BIOMECHANICS IN THE HUMAN BODY

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ANNOTATION: Humans are capable of performing a variety of movements, which give us the ability to move from one place to another. This is due to our musculoskeletal system, which supports body loads and the movement of body segments. This function is included in the principles of human biomechanics. Biomechanics is used to provide optimal care for injuries or conditions related to movement. All living things in the world, including humans, are constantly under the influence of gravity, and therefore are subject to forces from within and around the body. By studying the interaction of these forces and their effects, we can examine the shape, function, and movement of our bodies and apply the resulting knowledge to improve the quality of life. Human movement, under gravity and other loads and controlled by the nervous system, is achieved through complex and highly coordinated mechanical interactions between the bones, muscles, ligaments, and joints in the musculoskeletal system. On the other hand, the proper modification, manipulation, and control of the mechanical environment can help prevent injury, correct abnormalities, and accelerate healing and rehabilitation. Therefore, understanding the biomechanics and loading of each element during movement using motion analysis is useful for studying the etiology of disease, making treatment decisions, and evaluating the effects of treatment. This article is designed to study the biomechanics of human movement as well as human movement.

АННОТАЦИЯ: Люди способны выполнять различные движения, которые дают нам возможность перемещаться из одного места в другое. Это происходит благодаря нашей опорно-двигательной системе, которая поддерживает нагрузки тела и движение сегментов тела. Эта функция включена в принципы биомеханики человека. Биомеханика используется для обеспечения оптимального ухода за травмами или состояниями, связанными с движением. Все живые существа в мире, включая людей, постоянно находятся под влиянием гравитации и, следовательно, подвергаются воздействию сил изнутри и вокруг тела. Изучая взаимодействие этих сил и их эффекты, мы можем исследовать форму, функцию и движение наших тел и применять полученные знания для улучшения качества жизни. Движение человека под действием гравитации и других нагрузок, контролируемое нервной системой, достигается посредством сложных и высокоскоординированных механических взаимодействий между костями, мышцами, связками и суставами в опорно-двигательном аппарате. С другой стороны, правильная модификация, манипуляция и контроль механической среды могут помочь предотвратить травмы, исправить отклонения и ускорить заживление и реабилитацию. Поэтому понимание биомеханики и нагрузки каждого элемента во время движения с использованием анализа движения полезно для изучения этиологии заболеваний, принятия решений о лечении и оценки эффектов лечения. Эта статья предназначена для изучения биомеханики движения человека, а также движения человека.

KEYWORDS: Biomechanics, 3D technologies, Biomechanical analysis, molecular biomechanics, invasive measurements, organism, organ kinematics.

КЛЮЧЕВЫЕ СЛОВА: Биомеханика, 3D-технологии, биомеханический анализ, молекулярная биомеханика, инвазивные измерения, организм, кинематика органов.

INTRODUCTION:

Biomechanics is a branch of biophysics that studies the mechanical properties of living organisms, organs and tissues and the mechanical phenomena that occur in them. Previously, the concept of biomechanics was also applied to the field of developmental mechanics of embryology, often called experimental embryology. Usually the term biomechanics is applied to the study of human and animal movement. Biomechanics studies include: respiratory biomechanics - the kinematics of the respiratory organs, elastic and inelastic resistance (i.e., the geometric characteristics of movements) and the dynamics of respiratory movements and other areas of the respiratory organs; blood circulation biomechanics - the tension properties of the vessels and the heart, the hydraulic resistance of the vessels to blood flow, the propagation of tension waves along the vessel walls, the movement of blood, the work of the heart. Biomechanics - based on the evidence of anatomy and theoretical mechanics, studies the structure of the organs of locomotion, the muscular forces that produce movement in the joints, the distribution of its weight along the body parts, the laws of movement of the body and its parts. The main task of biomechanics is to determine the characteristics of the impact force according to the kinematic classification of movement. This allows us to assess the efficiency of movement, the degree of use of external and muscular forces, and to draw conclusions about the mechanisms of coordination of movement and its control. The study of the position of the body (standing, sitting, etc.) is also a task of biomechanics.

LITERATURE REVIEW AND METHODOLOGY:

Biomechanics studies the human and animal bodies and even applies to the mechanical workings of plants and cells. However, most people think of biomechanics in terms of sports and athletic performance. Biomechanics helps design everything from optimal sports equipment to injury recovery techniques. Biomechanics is the science of the movement of the living body, including how muscles, bones, tendons, and ligaments work together to produce movement.

Biomechanics is part of the larger field of kinesiology, which specifically focuses on the mechanics of movement. In short, it is the study and analysis of how all the individual parts of your body work together to create athletic and everyday movements. Biomechanics includes the structure of bones and muscles and the motion they produce, as well as the mechanics of blood circulation, kidney function, and other bodily functions.

Biomechanics is the science that studies the continuum mechanics of biological systems (i.e., the study of loads, motion, stresses, and deformations of solids and fluids) and the mechanical effects on the motion, size, shape, and structure of the body. Mechanical effects on biological systems can occur at many levels, from the molecular and cellular to the tissue, organ, and system levels. The study of biomechanics in humans ranges from the inner workings of the cell, to the mechanical properties of soft and hard tissues, to the development and movement of the body's neuromuscular system. Molecular biomechanics explores how mechanical forces and deformations affect the conformation, binding/reaction, function, and transport of biomolecules such as DNA, RNA, and proteins, and the mechanical biochemical couplings in the flow of biomolecular motors and ion channels, among others. It is concerned with the study of how cells sense mechanical forces or deformations and translate them into biological responses, with particular emphasis on the study of how mechanical forces affect cell growth, differentiation, movement, signal transduction, protein secretion and transport, and gene expression and regulation. The properties of living tissues are influenced by applied loads and deformations, and tissue biomechanics is primarily concerned with the growth and remodeling of tissues in response to applied mechanical stimuli. For example, the effects of elevated blood pressure on the mechanics of the arterial wall and the behavior of cardiomyocytes within the heart after a heart attack are well-known examples of living tissue regeneration as a direct consequence of applied loads. Biomechanics uses methods to record the displacements, velocities, and accelerations of the movements being studied in

experiments. In this case, optical methods are used more often: accelerated cinematography, cyclography, chemocyclography, etc. In B., methods of electrical recording of mechanical quantities using mechanotrons, base dynamographs, and angular displacement devices are also used. The history of biomechanics research begins with the study of human movements by the Italian scientist Leonardo da Vinci from the point of view of anatomy and mechanics.

Biomechanics research is of great practical importance in labor and sports physiology, military and clinical medicine, including neurology, orthopedics, traumatology, and prosthetics. Because the study of physical exercise and sports movements helps to organize a training system on a scientific basis. The study of the elasticity of bones, tendons, and other tissues allows us to understand the mechanism of the influence of traumatic factors on the body and prevent it. A number of indicators of the state of blood circulation and respiration are important in the development of diagnostics of heart and lung diseases, as well as the consequences of operations.

Currently, combining non-invasive measurements of motion, such as segmental position and force measurement with computer graphics-based anatomical modeling, is a useful approach to assessing these loads. In this approach, the integration of motion analysis and medical imaging techniques is essential. These include measuring human motion and external loads, developing biomechanical models based on three-dimensional (3D) computer graphics based on medical images, calculating internal forces, and validating the results. The validated 3D computer biomechanical model can then be used to simulate various movements and surgical procedures. Electromyogram (EMG) recordings of active muscles can be used additionally to understand muscle activity during human movement. However, the development of an accurate and non-invasive method to measure internal forces within the human body for clinical and other purposes is still a challenge.

DISCUSSION:

All motion and changes in motion are caused by internal and external forces. A change in the force acting on an object is necessary to move the object from rest or to change its velocity. The amount of change in the velocity of an object depends on the magnitude and direction of the applied force. Newton's laws of motion provide a precise relationship between a changing force and the resulting change in motion, and this applies to all forms of motion, including human motion. Human motion analysis is the systematic study of human motion through extended, careful observation using instruments to measure body movements, body mechanics, and muscle activity. This helps to collect quantitative data about the mechanics of the musculoskeletal system in the performance of motor functions. A specialized branch of human motion analysis is gait analysis, which is the study of how people walk and is used to assess, plan, and treat conditions that affect their ability to walk. The following is a brief history of human movement analysis/gait analysis.

In their quest for mental and physical perfection, the ancient Greeks recognized that the harmony of mind and body required athletic activity to complement their pursuit of knowledge. Their interest in sports and human movement can be seen in the dominance of cinematic depictions of Greek athletics in artistic media. With the mechanical, mathematical, and anatomical paradigms developed during the ancient Greek period, the great philosopher Aristotle wrote his first book on human movement, which provides the first scientific analysis of human and animal movement in terms of observing and describing muscles.

RESULTS:

Mechanics is the branch of science that deals with forces and the effects of those forces. The application of this field to biological systems is called biomechanics. Human biomechanics focuses on how forces act on the musculoskeletal system and how body tissues respond to those forces. Using the

forces involved in producing movement and posture, biomechanics can be considered in the context of external or internal biomechanics.

Sports biomechanics

Sports biomechanics is the study of human movement during exercise and sports. The laws of physics and mechanics are applied to athletic performance. For example, the biomechanics of the squat involves considering the position and movement of the feet, hips, knees, back, shoulders, and arms. Knowing the correct movement patterns for the squat can help you get the most out of your exercise, while also preventing potential injuries, correcting form errors, and increasing performance.

Biomechanics can be used in a variety of ways, including analyzing an individual's movements to develop and improve performance-enhancing sports equipment, treating injuries, and informing training protocols. Understanding how the body moves and why it moves helps professionals prevent and treat injuries, reduce pain, and improve performance.

Equipment

Biomechanics can be used to design sports equipment, clothing, footwear, sports fields, and structures. For example, a shoe might be designed for optimal performance for a middle-distance runner, or a padel racket for optimal grip. Another example: The grip of a basketball is key to strength, accuracy, and proper formation when passing and shooting. Playing surfaces are also studied for this purpose, such as how the hardness of an artificial turf surface affects an athlete's performance.

Individuals

Biomechanics can be applied to individuals, analyzing their movements and training them to perform more effectively during exercise and sports activities. For example, a person's running gait or golf swing can be filmed and recommendations can be made for modification and improvement.

Injuries

Biomechanics can be used to study the causes, treatment, and prevention of sports injuries. Research can analyze the forces at work that can cause ankle sprains and how shoe design or playing surfaces can reduce the risk of injury. For example, walking shoes for overpronators can help provide the necessary stability and motion control to help correct your gait.

Training

Biomechanics can study sports techniques and training systems and develop ways to make them more effective. This could include basic research into how arm position affects movement in swimming. It can propose and analyze new training methods aimed at improving performance based on the mechanical demands of the sport. For example, muscle activation measured using electromyography and kinematics in cycling can help researchers see how factors such as posture, components, or exercise intensity affect muscle activation.

CONCLUSION:

Gravity affects all life forms on Earth. Our bodies are constantly subjected to forces from within and around us. By studying the interaction of forces and their effects on the body, we can study the shape, function, and movement of our biological bodies and apply the knowledge gained to improve the quality of life. GRF and muscle activity measured using stereophotogrammetry-based human movement analysis methods can be used to identify deviations from normal kinematic, kinetic, or EMG patterns and then used to assess the state of the neuromusculoskeletal system, help plan further treatment, and evaluate the effectiveness of treatment. In various patient groups. It can also be used to improve athletic performance and help identify posture or movement problems in people with injuries or diseases. In a nutshell, biomechanics refers to the body's movements in an anatomical position, standing upright, with your gaze looking forward, your arms at your sides, palms facing forward, and your toes pointing forward and slightly apart from your heels.

REFERENCES:

1. Clinical Gait Analysis, University of Vienna, Austria. History of the study of locomotion. **http://www.univie.ac.at/cga/history/**.
2. B.M. Nigg, W. Herzog. *Biomechanics of the musculo-skeletal system*. 3rd ed. Hoboken NJ: John Wiley & Sons. 2007.
3. Watkins. *Structure and function of the musculoskeletal system*. Champaign: Human Kinetics. 1999.
4. Bergmann, G. Deuretzbacher, M. Heller, F. Graichen, A. Rohlmann, J. Strauss, et al. Hip contact forces and gait patterns from routine activities. *J Biomech*. 2001; **34**: 859–871.
5. https://uz.wikipedia.org/wiki/Biomexanika