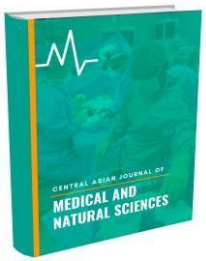

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Article

Force Effect of Biologycel

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Abstract: This study was conducted to investigate the effects of force, specifically biomechanics, a major topic in biology. Biomechanics is the study of how forces interact with biological systems. It examines how the mechanisms and movement of organisms respond to internal and external factors. Demographic data were collected for the study sample, including age and body mass index (BMI). Demographic results showed higher rates of BMI (24.9–18.5 kg/m²) in the female group compared to the male group, as well as higher rates of BMI (<30 kg/m²) in the male group compared to the female group. Significantly higher BMI levels were recorded among females in the patient group compared to males. Aims To investigate the potential integration of biomechanics with traditional concepts of force. This study provides an overview of the mechanical properties of many body parts, such as muscles, hair, bones, and others. In short, biomechanics is a vital field that integrates biology and physics to better understand how organisms interact with their surroundings, thus improving human performance and overall well-being.

Keywords: Force, Body Mass Index (BMI), Biologycel

1. Introduction

Force has a major impact on biology at all levels, from the movement of cells to the movement of big creatures [1]. Force affects an organism's form and function and is necessary for many biological processes, such as cell development and division, movement, and interaction with the environment. A biological unit, which is a cohesive, interconnected structural unit whose component components cooperate to give the organism life, is also a living organism. The influence of forces in biology is primarily concerned with the study of various organismic functions, such as the functioning of the circulatory, neurological, muscular, and respiratory systems [2,3]. This entails describing the functions of living organisms' organs. These functions are understood and explained by the laws of physics and chemistry. People can be moved, the angles at which muscles contract, blood circulation speed, cell diffusion, nerve communications, and other physical phenomena may all be studied using force calculations. Given the above, forces may be defined as the physics and chemistry of living things [4], including the chemical reactions that occur during the digestion of food, physical activity, and energy production. Physiological psychology, which focusses on behaviour and disorders related to nerve impulse transmission, is a branch of psychology that is also linked to morphological sciences such as anatomy, cytology, and histology, as well as many medical sciences [4,5]. Modern studies rely on the observation and research of live phenomena, recording the results that follow from these events, in order to qualitatively and quantitatively define and quantify living phenomena, or to display them in volumetric digital images.

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Therefore, we examine the mechanical properties of the body's component elements, including proteins, nucleic acids, polysaccharides, lipid aggregates, biomembranes, cells, and others, using the most up-to-date technologies available [6,7].

Human Body And Force

The effect of force in biology is the field that studies how mechanical forces affect living organisms and their biological systems[8]. Force can change the shape, size, and movement of living objects and plays a vital role in various biological processes. Force can change the shape and size of living organisms, whether due to external factors such as pressure or pull, or due to internal factors such as muscle contraction[9]. Force can be an external mechanical force, such as pressure, or an internal force, such as the force generated by muscle contraction. Furthermore, mechanical forces can interact with biological systems in complex ways, resulting in a wide range of effects [10]. To understand the effect of force in biology, which helps us understand many biological processes and contributes to the development of treatments for various diseases, some of these effects are as follows.

The Effect of Force on Locomotion:

Force is essential for the movement of living organisms, whether it is the movement of cells or the movement of the organism as a whole. It can either make an object move, stop it, change its direction of motion, or slow or accelerate its speed. Simply put, force is what makes an object move, stop, or change course[11].

The Effect of Force on Biological Processes:

Force is involved in tissue formation, cell division, and the passage of materials across membranes. Furthermore, force affects biological processes in a number of ways, either directly via adjustments to the way cells and tissues move or indirectly through changes to the organism's surroundings. Force may damage biomolecules or even kill an organism by changing its physiology and biochemistry [11,12].

Biophysical Biology:

This field looks at how the rules of physics could account for biological processes including the movement of physiological fluids and the transmission of energy inside cells. Using physics principles to understand biological occurrences at various sizes, from molecules to whole organisms, is the aim of this interdisciplinary field that combines biology with physics. [13].

2. Materials and Methods

The study was conducted at the College of Science/University of Wasit in cooperation with the College of Physical Education in Kut city/Wasit Governorate, for people coming to the university for both sexes, within the period between (1/2/2025) until (3/24/2025) as sample collection centers. The sample ages were (21 < 61 years), and the sample was divided into two groups of males and females for three age groups, which are (21 - 40) years), (41 - 60 years), and (< 61 years), as the study sample included both sexes with a total of 80 people. The first section represented the male group to include 40 people, and the second represented the females to include 40 people.

Demographic factors

Some demographic criteria were determined for the current study sample, including:

a. Age (years): The age of the study sample was recorded based on the information provided by them, and for both genders, for both the patient and control groups.
b. Body Mass Index (BMI): The body mass index (BMI) was calculated for all study sample members, and for both sexes in the control and patient groups, using the weight (kg) divided by the square of the height (m2) according to the following equation:

Body Mass Index (BMI) kg/m2 = $= \frac{\text{Weight(kg)}}{\text{Length(m2)}}$

c. Weight (kg): The weight reading was recorded using a digital scale in (kg) for all study members, and for both sexes in the patient and control groups.
d. Height (m): The height was measured from the crown of the head to the toe using a measuring tape in (centimeter) for both sexes, and for all members of the patient and control groups.

3. Results and Discussion

As shown in Figure 1, the subjects of the current study represented that the body mass index (30> kg/m2) recorded the highest percentage in the number of people among the male participants with a percentage of (43.34%), followed by the body mass index (29.9-25 kg/m2) with a percentage of (35%) compared to the percentage of the same body mass indexes for the female sample, as their percentages ranged (23.34% and 46.66%), respectively. Meanwhile, the percentage of the number of participants in the male group who have a biomass index (24.9-18.5 kg/m2) decreased, reaching (21.66%) compared to the percentage of the female group (30%).

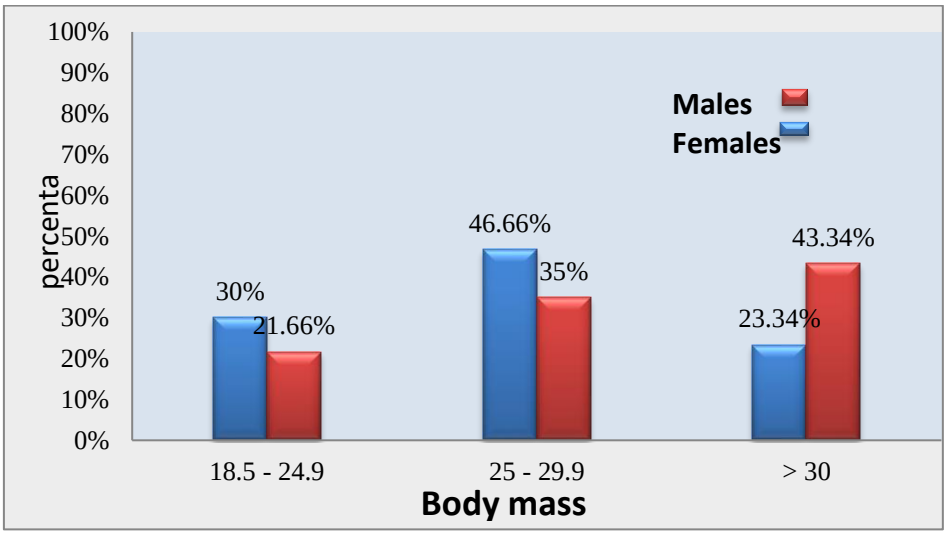

Figure 1. Body mass index percentages (kg/m2) for the male and female groups.

The results of the current study indicate that higher average body mass index (BMI) in females compared to males is associated with overweight and obesity, which increases the ability of muscles, no matter how complex, to produce movement and function, an indicator of human strength [14]. Factors influencing muscle strength include muscle size, muscle fiber type, and the effectiveness of the nervous system in activating muscles in both sexes. This is also influenced by the viscosity of the fluid, which facilitates movement of the body and other organs. The ability of a fluid to resist the forces that cause it to flow is essentially what is known as viscosity [15]. Additional details about viscosity include the fact that it typically decreases as the temperature of the fluid increases, resulting in a thinner material and poorer flow. The opposite is also true: as the temperature of a fluid decreases, its viscosity increases, thickening the material and requiring more energy to move [16,17]. Another important concept to understand is that higher-viscosity fluids cause greater frictional loss in pipes [18]. In addition, the formation and maintenance of bones, muscles, tendons, and ligaments depend on proteins, which also constitute the molecular composition of the body's components in both sexes. These proteins include collagen, actin, myosin, and other structural proteins involved in the formation of muscle fibers and connective tissue [19]. Bone is a specialized connective tissue that is constantly evolving, and despite its immense strength, it is flexible. Bones act as a solid component and barrier for delicate internal organs. Bones are composed of bone marrow, which is responsible for the formation of blood cells. Bones also constitute the body's calcium

reserve. Growth plates are recognizable areas in the bones of some children [20]. As the bones continue to grow in these areas, the plates close when children reach their desired height. After this point, bones become denser rather than longer, because greater density is required in certain areas of the body. Bones also vary in density from male to female. Furthermore, the basic concept of structural design in biological systems is to start with the molecule and expand from there. All external parts larger than one centimeter are composed of molecules that interact minimally with each other. The human hand performs a lever-like function. Hand movement is directly supported by a group of microscopic cells called myocytes, which generate force through the molecular movement of protein fibers within the cell. Biological systems are derived from the complex structures of many molecules, especially proteins [21]. Proteins are composed of 20 different amino acids, folded into specific three-dimensional patterns, and have a specific purpose. Proteins can function as hormones, enzymes, antibodies, receptors, channels, and inhibitors. In their formal state, they can, for example, perform the functions of microtubules, tendons, bones, teeth, hair, and silk fibers [22]. Many known enzymes are involved in catalyzing multiple functions, enabling a series of chemical reactions to occur in a controlled manner and maintaining the life of the host organism. In addition, enzymes have a singular role in each of their capabilities. Enzymes are capable of binding to only one molecule: the substrate, at the enzyme's active site, to carry out the necessary conversion. The substrate binds to the catalytic region and triggers the enzyme's action [23]. This binding essentially begins with the substrate: the active site is attracted to it, and this mechanical process moves the substrate along a preprogrammed path. When electrons finally bind to the active site, the enzyme's three-dimensional structure changes. The transfer of electrons is forced to adapt from a more stable state to a somewhat distorted one[24]. This distorted conformation resembles the state of electrons in a chemical process that produces a particular molecule. Thus, the bound substrate remains "active" in the enzyme's active site. This process does not increase temperature; rather, it dissipates the energy associated with the active site. To maintain the substrate's geometric conformation, functional amino acids in the active portion of the enzyme are structured in a specific manner [25]. Under ambient conditions, the conversion of the bound substrate from reactant to product is easier because its shape closely resembles the active form of its composition. If the substrate is subjected to physical stress in its active state, the enzyme must have sufficient strength to withstand the stress for a sufficient period of time for the reaction to produce a product [26].

4. Conclusion

a. Biological forces are complex and interconnected factors that can interact with each other and affect living organisms in various ways.
b. Understanding biological forces is crucial to developing effective strategies for preventing and treating diseases and improving human and environmental health.
c. Biosafety and biosecurity are important issues that require special attention, especially in the context of biotechnology and biological weapons.

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