The Science of Health, Nutrition and Fitness

Functions of the Human Skeleton

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Every day when we walk around the big cities and wonder at the miracles of modern architecture; we humbly forget the amazing architecture that exist with ourselves. I refer to the structures of the human body. In this section we are going to talk about the multi-functional 'scaffolding' that supports our human frame.

In the adult body the human skeleton consists of 206 individual bones. The bones are located according to specific functionality which is often related to their individual 'structure'. Further articles will outline this allocation and structural function but this article will focus on the six 'functions' of the skeletal structures.

The human skeleton has 6 main functions. These functions are:

- Support
- Movement
- Protection
- Blood Cell Production
- Mineral Storage
- Lipid Storage

Support

An average male weight around 80kg. Of that bodyweight around 15 – 20kg will comprise of bone tissue. Therefore the remaining bodyweight is comprised of soft tissue i.e. smooth muscle, skeletal muscle etc. and fluid mediums i.e. blood. It is the role of the skeleton to support those soft structures and allow them areas of attachment. For example, the spinal column and its perfectly engineered design, allows the body to remain upright. This allows the functions of the lungs, intestines and heart to remain unhindered.

This support functionality is related to the distinct shape of the human form. For example, the lower extremities, formed predominately by long bones, along with the spinal column allow upright bipedal movement to take place. This is manifested in the upright 'homo erectus' form.

Movement

Muscles are the mechanisms by which movement is created within the human body. When a muscle contracts it shortens and thus pulls on other structures. In the case of the human body, most agonist muscles co-ordinate with bones through tendinous origins and insertions. Therefore as a specific muscle contracts, it may pull on a bone at a joint. This system of powered leverage allows movements to take place. For example, the bicep pulls on the radius and ulna at the elbow and allows arm flexion

to occur. Therefore the skeleton is a fundamental system where human movement is required. Whether gross or fine motor movement is required.

Protection

The human body is highly adaptable and resilient. However, there are structures within the human body that if damaged, could have catastrophic outcomes. The brain, heart and lungs are examples of these highly important organs. The human skeleton has been given the role of protection within the scope of such organs. For example, the cranium and its many rigid fused bones, provide a natural 'crash helmet' over the brain. This protection reduces the chances of low to medium forces damaging the brain. The ribs and sternum encase the heart and lungs in a protective cage and the vertebrae of the back protect the spinal column from damage or injury. There are many more valid examples. This protective functionality assists in the continued homoeostatic survival of the human organism.

Blood Cell Production

Within the human body the blood has a huge role with regards to the maintenance of homeostasis. The red blood cells in their oxygenated and deoxygenated states allow oxygen to be delivered to the working muscles and other important structures; and they also remove unwanted carbon dioxide produced in the metabolic processes. White blood cells have functions relating to combatting both infectious disease and foreign invaders, the role of immunity.

These blood cells are produced in the soft fatty tissue inside bone cavities called 'bone marrow'. This process is termed '*Hematopoiesis'.* In the human adult the bone marrow produces all of the red blood cells, 60–70 percent of the white cells and all of the platelets.

Mineral Storage

Minerals have many important functions. The mineral termed 'calcium' is responsible for healthy bones and teeth; muscle contraction; nerve functionality, blood clotting, blood pressure regulation and immune system health. 99% of calcium is found in the bones and the teeth. So bone is a major repository or storage area for this mineral. Calcium may also be derived from many foodstuffs; perhaps the most well-known being milk. Calcium is also stored in different cells throughout the body but the main reserve is within the bones of the human skeleton.

Lipid Storage

There are two types of bone marrow with typical bones. The two types are termed red bone marrow and yellow bone marrow. Yellow bone marrow contains adipose tissue. This specific tissue is specialized in storing energy as fat. The storage form of fat found in these adipose tissues is termed triglyceride. Triglycerides are primarily an energy source; they liberate the largest amount of energy per unit mass of any of the fuel sources. Therefore the human skeletal bones have energy storage roles.

Obviously this article has only provided an outline of the skeletal systems functions. However, in future articles much of the above theory will once again manifest as we discuss area such as nutrition, metabolism and other human functionality.