

## ANATOMY AND PHYSIOLOGY IN SPORTS

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### **Abstract:**

*The physiology of sports embodies a wide and diverse range of scientific interests. It is a recent outlet emanating from the discipline of exercise physiology that encompasses application of the concepts of exercise physiology to training athletes and enhancing sports performance. Sports physiology, a field that was once pursued almost exclusively in research laboratories and cardiac rehabilitation programs, is now commonly applied in comprehensive sports medicine clinics. Cardiorespiratory fitness is one of the most important parameters of physical fitness of an individual. This can be evaluated by assessing aerobic capacity (VO<sub>2</sub>max) and heart rate variability indices signifying the cardiac autonomic regulation. Both of these parameters derived from cardiorespiratory fitness assessment have been found sensitive to training effects in team sports players, thus of relevance in sports physiology.*

**Keywords:** *Athletes, exercise, fitness, heart rate variability, sport, basal metabolic rate, total body fat, total body mineral.*

### **Introduction:**

#### **Defining Anatomy:**

Anatomy explains the structure and location of the different components of an organism to provide a framework for understanding. Human anatomy studies the way that every part of a human, from molecules to bones, interacts to form a functional whole. Anatomy provides information about structure, location, and organization of different parts of the body. Thus, we can say that it is the study of the structure and relationship between body parts.

### **Defining Physiology:**

Physiology is the science of the normal function of living systems. Physiology studies the processes and mechanisms that allow an organism to survive, grow, and develop. Physiological processes are the ways in which organ systems, organs, tissues, cells, and bio-molecules work together to accomplish the complex goal of sustaining life. Human physiology studies the functions of humans, their organs and cells, and how all of these functions combine to make life, growth and development possible. Thus we can say that physiology is the study of the function of body parts and the body as a whole.

The human body is made up of many different systems that work together and allow us to take part in a huge variety of sport and exercise activities. An athlete can go from rest to all-out sprinting in a matter of seconds, whereas an endurance athlete can continue exercising for many hours at a time.

The skeletal and muscular systems work together to allow our bodies to perform a vast range of different movements. Our cardiovascular and respiratory systems act as a delivery service, working together to supply oxygen and nutrients to the body which in turn is used to produce energy for muscular contraction.

In order to appreciate how each of these systems function, learners will study the structure of the skeletal, muscular, cardiovascular and respiratory systems. The human anatomy of these systems is very different but in terms of operation, each system is implicitly linked. Having an understanding of

these body systems is imperative in the sport and active leisure industries in order to begin to appreciate how the body functions and how it copes with the many different stresses of exercise.

The unit starts by exploring the structure and function of the skeletal system which includes the different bones of the skeleton and the different types of joints. The muscular system is then studied, including the major muscles of the body, muscle movement, the different types of muscle and muscle fiber types.

The structure of the heart and blood vessels is covered, together with the function of the cardiovascular system. The unit goes on to explore the structure of the respiratory system and the function, including the mechanics of breathing. The final part of the unit explores the three different energy systems and the sports in which they are predominantly used.

### **Importance of Anatomy and Physiology in Sports:**

- Helps to understand nature and shape, size and vital abilities of human body.
- Provides knowledge about human body structure and function to know effects of exercises.
- To select and identify of talent according to games, events, playing position.
- Protects from sports injuries
- Rehabilitation and naturopathy
- Helps in maintaining healthy body
- Helps to know about individual differences
- Provide biological Foundation to physical Education
- To carried out research
- To study the human movement skills & techniques. on the basis of anatomical structures.
- To provide scientific basis to movements through physiological capacities.
- To cure various diseases concerned exercise.

- To provide knowledge of nutrition required for individual's vital needs.
- **Capacity:** - Knowledge of anatomy and physiology helps to evaluate the capacity of an athlete's such as anaerobic and aerobic capacity of an athlete, etc.
- **Effects of exercise:** - Knowledge of anatomy and physiology helps to study the effects of exercises on human body such as effects on muscular system, skeletal system, cardiovascular system, respiratory system, circulatory system, digestive system, etc.
- **Body structure:** - Knowledge of anatomy and physiology helps to provides information of every aspect of athlete's i.e. either positive or negative aspects of a player's bodily structure such as height, weight, body types, etc.
- **Prevention:** - Knowledge of anatomy and physiology helps to preventing sports injuries during physical activity or competition. Example: First aid given to according to the types of injuries like strain or sprain, bone and joint injuries.
- **Uses of food:** - Anatomy and physiology helps to providing adequate information of sports nutrition. It gives the information of food nutrients and its uses. Like benefits of balanced diet, uses of protein in strength sports, etc. which is helpful in the enhancement of sports performance.
- **Selection of sports:** - Anatomy and physiology helps to selection of sports such as short structured athletes are good for weightlifting; tall athletes are good for volleyball and basketball, an athlete who has more fast twitch fiber is good for 100 m race and 110 m hurdle race and an athlete who has more slow twitch fiber is good for marathon,

### **Major Systems of Human Body:**

**Circulatory System:** - The circulatory system consists of three independent systems that work together: the heart (cardiovascular), lungs (pulmonary), and arteries, veins, coronary and

portal vessels (systemic). The system is responsible for the flow of blood, nutrients, oxygen and other gases, and as well as hormones to and from cells

**Respiratory System:** - The human respiratory system is a series of organs responsible for taking in oxygen and expelling carbon dioxide. The primary organs of the respiratory system are the lungs, which carry out this exchange of gases as we breathe

**Digestive System:** - The human digestive system consists of the gastrointestinal tract plus the accessory organs of digestion (The tongue, salivary glands, pancreas, liver and gallbladder). Digestion involves the breakdown of food into smaller and smaller components, until they can be absorbed and assimilated into the body.

**Nervous System:** -Controls the functions of every other system it communicates with bodily systems in order to coordinate performance and to provide the needs of the body from moment to moment.

#### **Muscle and Classification of Muscles:**

Muscle is the tissue composed of fibers capable of contracting to effect bodily movements or muscle is the body tissue that can contract and produce movement. There are three types of muscle, skeletal or striated, cardiac, and smooth. Muscle action can be classified as being either voluntary or involuntary. Cardiac and smooth muscles contract without conscious thought and are termed involuntary, whereas the skeletal muscles contract upon command

- 1-Voluntary/skeletal/striated muscle
- 2-Involuntary or smooth or spindle muscle
- 3-Cardiac muscle

#### **Properties of Muscles:**

All muscles types share the following unique properties that allow them function properly:

**1. Contractility:** It is the ability of a muscle tissue to shorten and contract forcefully. Once the muscles have received stimulation, the muscle is capable of actively shortening (contracting) to do a particular task.

**2. Excitability:** It is the ability of a muscle tissue to generate an action potential in response to a stimulus. With the application of force, muscle can be stretched without damage.

**3. Extensibility:** It is the ability of a muscle tissue of muscle to stretch or get longer. Muscle can be stretched to its normal resting length and beyond to a limited degree.

**4. Elasticity:** It is the ability of a muscle tissue to return to its original shape. Whenever a muscle has been shortened or lengthened, it has the ability to return to its resting shape and length.

#### **Joints:**

##### **Definition and Classification Joint:**

A joint is the location at which two or more bones make contact. They are constructed to allow movement and provide mechanical support and are classified structurally and functionally. Structural classification is determined by how the bones connect to each other, while functional classification is determined by the degree of movement between the articulating bones.

##### **Types of Joints:**

1. Immovable or fibrous joints
2. Slightly movable or cartilaginous joints
3. Freely movable or synovial joints: -
  - a. Hinge joint
  - b. Pivot joint
  - c. Ball and socket joint
  - d. Saddle joint
  - e. Gliding joint

##### **Classification of Bones:**

The 206 bones that compose the adult skeleton are divided into five categories based on their shapes. Generally, bones are classified as long, short, flat, irregular and sesamoid. Bones are classified according to their shape:

**1. Long Bones:** - A long bone is one that is cylindrical in shape, being longer than it is wide. Keep in mind, however, that the term describes the shape of a bone, not its size. Long bones are found in the arms (humerus, ulna, radius) and legs (femur, tibia, fibula),

as well as in the fingers (metacarpals, phalanges) and toes (metatarsals, phalanges). Long bones function as levers; they move when contract muscles.

2. **Short Bones:** - A short bone is one that is cube-like in shape, being approximately equal in length, width and thickness. The only short bones in the human skeleton are in the carpals of the wrists and the tarsal of the ankles. Short bones provide stability and support as well as some limited motion.
3. **Flat Bones:** - The term flat bone is somewhat of a misnomer because, although a flat bone is typically thin, it is also often curved. Examples include the cranial (skull) bones, the scapulae (shoulder blades), the sternum (breastbone), and the ribs. Flat bones serve as points of attachment for muscles and often protect internal organs.
4. **Irregular Bones:** - An irregular bone is one that does not have any easily characterised shape and therefore does not fit any other classification. These bones tend to have more complex shapes, like the vertebrae that support the spinal cord and protect it from compressive forces. Many facial bones, particularly the ones containing sinuses, are classified as irregular bones
5. **Sesamoid Bones:** - A sesamoid bone is a small, round bone that, as the name suggests, is shaped like a sesame seed. These bones form in tendons (the sheaths of tissue that connect bones to muscles) where a great deal of pressure is generated in a joint. The sesamoid bones protect tendons by helping

them overcome compressive forces. Sesamoid bones vary in number and placement from person to person but are typically found in tendons associated with the feet, hands, and knees. The patellae are the only sesamoid bones found in common with every person.

### **Conclusion:**

Exercise not only makes you physically fitter but it also improves you're all the body health and general sense of well-being. Physical activity or exercise can reduce the risk of developing several diseases like type 2 diabetes, cancer, and cardiovascular diseases. Daily exercise can reduce stress and anxiety, boost happy chemicals, improves self-confidence, increases the brain power, sharpen the memory and increase our muscles and bones strength. Physical activity and exercise can have immediate and long-term health benefits. Most importantly, regular activity can improve your quality of life. A minimum of 30 minutes a day can allow you to enjoy these benefits.

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