Muscle cells contain a variety of proteins which help them contract in size. The proteins form fibers, which connect various parts of the cells. The main proteins used are actin and myosin.

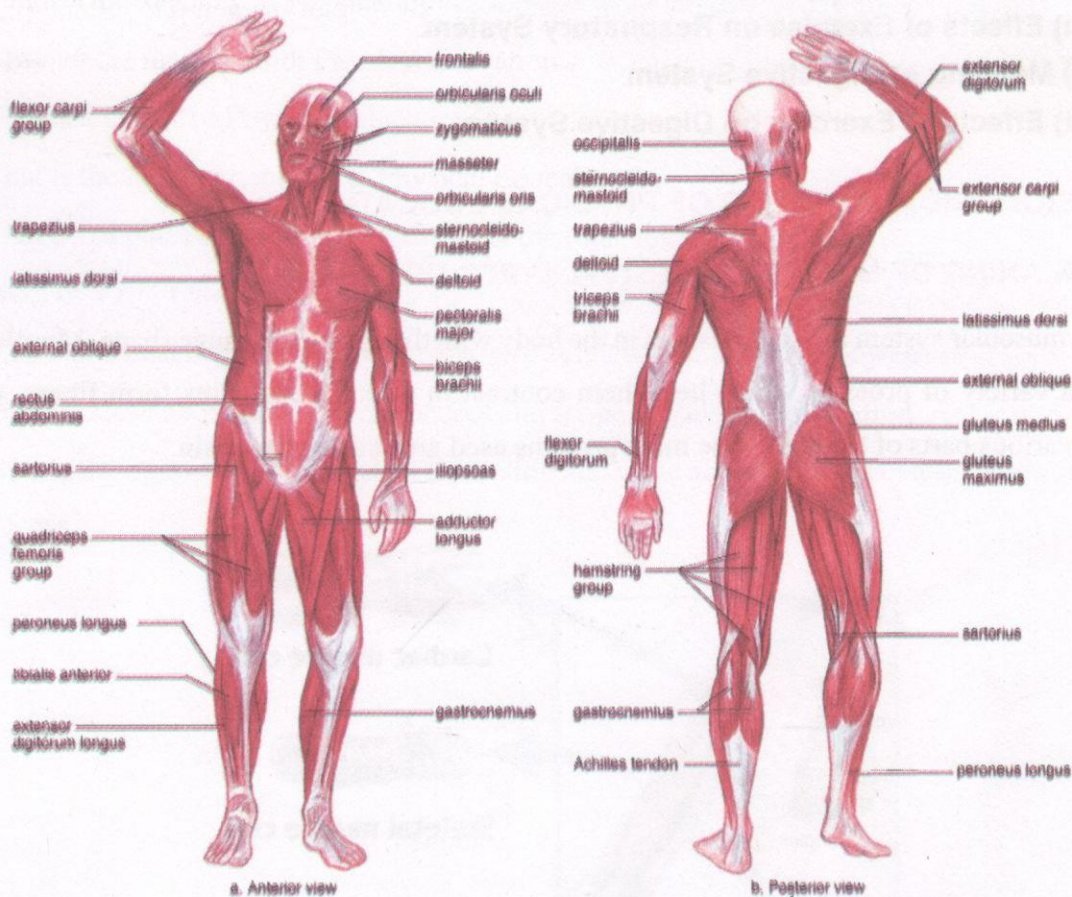


The 3 types of muscle tissue are cardiac, smooth, and skeletal. Cardiac muscle cells are located in the walls of the heart, appear striated, and are under involuntary control. Smooth muscle fibers are located in walls of hollow visceral organs, except the heart, appear spindle-shaped, and are also under involuntary control. Skeletal muscle fibers occur in muscles which are attached to the skeleton. They are striated in appearance and are under voluntary control.

2.1 (ii) EFFECTS OF EXERCISE ON THE MUSCULAR SYSTEM

MUSCULAR SYSTEM

The basis of human activities is motion, in other words it is said that the movement of the human body is possible only by the contractibility of muscles. The muscle is specialized tissue which enables the body parts to move. The beauty and shape of the body is due to these muscles. The contribution of the muscles in the body is 40% to 50%. These muscles are attached to bone, cartilage, ligaments



and to the skin. Some muscles are flat and some are long. The muscles which are under the skin are flat muscles, the muscles of trunk are round and flat, the muscles of upper and lower limbs are long

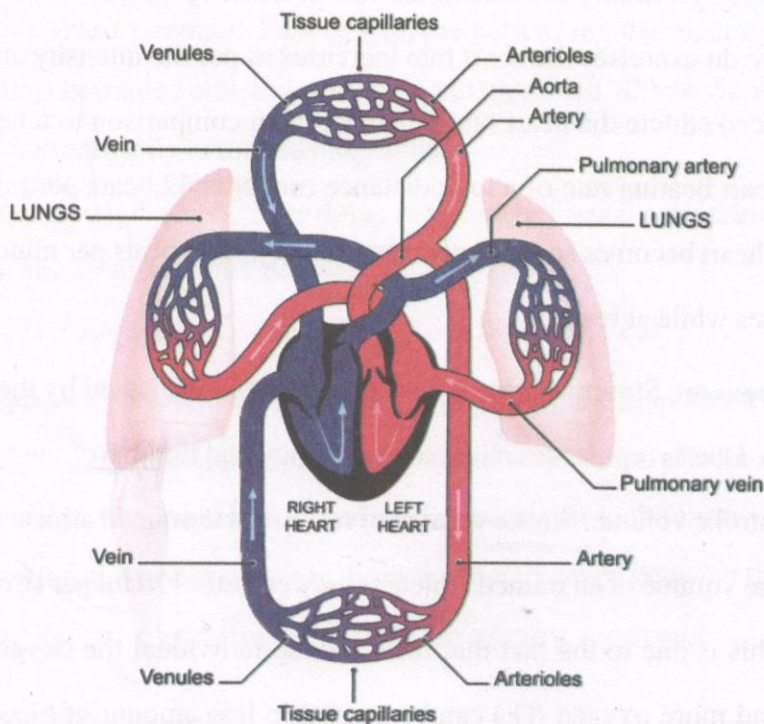
muscles. The muscles are made up of fibers. These fibers are thread like and are connected with each other with connective tissues. The length of these fibers varies from 3mm to 4cms and thickness varies from 0.01mm to 0.1mm. Every fiber has its cell. The cell contains a liquid called sarcoplasm.

2.2 (i) MEANING OF CIRCULATORY SYSTEM

Circulatory system : The system that moves blood throughout the body. The circulatory system is composed of the heart, arteries, capillaries, and veins. This remarkable system transports oxygenated blood from the lungs and heart throughout the body via the arteries. The blood goes through the capillaries which are situated between the arteries and veins. And the blood that has been depleted of oxygen by the body is then returned to the lungs and heart via the veins.

2.2 (ii) EFFECTS OF EXERCISE ON CIRCULATORY SYSTEM.

To perform any kind of work energy is required. So energy is the capacity to do work. The food which we take provide this energy which is oxidized with the help of oxygen (O_2). Blood plays an important role to carry the essential nutrients and oxygen (O_2) to the different parts and muscles of the body. These nutrients and oxygen (O_2) are required to do any type of activity or exercise. These



nutrients are carried by blood to different parts of the body or muscle. At the time of exercise the blood circulates at a faster rate to provide more energy to the muscles which are engaged in the

activity. When we do exercises there are changes takes place, some are of temporary nature and some are of permanent nature. The effects of exercises as compared to muscular system is more on circulatory system. There occurs several changes in circulatory parameters positively of few weeks of training. By this training the heart undergoes both morphological and functional changes i.e. size and weight of the heart as well as changes in heart's parameters. The morphological changes includes the hypertrophy of the heart muscles and dilation of atria and ventricles. The changes which takes place are as follows :

Size of the Heart Increases : Directly there is no exercise for heart but when we perform any type of exercise regularly, the heart rate increase due to which the muscles of the heart develops and the heart works more efficiently. This increases the size of the heart and also heart is strengthened and become efficient in doing its job.

Heart Rate Decreases : Normally in an adult the rate of heart beating is 72 beats per minute while in rest, but when we do exercises the heart rate increases as per the intensity and duration of exercises. In an experienced athlete the heart rate remains low in comparison to a beginner. It has been observed that the heart beating rate of a long distance runner is 42 beats per minute while at rest. Due to exercises the heart becomes so much efficient that in just 42 beats per minute it can meet the requirement of muscles while at rest.

Stroke Volume Increases : Stroke volume is the amount of blood ejected by the left ventricle during a systole or stroke. Due to regular exercises the efficiency and the size of the heart increases which also increases the stroke volume. Stroke volume of rest for an untrained athlete is about 70 ml per stroke where the stroke volume of an trained athlete is between 60 - 120 ml per stroke depending upon the requirement. This is due to the fact that for a trained individual the oxygen (O_2) intake capacity will be better and more oxygen (O_2) can be carried in less amount of blood. The stroke volume during exercises shows a considerable difference. It is about 120 ml for untrained adult and be more than 200 ml for trained adult.

Reduces Cholesterol Level : The level of cholesterol decreases in blood due to regular exercises. There is a direct link between blood pressure and cholesterol. So for a blood pressure patient to reduce the level of cholesterol, light exercises are recommended. With the reduction of level of cholesterol in blood the chances of heart problem also decreases.

Number and Efficiency of Capillaries Increases : Regular exercises also increases the efficiency and number of capillaries. With the regular exercises the capillaries which are not in use also become efficient and active, and nourish the various cells efficiently.

Number of R.B.C.'s and W.B.C.'s Increased : With the help of regular exercises number of RBC (red blood-corpuscles) and WBC (white blood corpuscles) are increased. The R.B.C. are the carriers of nutrients including hemoglobin and oxygen (O_2) to the muscles.

Delay in Fatigue : Fatigue is delayed with the help of exercises in an individual. The individual feels tired with the formation of phosphate and lactic acid in the muscles. If exercises are performed regularly these wastes are easily got out from the body which enable the muscles to bear the formation of lactic acid and this way the fatigue is delayed.

Recovery Period Becomes Fast : With the help of regular exercises the heart rate becomes normal at earliest in trained athlete as compared to untrained athlete, Same in case of respiration, it also becomes normal easily in trained individuals.

Prevention From Diseases : By doing regular exercises the diseases like high blood pressure, heart problem and so many other diseases are kept away.

2.3 (i) MEANING AND TYPES OF RESPIRATORY SYSTEM

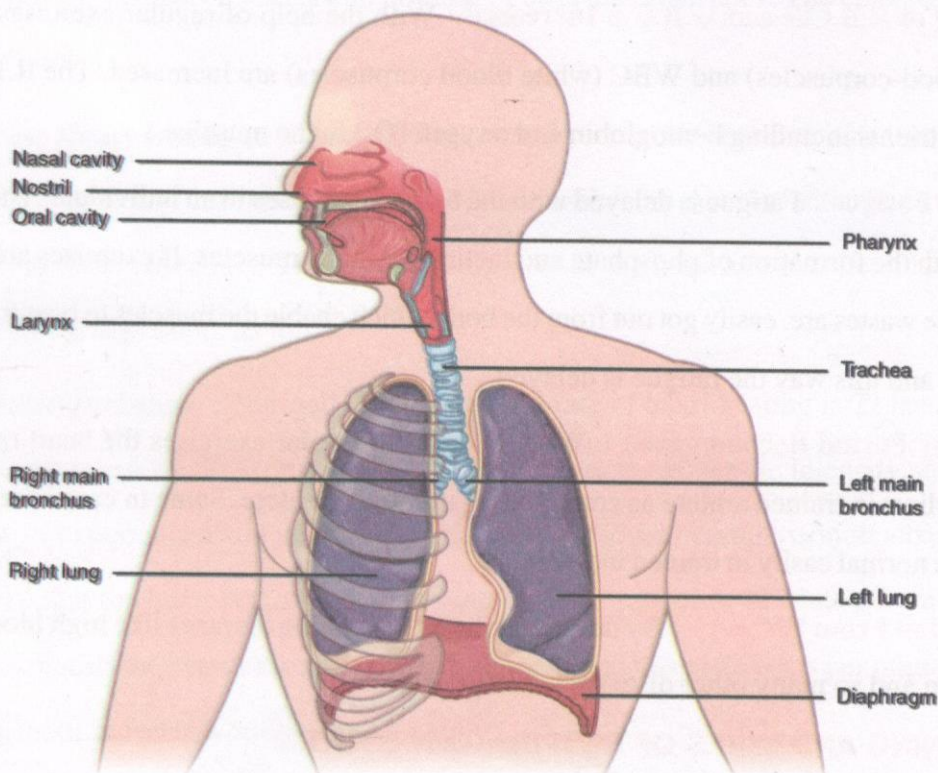
The Respiratory System : The process of physiological respiration includes two major parts: external respiration and internal respiration. External respiration, also known as breathing, involves both bringing air into the lungs (inhalation) and releasing air to the atmosphere (exhalation). During internal respiration, oxygen and carbon dioxide are exchanged between the cells and blood vessels.

2.3 (ii) EFFECTS OF EXERCISE ON RESPIRATORY SYSTEM

INTRODUCTION

There is no need to tell body how important the respiratory system is for an individual or human being. As we know that the requirement of oxygen (O_2) is very important to human beings, if it is not

supplied for a few minutes the individual can die. So, the body requires the constant supply of oxygen (O_2). Oxygen (O_2) is also needed for the production of oxidative energy from carbohydrates, fats and proteins. The product which comes out of this biochemical process is carbon dioxide (CO_2) which needs to be eliminated continuously and it is done with the help of respiratory system. The process of oxygen (O_2) supply to the cells and transportation of carbon dioxide (CO_2) from these cells is called inspiration. The respiratory system consists of various organs like nose or nasal cavity, pharynx, trachea, bronchi and lungs.



Nose : Nose is also known as organ of smell and it plays significant role in the process of respiration. Inhalation and exhalation is done with the help of nose. It is composed of a triangular frame work of cartilage bone and is covered by skin. It has two oval shaped openings called nostrils.

Pharynx : It lies behind the nose. It is a muscular tube which extends from the base of skull to its junction.

Trachea : It is also known as wind pipe. It is like a tube with cylindrical shape. It is about 11.2 cm long and 2–2.5 cm of diameter.

Bronchi : The two bronchi into which trachea divides, differs slightly. The right bronchus is shorter, wider and more vertical than the left bronchus.

Lungs : These are two in number in human body and is a vital organ of respiration. The shape of the lungs is just like a cone with the apex above. These are divided into two lobes by fissures. The left lung has two lobes and the right lung has three lobes.

EFFECTS OF EXERCISE ON RESPIRATORY SYSTEM

As we know that all the systems of the body are interrelated to each other and if there is effect of exercises on respiratory system, then it also affects circulatory and muscular system also. This means that the effects produced on respiratory system by exercises improves lungs capacity and improves gaseous exchange. This improvement in respiratory system is also assisted by the improved functions of the circulatory system and muscular system. The effects of regular exercises on respiratory system are as follows :

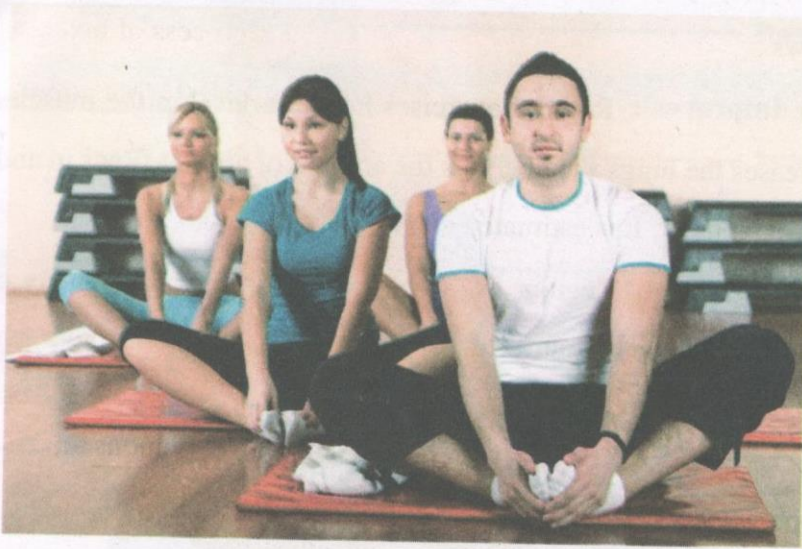
Tidal Volume Improves : Regular exercises helps to develop the muscles of the thoracic cavity and this increases the lungs volume. It is the amount of air that flows in and out of the lungs in each respiratory movement. It is estimated about 500 to 800 cc.

Vital Capacity Improves : Regular exercises increases the vital capacity of lungs. This is, because the tidal volume of lungs is improved. Vital capacity is the amount of air which an individual inhale or exhale. In normal adult it varies from individual to individual i.e. 3500 cc to 4500 cc. With the help of regular exercises the vital capacity is increased upto 5500cc.



Respiration Rate Decreases : As we know that exercises improves the tidal volume and vital capacity. Due to which a trained individual inhales more oxygen (O_2) in one inhalation than an untrained individual. This also reduces the number of inhalation in one minute during the rest period of a trained individual. Similarly during and after a strenuous activity the trained person requires lesser number of inhalation than the untrained person to obtained the same amount of respiratory minute volume. This is all due to regular exercises.

Maximum Oxygen (O_2) Uptake Improves : It is the amount of oxygen (O_2) utilized by the body in one minute. The direct measure of individual work capacity is Max VO_2 . This is also improved with the help of regular exercises. Due to the improved Max VO_2 uptake also increases the performance.



Faster Recovery Rate : As we know that with the help of exercises the vital capacity,, improved Max VO_2 is improved, the recovery after strenuous activity will be faster.

Improves Aerobic Capacity : With regular and proper aerobic exercises the aerobic capacity improves. Due to which the individual can perform moderate work or exercises for a longer duration.

Avoid Second Wind : The stage of second wind is a crucial stage for a beginner. For a person who does regular exercises, it is hardly felt to him. A well experienced athlete does not feel it during the activity.

Increases Endurance : With the help of regular exercises and for a longer period, the endurance is increased. Due to which the activity can be done for a longer duration without taking any rest. Those individuals who do not do exercises daily can not continue the activity for a longer time. Hence it is said that exercises can increase the endurance of an individual.

2.4 (i) EFFECTS OF EXERCISE ON DIGESTIVE SYSTEM

INTRODUCTION

To remain healthy and active our body needs constant supply of food. The food which we take is not observed directly by the cells of our body but it goes for some changes i.e. food is transformed chemically and physically into simple substances after which it is ready for the cells of our body.

According to Bhatia and Suri : “Digestion is the process of breaking up various food stuffs into simpler products, which can find their way into the blood circulation”.

According to Murche : “Digestion is the first step in blood making”.

Digestion of food is the continuous process of assimilation (simplification) and absorption. There are so many organs involved in the process of digestion i.e. the alimentary canal and accessory organs. Besides this so many glands are also involved in the process of digestion.

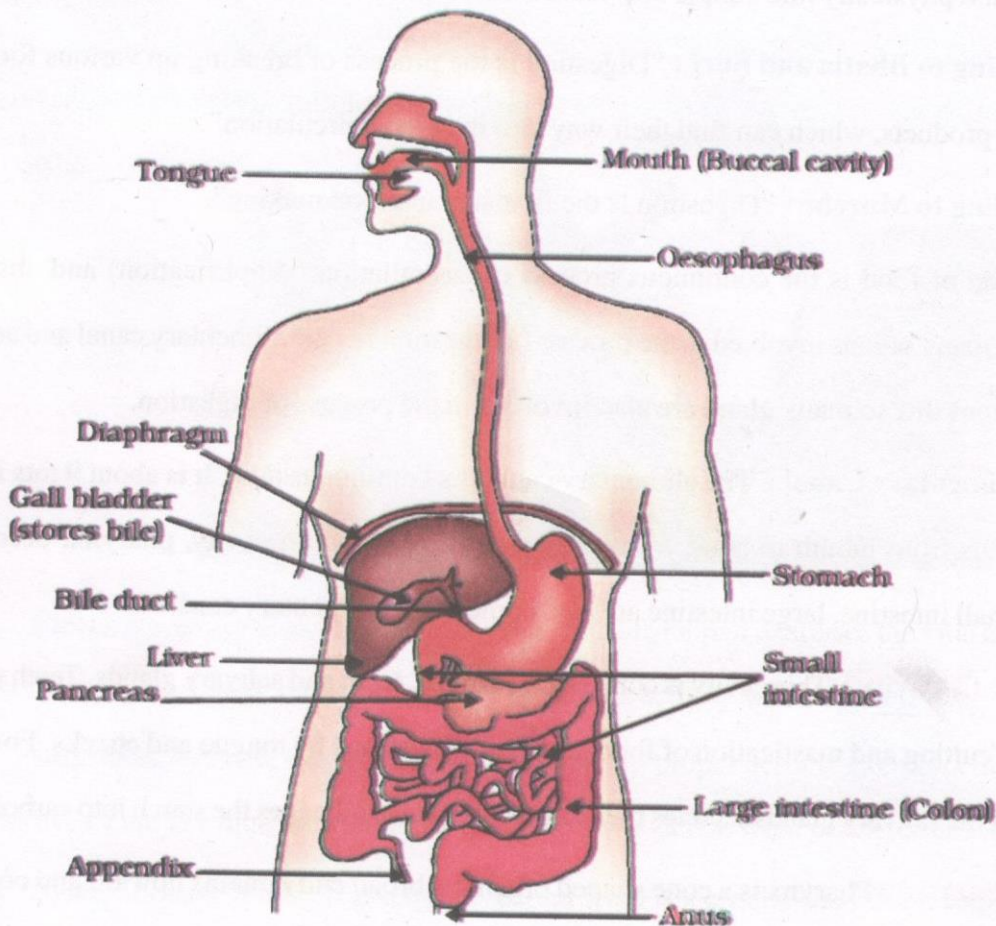
The Alimentary Canal : The alimentary canal is a continuous tube. It is about 9 mts in length which extends from mouth to anus. Various organs such as mouth cavity, pharynx, oesophagus, stomach, small intestine, large intestine are also come under alimentary canal.

(a) Mouth Cavity : This cavity is consisted of tongue, teeth and salivary glands. Teeth performs the work of cutting and mastication of food which is also helped by tongue and cheeks. For making the food soft the salivary glands secrete their saliva. This saliva changes the starch into carbohydrates.

(b) Pharynx : Pharynx is a cone shaped organ. Its broad end remains upward and constricted end down wards to end in the oesophagus. It has some sensory receptors. When food or liquid stimulates these receptors, the process of swallowing is initiated.

(c) Oesophagus : It is a muscular tube and it is about 23 cm to 25 cm long having diameter from 25 mm to 33 mm. It begins at the lower end of the pharynx and its lower end attached to the stomach, the work of oesophagus is to receive the food from the pharynx and passes into stomach.

Stomach : Oesophagus ends in stomach, which is collapsible. It is just like a sac and lies in oblique position directly under diaphragm. The shape and size of stomach changes from time to time with the changes in itself and in the surrounding organs. The stomach never becomes empty but always have a little gastric fluid, hydrochloric acid (HCl), pepsin and rennin, where hydrochloric acid (HCl) helps in digesting food and pepsin, rennin acts as an protein.



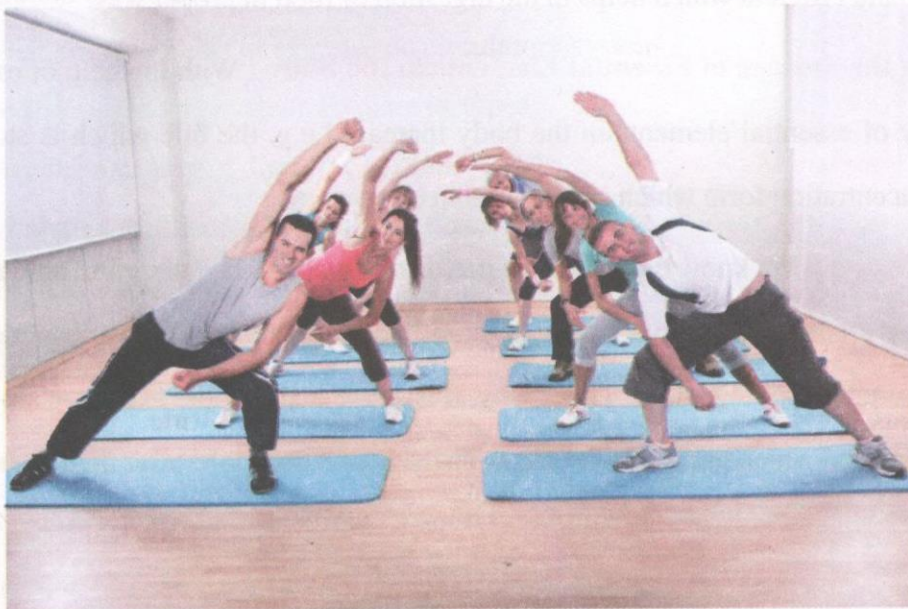
(e) Small Intestine : The small intestine is about 7 mts long and starts from pylorus with a diameter of about 28 cm at beginning and it gradually decreases and is hardly 2.5 cm at the lower end. The greatest amount of digestion and absorption takes place in small intestine.

(f) Large Intestine : It is about 1.5 mts in length and is wider than small intestine and this the last part of alimentary canal. It starts from the right - downward side of stomach, in large intestine water and electrolytes are absorbed.

Accessory Organs : These are those organs which play an important role in digestic food, that's why these organs are called accessory organs like tongue, teeth, salivary glands, pancreas, liver, gall bladder.

EFFECTS OF EXERCISE ON DIGESTIVE SYSTEM

The exercises play an important role in the improvement of digestive system, it has two way effects on our digestive system i.e. positive effects and negative effects. Positive effects are permanent in nature where as negative effects are of temporary nature.



Positive Effects : These are those effects which remains permanent. When we do regular exercises then there occur some permanent nature of changes in our digestive system Such as:

Appetite Increases : The human body is made up of number of cells. These cells are very important and their contribution is very important in doing any type of work or activity. When we do regular exercises the cells of our body needs more nutrients due to which there is a increase in appetite.

Removes Constipation : With the help of regular exercises the organs of our digestive system starts functioning efficiently. The constipation is mainly due to non-functioning properly of large intestine which is made correct and improved with the help of regular exercises and the constipation is removed.

Efficient in Absorption of Food : We know that the absorption of food takes place in small intestine. If the small intestine did not work properly then there are chances of indigestion. With the help of regular exercises the functioning of small intestine is improved and the problem of indigestion is also removed due to which the food absorption becomes efficient.

Glands Work Efficiently : With the help of regular exercises the secretion in the glands becomes proper and efficient which helps in the digestion of food in proper way.

Increase in the Storage of Essential Elements in the Body : With the help of exercises the storage capacity of essential elements in the body increased e.g. the bile which is stored in gall bladder is in concentration form which can be used in emergency.

Negative Effects : We know that when we perform exercises, the maximum amount of blood is Involved in the organs and the digestive system did not get the proper and adequate amount of blood which is required for digestion. That's why, it is suggested that the exercises are not started immediately after food which has negative effects on the health. It is done after three hours of taking food.

EXERCISE**❖ Very Short Answer Type Questions :**

1. What do you mean by muscular system ?
2. Mention the types of muscular system.
3. What is the meaning of circulatory system ?
4. What is the effect of exercise on the circulatory system ?
5. What do you understand by respiratory system ?
6. What are the types of respiratory system ?
7. Define Digestive system.
8. Give any one effect of exercise on digestive system.

❖ Short Answer Type Questions :

1. What is the muscular system ? Explain its types.
2. Explain the effects of exercise on the muscular system.
3. What are the effects of exercise on circulatory system ?
4. Define respiratory system. Explain its types.
5. Give the meaning of digestive system.
6. What are the effects of exercise on digestive system.

❖ Long Answer Type Questions :

1. What do you understand by muscular system. Explain its types and the effect of exercise on it.
2. What is circulatory system ? Explain the effect of exercise on it.
3. What do you mean by respiratory system ? Explain the effect of exercise on respiratory system.
4. What is meant by digestive system ? Explain the effects of exercise on it.