

3.1. Exercise physiology

It can be defined as both a basic and an applied science that describes, explains, and uses the body's response to exercise and adaptation to exercise training to maximize human physical potential.

Students need to learn exercise physiology in order to:

1. Understand how the basic physiological functioning of the human body is modified by short- and long-term exercise as well as the mechanisms causing these changes. Unless one knows what responses are normal, one cannot recognize an abnormal response or adjust to it.
2. Provide quality physical education programs in schools that stimulate children and adolescents both physically and intellectually. To become lifelong exercisers, students need to understand how physical activity can benefit them, why they take physical fitness tests, and what to do with fitness test results.
3. Apply the results of scientific research to maximize health, rehabilitation, and/or athletic performance in a variety of subpopulations.
4. Respond accurately to questions and advertising claims, as well as recognize myths and misconceptions regarding exercise. Good advice should be based on scientific evidence.

3.2. Biomechanics

The word biomechanics can be divided into two parts: the prefix bio- and the root word mechanics. The prefix bio- indicates that biomechanics has something to do with living or biological systems. The root word mechanics indicates that biomechanics has something to do with the analysis of forces and their effects. So it appears that biomechanics is the study of forces and their effects on living systems. This comes very close to the definition of biomechanics presented by Herbert Hatze in 1974: "Biomechanics is the study of the structure and function of biological systems by means of the methods of mechanics"

What Are the Goals of Sport and Exercise Biomechanics?

*Performance Improvement ;

The ultimate goal of sport and exercise biomechanics is performance improvement in exercise or sport. A secondary goal is injury prevention and rehabilitation. This secondary goal is closely related to the first and could almost be considered part of the primary goal, because an uninjured athlete will perform better than an injured athlete. Well, how do biomechanists work toward achieving these goals?

Technique Improvement:

The application of biomechanics to improve technique may occur in two ways: Teachers and coaches may use their knowledge of mechanics to correct actions of a student or athlete in order to improve the execution of a skill, or a biomechanics researcher may discover a new and more effective technique for performing a sport skill.

In the first instance, teachers and coaches use qualitative biomechanical analysis methods in their everyday teaching and coaching to effect changes in technique.

In the second instance, a biomechanics researcher uses quantitative biomechanical analysis methods to discover new techniques, which then must be communicated to the teachers and coaches who will implement them.

Equipment Improvement

How else can biomechanics contribute to performance improvement? What about improved designs for the equipment used in various sports? Shoes and apparel constitute the equipment used in almost every sport.

The equipment worn may have an effect on the performance, either directly or through injury prevention.

Can you think of any sports in which improvements in apparel or shoes have changed performances? What about swimming, ski jumping, and speed skating?

Training Improvement

How else can biomechanics contribute to improved performance in sports and physical activities? What about training? Biomechanics has the potential to lead to modifications in training and thus improvements in performance. This application of biomechanics can occur in several ways. An analysis of the technique deficiencies

of an athlete can assist the coach or teacher in identifying the type of training the athlete requires to improve. The athlete may be limited by the strength or endurance of certain muscle groups, by speed of movement, or by one specific aspect of his technique.

Injury Prevention and Rehabilitation

Some believe that injury prevention and rehabilitation should be the primary goal of sport and exercise biomechanics. Biomechanics is useful to sports medicine professionals in identifying what forces may have caused an injury, how to prevent the injury from recurring (or occurring in the first place), and what exercises may assist with rehabilitation from the injury. Biomechanics can be used to provide the basis for alterations in technique, equipment, or training to prevent or rehabilitate injuries.

3.3. Nutrition :

Nutrition and its impact on health and performance are of crucial importance. Nutritional deficiencies were once a major health challenge in most developed countries. However, what we are facing now is the fact that nutritional abundance contributes to many of today's health problems. In order to choose foods that satisfy your personal and cultural preferences, but which also contribute to a healthy diet and prevent diseases, you must have information about what nutrients you require, what role they play in health and performance, and what foods contain them. You must also be able to judge the validity of the nutrition information you encounter.

Nutrition is a science that links foods to health and diseases. It studies the structure and function of various food groups and the nutrients they contain. It also examines the biological processes by which our body consumes food and utilizes the nutrients. The science of nutrition also concerns the psychological, social, cultural, economic, and technological factors that influence which food we choose to eat.

Why study nutrition?

Nutrition has played a significant role in your life, even from before your birth, although you may not always be aware of it – and it will continue to affect you in major ways, depending on the foods you select. Not meeting nutrient needs in younger years makes us more likely to suffer health consequences in later years. At the same time, taking too much of a nutrient can be harmful. A poor diet and a sedentary lifestyle are known to be the major risk factors for life-threatening chronic diseases such as heart disease, hypertension, diabetes, and some forms of cancer, which together amount for two-thirds of all deaths in North America

Role of nutrition in fitness, health, and performance

Proper nutrition is an important component in the total training program of athletes. Consumption of energy-containing nutrients such as carbohydrates provides the fuel necessary for increased biological work. Nutrient deficiencies can seriously impair performance, whereas nutrient supplementation may delay fatigue and improve performance. Nutritional status can be a major factor differentiating athletes of comparable genetic endowment and training. Regular training allows athletes to improve their performance by enhancing biomechanical skills, sharpening psychological focus, and maximizing physiological functions. However, gains in these areas can be directly enhanced or undermined by various dietary factors associated with the athlete. For example, losing excess body fat will enhance biomechanical efficiency; consuming carbohydrates during exercise may prevent hypoglycemia and thus fatigue; and providing adequate dietary iron may ensure optimal oxygen delivery to the working muscles.

Sports nutrition has become a fast-growing area of study within recent years. It is the study and practice of nutrition and diet as it relates to athletic performance. Although scientists have studied the interactions between nutrition and various forms of sports and physical activities for more than a century, it is only within the past few decades that extensive research has been undertaken regarding the specific guidelines and recommendations to athletes.

Nutrition plays a significant role in one's life. "Good nutrition" encompasses more than preventing nutrient deficiencies or inadequacies related to diseases. It also forms the foundation of one's fitness, physical performance, and overall well-being. As you gain an understanding about your nutritional habits and increase your knowledge about optimal nutrition, you will have the opportunity to reduce your risk of many common diseases, to meet the demands placed upon your body, and to stay healthy, fit, and strong.

3.4. Sports Psychology:

The “American Psychology Association” defines sport psychology as a proficiency that uses psychological knowledge and skills to address optimal performance and the well-being of athletes, developmental and social aspects of sports participation, and systemic issues associated with sports settings and organizations.

Sport and exercise psychology is a unique scientific discipline, but it derives its theoretical and applied perspectives from several sources of scientific and applied knowledge. These are primarily:

1. Sport Science and Kinesiology, including motor learning/development/control, biomechanics and exercise physiology
2. Psychology, especially the social and cognitive streams, as well as various sub-disciplines of applied psychology
3. Health Sciences, especially medical, social and behavioural knowledge
4. Methodology, in particular measurement, assessment and evaluation, as well as statistical methods

| Theory and Research | Educational | Applications |
|---|---|--|
| Cognitive mechanisms Motivation Psychophysiology Exercise and health aspects. Personality. Group dynamics Communication. Emotions. Arousal, stress and anxiety. Motor learning, development, control. Gender issues. Burnout and over-training. Drop out. | Psychological principles in teaching physical education. Teaching principles in special populations. Psychological principles in coaching youth, adult and elite athletes Motivational principles to adhere to motor programmes. Position stands on relevant issues such as: aggression, ethics in sport and psychological benefits of physical activity. | Performance enhancement Team cohesion Clinical (i.e., treatment, rehabilitation). Educational (i.e., teaching, learning). Leisure and recreation. Social support (i.e., youth and elite sports, exercise programmes). |

3.5. Sports medicine :

Sports Medicine or Sport and Exercise Medicine is a rapidly growing speciality, which draws upon basic and applied biomedical, and clinical science for the knowledge to ensure best practice in the prevention, diagnosis

and management of Sports and Exercise related clinical problem. It is a multidisciplinary field which involves Physical Medicine, Primary Care Medicine, Dance Medicine, Emergency Medicine, Orthopedic Medicine, Wilderness Medicine and Rehabilitation Medicine. Sports medicine is difficult to define because it is not a single specialty, but an area that involves a wide variety of health care professionals, researchers, and educators from various disciplines.

Concept :

The concept of Sports Medicine comprises of:

- * Medical supervision and care of athlete
- *Physical education (special or adapted)
- *Exercise for prevention of chronic degenerative diseases
- *Therapeutic exercise in the treatment of physical disorders or diseases

According to Allen Riyan the unifying principle for whole of concept of Sports Medicine is “the study and observation of man in motion