Chapter-8

Biomechanics and Sports

Meaning of biomechanics

Biomechanics is a branch of science which deals with the effect of forces acting on a living of organism in moving condition or stationary condition.

The study and analysis of human movement patterns in sports are called biomechanics.

Importance of biomechanics in sports:

- Improvement of Technique: Biomechanics helps to improve technique. It determines how the technique should be executed to get the best result. Biomechanics can be applied to improve techniques in two ways. First, the teacher of physical education may use their knowledge of mechanics to correct or rectify the errors of a sportsperson to improve the proper execution of a skill. Second, the sportsperson may discover new and more effective techniques for performing a sports skill.
- Improvement of Equipment: If helps to improve equipment According to nature & safety of the game for example in an increase in the thickness of mat for the high jump.
- Improvement in Training method: It helps to develop a new training method to get a better result. For example development of an isotonic method to develop strength.
- Development of Skill: It helps to develop the skill of sports. For example development in the skill of fielding in cricket.,
- Supports in preventing injuries: It also helps in the process of rehabilitation of injuries. Biomechanics is used to provide the basis for changes in techniques, equipment and training to prevent injuries.
- Assists in improving the teaching and learning process: Biomechanics helps in moving the body with precision or accuracy, which ultimately helps in enhancing sports performance. It can allude that biomechanics helps in improving the teaching and learning process.

Types of Movements (flexion, Extension, Abduction, Adduction)

There are various types of movements in the joint which may be divided into four major kinds.

- Gliding movement: It is the simplest kind of motion that can take place in a joint, one surface gliding or moving over another without any angular or rotator movement.
- Angular movement: It occurs only between the long bones. By angular movement, the angle between the two bones is increased or decreased. The various movements which fall under angular movement are:

a) Flexion: Bending parts at a joint so that the angle between them decreases.

b) Extension: Straightening parts at a joint so that the angle between them increases.

c) Abduction: Moving a part away from the midline.

Newton's Laws of motion and their application in sports

The first law of Motion (Law of Inertia): any object will remain in its position until or unless an external force is applied to it.

The second law of motion (Low of Acceleration): The rate of change of acceleration is directly proportional to the force applied on the object and inversely proportional to the mass of the object.

Application of second law of motion

Example 1: According to second law motion if we want to produce an acceleration in football then a large force will be required to put on the ball. In the same ratio to which force is applied on the ball will be accelerated.

Example 2: Landing of high jump initially done on the sand but with the time change now landing of the high jump will be done on the mats as according to second law when the rate of change of momentum will be done in a large period less force will be produced which will help to avoid injury. So

according to second law landing on the mats is more favourable for the high jumper to avoid injury.

Third law of motion (low of action and Reaction): There will be equal & opposite reaction to each & every action.

Application of third law of motion

Example 1: A swimmer pushes the water backwards (action). The water pushes the swimmer forward (reaction) with the same force.

Example 2: In shooting, when a gun or pistol is fired, the bullet moves forward (action). The gun or pistol jerks backwards (reaction).

Friction & Sports

Friction: is a force that develops when the surfaces of two objects come in contract to each other & there will be relative motion between these objects or tends to do relative motion between these two objects. Friction force always acts in the opposite direction to the movement.

Types of friction:

- Static friction: The opposite force that comes into play when one body is not moving over the surface of another body.
- Dynamic friction: Dynamic friction is the opposing force that comes into play when one body is moving over the surface of another body. It is in two types.

a) Sliding friction: The opposing force that comes into play when one body is sliding over the surface of the other body is called sliding friction.

b) Rolling friction: The opposing force that comes into play when one body is rolling over the surface of the other body is called rolling friction.

Advantages and disadvantages of friction in sports

Friction is usually called a necessary evil. It means that it is essential in games and sports. Without friction, we cannot perform better in the field of sports. Athletes

use spikes and football players use studs to have appropriate friction while they run fast. Without friction, they would be unable to run fast.

Friction is disadvantageous in some of the sports and games, such as in cycling, there should not be more friction between the road and the tyres of the cycle. If there is more friction there will be more wastage of energy of the rider. The tyres must be fully inflated to reduce the force of friction in cycling.

Friction is required in various sports but the requirement may differ or vary for different sports.