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Biomechanics: A Real Device For Body Fitness And Prevent Injuries

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Abstract
The district, zonal, state, and national contribution to sports and athletes indicates their awareness and their essentiality. India is a developing country and spends a lot of funds on sportspersons and athletes to participate in Olympia sports and athletes. Becoming a sportsperson and athlete is not an easy task and there is hard work behind. Hard work in a proper manner enhances the performance of the sportsperson and athletes and causes injuries if it is improper. Proper means the workouts of humans means movements/motion and static position while the force is acting in the linear and angular direction. For proper movement and static position, there is a science needed that biological mechanics which means bio-physics called biomechanics. It deals with the laws of mechanics of biological organisms which assists in making proper movement/motion and static position and preventing injuries. Biomechanics has branches such as Sports Biomechanics, Experimental Biomechanics, Computational Biomechanics, Comparative Biomechanics, Plant Biomechanics, Animal Biomechanics, Biofluid Mechanics, and Biotribology. All the branches have their purposes. The authors of this article are interested in presenting the importance of Biomechanics for body fitness and preventing injuries and they are briefly discussed in this article.
Keywords: *Biomechanics, Sports Biomechanics, Experimental Biomechanics, Biofluid Mechanics and Biotribology*

INTRODUCTION:

The awareness of sports has increased today and more contributions in district, zonal, state, and national levels of the participants are an example of that. Though, only 5.56% of the Indian population is sports of which 1.31% are women (The Bridge, n.d.). Each of the sports and exercises has own its movement/motions and statics when the different forces are applied on the human biological organism/system in a particular velocity either in the linear or angular direction. Injuries are possible in the biological organism if the force is applied improperly to the biological organism. For proper movements/motions in the biological organism, there is a science essential called biomechanical. Biomechanical is a science that deals with laws of mechanics for proper movement of biological mechanics called biomechanics. There are several branches available in biomechanics and they have its purposes. The following passages describe the importance of Biomechanics for body fitness and preventing injuries.

BIOMECHANICS:

Biomechanics is a science that deals with detailed analysis of biological movements of sports which prevents high risk of injury and increases performance in sports. The word biomechanics originated from the ancient Greek word combination of 'Bios' and 'Mechanike' which means 'Life' and 'Mechanics' respectively, earlier 1856. At very first, the Italian psychologist and physicist Giovanni Alfonso explained the muscular and skeletal dynamics (Britannica, 2022). It reflects the word biomechanics is the sum of Bio and mechanics. It can be simply defined as follows,

Biomechanics = Bio + Mechanics
= Biology + Mechanics

In the case of Biomechanics,

Biology – refers to the biological system

Mechanics – refers to the movements/motion and static position when the force or momentum is applied to the body

Biomechanics is a detailed analysis and assessment of human movement during sports (Physiopedia, n.d). It clearly

describes how the muscles, bones, tendons, and ligaments work together to make the movements (Verywellfit, 2022). Biomechanics assist in making the movements/motion in the biological system by using the laws of mechanics. Palladino and Davis (2012) defined biomechanics as 'mechanics applied to biology and mechanics itself is the responses of the body to forces or displacements' (as cited in Skirven, 2021). Biomechanics is not concerning only for human beings but it is also applicable to plants and animals. Based on this concept, biomechanics can be defined as the mechanics of human, plant, and animal biological systems while applying force on them. Sailus (2021) supported this by mentioning that 'Biomechanics is the study of how the system and structures of biological organisms, from the smallest plant to the largest animal, react to various forces and external stimuli'. There is no restriction to studying or applying biomechanics at the level of biological systems/organisms. Biomechanics is the application of mechanics to the study of the structure, function, and motion of mechanical parts of biological systems at every level (Vedantu, 2022). It is categorized under the branch of physics as biophysics and it deals with mechanical activity such as movement and statics while force is acting upon the living organisms.

Biomechanics is the application of mechanical principles of living organisms, such as humans, animals, plants, and the functional basic units of life, the cells (Tendons, 2018). The authors of this article have defined Biomechanics as 'A Bio-physics science dealt with mechanical aspects of a living organism/system for empowering the bio-parts of the organism/system'.

ELEMENTS OF BIOMECHANICS:

As we know, biomechanics is an integration of biology and mechanics and it is so as mechanical aspects of biology such as movements/motions and statics of the body. The following are focal points of biomechanics (Verywellfit, 2022) that to the mechanics of bodily movements which securely prevent the issues made with unstructured movements by muscles, bones, tendons, ligaments, and so on.

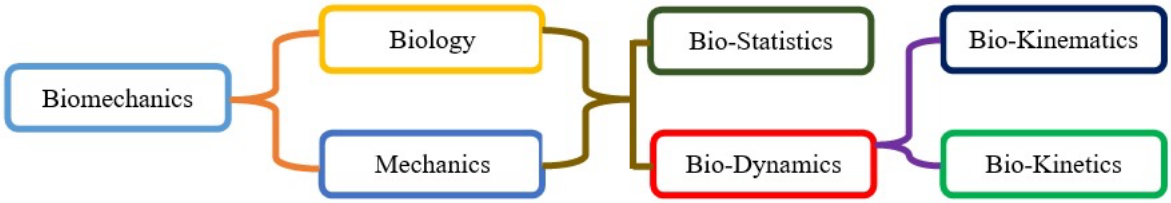

Figure. 1: Elements of Biomechanics (Authors, 2022)

- Bio-Statics: It describes the effect of biological systems when the system is either at rest or accelerating at a constant velocity.
- Bio-Dynamics: It assists in studying the effect of biological systems while in motion or movement with acceleration and deceleration.
- Bio-Kinematics: It elaborates the effect of forces on biological systems while making movements/motion towards linear and angular directions.
- Bio-Kinetics: It focuses the effects of forces and momentum on the biological system during movements.

BRACHES OF BIOMECHANICS:

The biomechanics is branched by having different purposes and they are briefly explained below,

- Sports Biomechanics: It deals with the application of laws of mechanics on human movement/motion in sports and their exercise for the betterment of performance by reducing unwanted injuries. This field is specially made for sportspersons and athletes.
- Experimental Biomechanics: It is an applied field that tests or experiments the effect of force on the mechanical works of biological organisms/systems either empowering or causing injury.
- Computational Biomechanics: The methods and models available in engineering are used to describe and forecast the mechanical works of biological organisms/systems.
- Comparative Biomechanics: It assists in to study of the mechanical aspects of the non-human biological organism/system.
- Plant Biomechanics: It is a sub-field of biomechanics that deals with the law of mechanics on the plant and its

cells and parts.

- Animal Biomechanics: It is a sub-field of biomechanics that deals with the law of mechanics on animals and their cells and parts.
- Biofluid Mechanics: It also known as biological mechanics deals with streams of liquid and gas in and around a biological organism/system.
- Biotribology: It deals with the bio-processes between the joints like wear, friction, and lubrication on the hip and knees.

SCOPE OF BIOMECHANICS:

Biomechanics was started earlier, though it has a wide range of uses in its sub and applied fields even now. Some of them are discussed below,

- It is helpful to find useful movements/motions for the development of the performance of the biological organism/system such as human, plant, and animal biological systems.
- Experiments in biomechanics can help find the effect of laws of mechanism on the biological system.
- Sports persons and athletes can develop their biomechanical performance without injuries by adopting sports biomechanics in their movements/motions or statics position while applying force.
- It is helpful to know the essentiality of liquid and gas circulation in and around of a biological organism/system which may secure the biological organism/system from severe injuries.
- Apply the biomechanics in exercise leads to acute performance in movements/motion of human performance in sports and athletes.
- Biomechanics can be adopted for treatment purposes and it guides how the human interface with the sports equipment will prevent the injury.

Conclusion:

Biomechanics is a branch of science that deals with the law of mechanics applied to biological organisms such as humans, animals, and plants. There are many branches available in biomechanics like sports biomechanics, experimental biomechanics, computational biomechanics, comparative biomechanics, plant biomechanics, animal biomechanics, biofluid mechanics and biotribiology, and each has its own purposes. By focusing on the scope of the biomechanics, it clearly depicts that the biomechanics and its branches assists the human to made appropriate movements/motions for enhancing performance and prevent injuries while the force is applied with a particular velocity on the human biological organism/system. Based on the this, the authors of this article concluded that Biomechanics assits to

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