BIOMECHANICS IN SPORTS

Biomechanics

Biomechanics is derived from Greek words, BIO + MECHANICS. Bio means living thing and mechanics is a field of physics. Thus, it is the branch of science which deals with the forces related to body movements.

Biomechanics is defined as systematic study of mechanics of body joints. According to Wikipedia, "Biomechanics is the study of the structure and function of biological system of humans."

Importance of Biomechanics in Sports

- Improves performance in sports
- Improvement in technique
- Development of improved sports equipment
- Improve in training techniques
- Prevents sports injuries
- Helps in understanding human body
- Knowledge of safety principles
- Helps in research work
- Creates confidence in player
- Helps in maintaining healthy body
- Increases the popularity of sports

Newton's Law of Motion and Their Application in Sports

First Law of Motion or Law of Inertia

According to first law of motion an object at rest will remain at rest or an object in motion will remain at motion at constant velocity unless acted upon by a force.

Example: - A moving football slows down and then stops often sometime. It comes to rest due to the fraction between the ground and the ball.

Second Law of Motion (The Law of Acceleration)

According to Newton's second law of motion, the rate of change of momentum of a body is directly proportional to the impressed force and takes place in the direction of force.

Example: - A cricket player while catching a ball moves his hands backwards. Initially the ball is moving with a certain velocity. The player has to apply a retarding force to bring the ballot rest in his hands.

Third Law of Motion

According to the Newton's third law of motion, to every action there is always an equal and opposite reaction.

Example: - The swimmer pushes the water in the backward direction with a certain force. Water pushes the man forwards with an equal and opposite force.

Levers - It's Types and its Application in Sports

LEVER

Lever is a rigid bar which is capable of rotating about a fixed point called the fulcrum.

Example: - see-saw, scissors, pulley etc. Skeletal system also acts like lever.

Example- See-saw, a pair of scissors, bicycle brake.

Class II Lever - A second class lever has the load or resistance located
Between the fulcrum and the force.
Example- wheel barrow, punching machine, Straight pushups, calisthenics etc.

Class III Lever - A third class lever has the force located between the fulcrum and the resistance.
Example- baseball bat, Tennis racket, boat-paddles.

Equilibrium: Dynamic and Static
Equilibrium: is defined as a state of balance or a stable situation, where opposite forces cancel each other out and where no changes are occurring.

Types of Equilibrium
1. Dynamic equilibrium: dynamic stability is a balance of body during movement
2. Static equilibrium: is the balance of the body during its rest or stationary position.

Guiding Principles to Determine Degree of Stability
1. Broader the base, greater the stability.
2. Lower the centre of gravity, higher the stability.
3. When the body is free in air, if the head and feet moves down then hip move up and vice versa.
4. Body weight is directly proportional to stability.

Centre of Gravity and its Application in Sports
Centre of Gravity
Centre of gravity is that point in a body or system around which its mass or weight is evenly distributed or balanced and through which the force of gravityacts. The centre of gravity is fixed, provided the size and shape of the body do not change.

Force
Force can be defined as a push or pull by one body acting upon another. Force is a product of mass and acceleration of an object or person.

Types of Force
    1. Centripetal force
    2. Centrifugal force
    3. Gravitational force
    4. Frictional force
    5. Static force

Importance and Application of Force in Sports
    1. Helps to move
    2. Stops the moving object
    3. Helps to accelerate
    4. Helps in throwing object.
    5. Helps to lift the object.
    6. Helps to pull the object