Physiology

Physiology (in Greek *physis* = nature and *logos* = word) is the study of the mechanical, physical, and biochemical functions of living organisms.

Physiology has traditionally been divided into plant physiology and animal physiology but the principles of physiology are universal, no matter what particular organism is being studied.

The field of animal physiology extends the tools and methods of human physiology

Human physiology

Human physiology is the science of the mechanical, physical, and biochemical functions of normal humans or human tissues or organs. The principal level of focus of physiology is at the level of organs and systems. An overriding theme in physiology is that of *homeostasis*, maintaining a stable internal environment despite external fluctuations. Indeed, the primary functions of many organ systems are to maintain homeostasis. Traditionally, the academic discipline of physiology views the body as a collection of interacting systems, each with its own combination of functions and purposes.

The **nervous system** consists of the central nervous system (which is the brain and spinal cord) and peripheral nervous system. The brain is the organ of thought, emotion, and sensory processing, and serves many aspects of communication and control of various other systems and functions. The study of the nervous system is termed neuroscience; with a focus on disease, it is termed neurology. The branch of medicine that diagnoses, treats, and studies mental illness and behavioral conditions, is psychiatry.

The **special senses** consist of vision, hearing, taste, and smell. The eyes, ears, tongue, and nose gather information about the body's environment. The study of vision and the eyes is termed ophthalmology, whereas the study of hearing, taste, and smell is termed otolaryngology.

The **musculoskeletal system** consists of the human skeleton (which includes bones, ligaments, tendons, and cartilage) and attached muscles. It gives the body basic structure and the ability for movement. In addition to their structural role, the larger bones in the body contain bone marrow, the site of production of blood cells. Also, all bones are major storage sites for calcium and phosphate. The study of the skeleton is termed osteology; with a focus on bone disorders it is termed orthopedics.

The **circulatory system** consists of the heart and blood vessels (arteries, veins, capillaries). The heart propels the circulation of the blood, which serves as a "transportation system" to transfer oxygen, fuel, nutrients, waste products, immune cells, and signalling molecules (i.e., hormones) from one part of the body to another. The study of the circulatory system is termed cardiovascular physiology; with a focus on disease it is cardiology.

The **blood** consists of fluid that carries cells in the circulation, including some that move from tissue to blood vessels and back, as well as the spleen and bone marrow. The cells include red blood cells that carry oxygen, white blood cells that mediate our response to infection and foreign materials, and platelets with complementing plasma proteins that promote clotting and wound healing. The study of blood is termed hematology.

The **gastrointestinal system** consists of the mouth, esophagus, stomach, gut (small and large intestines), and rectum, as well as the liver, pancreas, gallbladder, and salivary glands. It converts food into small, nutritional, non-toxic molecules for distribution by the circulation to all tissues of the body, and excretes the unused residue. The study of this system is termed gastroenterology.

The **respiratory system** consists of the nose, nasopharynx, trachea, and lungs. It brings oxygen from the air and excretes carbon dioxide and water back into the air. The study of this system is termed respiratory physiology. Its clinical counterpart is pulmonology.

The **urinary system** consists of the kidneys, ureters, bladder, and urethra. It removes water from the blood to produce urine, which carries a variety of waste molecules and excess ions and water out of the body. The study of the function of the urinary system is termed nephrology or renal physiology; with a focus on structural disease it is urology.

The **immune system** consists of the white blood cells, the thymus, lymph nodes and lymph channels, which are also part of the lymphatic system. The immune system provides a mechanism for the body to distinguish its own cells and tissues from alien cells and substances and to neutralize or destroy the latter. The study of the immune system is termed immunology.

The **endocrine system** consists of the principal endocrine glands: the pituitary, thyroid, adrenals, pancreas, parathyroids, and gonads, but nearly all organs and tissues produce specific endocrine hormones as well. The endocrine hormones serve as signals from one body system to another regarding an enormous array of conditions, and resulting in variety of changes of function. The study of this system is termed endocrinology.

The **reproductive system** consists of the gonads and the internal and external sex organs. The reproductive system produces gametes in each sex, a mechanism for their combination, and a nurturing environment for the first 9 months of development of the offspring. The study of the physical function of this system is termed reproductive physiology; when applied to the disorders of reproduction it is termed gynecology or andrology. The study of the behavioral aspects is sexology and when applied to the developmental aspects is termed embryology.

The **integumentary system** consists of the covering of the body (the skin), including hair and nails as well as other functionally important structures such as the sweat glands and sebaceous glands. The skin provides containment, structure, and protection for other organs, but it also serves as a major sensory interface with the outside world. The study of skin is dermatology.

Exercise physiology

Exercise physiology is the identification of physiological mechanisms underlying physical activity, concerned with the analysis, improvement, and maintenance of health and fitness,

rehabilitation of heart disease and other chronic diseases and/or disabilities, and the professional guidance and counsel of athletes and others interested in athletics, sports training, and human adaptability to acute and chronic exercise.

Exercise physiologists

An **exercise physiologist** is a person who has an Bachelors or Masters degree or a doctorate in exercise physiology from an accredited college or university.

Topics studied in exercise physiology include human energy transfer, human energy expenditure, evaluation of energy-generating capacities, the nervous system, pulmonary system, the cardiovascular system, the musculoskeletal system, endocrine system (including hormones) and the interaction of these, plus training methods, environmental effects on physiology, and ergogenic aids. **Ergogenic aids** are any external influences which can positively affect physical or mental performance. These include mechanical aids, pharmacological aids, physiological Aids, nutritional aids, and psychological aids.

Exercise physiologists tend to specialise into either health and fitness or exercise rehabilitation streams with exercise used as a treatment strategy in physical rehabilitation, prevention of disease, and work conditioning.

Exercise physiolgists promote self-management strategies to encourage long term behaviour change, so real benefits can be achieved for the client. This is particularly useful for individuals with chronic and/or complex conditions such as diabetes mellitus, arthritis, lower back pain, kidney disease and many other states and conditions.

Physical exercise

Physical exercise is the performance of some activity in order to develop or maintain physical fitness and overall health. It is often directed toward also honing athletic ability or skill. Frequent and regular physical exercise is an important component in the prevention of some of the diseases of affluence such as heart disease, cardiovascular disease, Type 2 diabetes and obesity.[1][2]

Exercises are generally grouped into three types depending on the overall effect they have on the human body:

Flexibility exercises such as stretching improve the range of motion of muscles and joints. Aerobic exercises such as walking and running focus on increasing cardiovascular endurance.

Anaerobic exercises such as weight training, functional training or sprinting increase short-term muscle strength.

Physical exercise is considered important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; reducing surgical risks; and strengthening the immune system.

Proper nutrition is at least as important to health as exercise. When exercising it becomes even more important to have good diet to ensure the body has the correct ratio of

macronutrients whilst providing ample micronutrients, this is to aid the body with the recovery process following strenuous exercise.

Proper rest and recovery is also as important to health as exercise, otherwise the body exists in a permanently injured state and will not improve or adapt adequately to the exercise

Exercise benefits

Frequent and regular exercise has been shown to help prevent or to cure major illnesses such as high blood pressure, obesity, heart disease, Type 2 diabetes, insomnia, and depression. Researchers have shown that three 10 minute walks burn as many calories and exercise the heart as well as one 30 minute walk. (Strength training, on the other hand, appears to have continuous energy-burning effects that persist for about 24 hours after the training.)

There is conflicting evidence as to whether vigorous exercise is more or less beneficial than moderate exercise. However studies have shown that vigorous exercise executed by healthy individuals can effectively increase opioid peptides (aka endorphins, a naturally occurring opiate that in conjunction with other neurotransmitters is responsible for exercise induced euphoria and has been shown to be addictive), positively influence hormone production (i.e., increase testosterone and growth hormone), and help prevent neuromuscular diseases. These benefits are not as fully realized with more moderate exercise.

Both aerobic and anaerobic exercise also work to increase the mechanical efficiency of the heart by increasing cardiac volume, or myocardial thickness.