

## **SPORT SCIENCE, HEALTH AND PHYSICAL EDUCATION**

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### **Summary**

The aim of this chapter is to integrate definitions, concepts and methodologies, subdomains and sciences related to Sport Science Physical Education and Health.

Sport Science is a branch of Social Sciences having as a study target the healthy human and from this perspective we have to understand and integrate practices, theories and methods of other sciences regarding human being. Movement, exercise and sport are the key elements and represent the theoretical and practical fundament of Sport Science. The field of Sport Science and Physical Education extends from deciphering the need of exercise for health and performance, to the prophylaxis from diseases through physical activity and therapeutic physical exercise.

Detecting the impairment of the health status involves the definition of the health concept and elaboration of the classification criteria of the health status damage. In the current stage of social, political, economic and cultural development, an important place is held by the continuous preoccupation to promote health, the quality of life and the development of the human personality and to obtain performances as high as possible. This is the cultural framework in which world organizations cooperate and contribute to the definition and expansion of the field of Sport Science.

Continuing the strategy of the scientific research in the field – promoting the population's health status – Sport Science is viewed as the dynamic expression of the interference of the complex of biological, psychological, social and economic factors. The orientation toward health prophylaxis of the entire community becomes essential

mainly by studying the factors which cause the alteration of the health status (hereditary, congenital factors, ecological factors etc.).

There is a major development of knowledge in Sport Science in recent years as a consequence of more elaborated research methods. There are also tremendous numbers of studies focused on these topics reaching more and more areas and varying with the methodological guidelines.

## **1. Introduction – definition, concepts, terminologies**

This chapter begins with definitions, concepts, methodologies up to the involvement of sub-domains and sciences correlated with Sport Science, that have in common the concern for promoting the quality of life and wellbeing, health and human performance.

**Sports Science** offers a conceptual and methodological foundation for physical activity. The basic support of Sport Science is represented by **Exercise Physiology** and **Sport Medicine** which are directly linked to health, human performance, wellness and quality of life. While Sports Science provides an objective support for maintaining the population's wellbeing, Exercise Physiology and Sport Medicine study the effects of movement on body functioning, but also the physiological adaptations to physical effort.

Definitions of health differ and are constantly changing because health is a complex notion, with an evolutionary character according to its social and cultural influences. Yet, the reference point and the aspiration regarding **health** achievement remain the World Health Organization (WHO) statement from 1948, according to which “health is not only the absence of diseases or infirmity, but rather a good state from physical, mental and social point of view”(www.who.int/en/).

Well-being, wellness and quality of life are interrelated notions that influence each other. **Wellness**, in a medical approach is associated with **well-being** and generally describes the state of being free from illness, injury or pain. When extending the evaluation of well-being to individuals and societies with all their influences, actually we present an overview of the **quality of life**. There are 12 indicators established by the United Nations Organization for defining quality of life, and health reaches first place and is also a major indicator of the community's living standard (Delhy, 2002).

Maintenance and surveillance of the health status of the individual and community requires multiple and varied knowledge from different fields of activity. Thus, Sport Science embodies the support for movement foundation and its enhancement as an indispensable element for good health, for restoring the functional capacity of individuals and for health assessment. It provides objective support, arguing for the active and healthy use of physical exercise through programs of **Physical Education and Health** in terms of the maintenance of the population's physical and mental well-being. The increasing concern in this area represents the stimulus for the periodical renewing of educational programs (Edginton, 2011). Health and physical exercise benefits, regarding the individual's functional status and quality of life, are ongoing

concerns of scientific research in the field of **Physical Education and Sport** (Hardman, 2009).

The most important element of Physical Education and Sport applied to the general population is related to the awareness of physical exercise implications on health status, for maintaining and preserving individual health and as a prophylaxis from diseases (Bailey, 2006). As for exercise and physical exercise, they represent the theoretical and practical fundament of Sport Science, also including sports training and competition with the purpose of increasing performance.

The theoretical and practical approaches of the concepts used in the Sport Science domain requires accumulation of practical experience and documentation for their presentation in a coherent, comprehensive, compressed structured and also for further development of the knowledge of a modern and topical concept, which is Sport Science, Physical Education and Health.

Within the connections between the human body and its natural environment, a special place is held by the artificial environment as well, which is created and developed by man. The sanogenetic factors are those factors of the surrounding environment that have a favorable impact on health and that contribute to its maintenance and strengthening. Following the consistent application of the prophylactic measure in general and especially of primary prophylactic, important mutations has occurred in the environment and the population's health. The exposed groups are characterized by a large diversity: healthy people, sedentary, disabled people, elderly and individuals with various pathologies. In this context, objectives such as: life span, life expectancy, life satisfaction and improvements in health status are most pursued within different interventions.

## **2. Relevant Historical Dates On Sport Science, Physical Education And Health**

The history of Sport Science and Physical Education has to be regarded and analyzed in the context of societal development and in close connection to social-economic and political relations specific for each time period.

Physical exercise has been used for prophylactic and therapeutic purposes since antiquity. This is illustrated in writings dating back as far as approximately 5000 years in Ancient Greece. In his book, *Ars Gymnastica*, the Greek physician Herodicus (5th century), Hippocrates's teacher (approximately 460 B.C. – 370 B.C.), described compounds/ programs of exercises and he recommended to his patients wrestling or walking a few kilometers without stopping. The connections between exercise – muscles, immobilization – atrophy, as well as the role of physical exercise in recovering the muscle strength were studied by Hippocrates.

Ancient Greece is the cradle of all sporting games and competitions, this being justified also by the attention paid to training the athletes in training sessions.

- The father of kinesiology is Aristotle (384 – 322 B.C.), who explained the muscles' action, and his knowledge was then used and improved by Galen (130 – 200), Galileo (1564- 1642), Newton (1642 - 1727) and Borelli (1608 – 1679).

- Flavius Philostratus (3rd century A.D.) – in his book “Gymnasticon” writes about physical exercise.
- Noteworthy is Avicenna’s interest in prophylactic and therapeutic exercise.
- Joseph Duchesne (1544-1609) stated that “Exercise is a beneficial thing that guarantees man the avoidance of many invalidities and diseases”... “It grants the body agility, strengthens the nerves and joints”.
- Sanctorius Sanctorius (1561-1636) in five of his seven books made reference to physical exercise and rest.
- Giovanni Alfonso Borelli (1608-1679) of Naples wrote about the mechanics of the muscles and of exercise.
- Per Henrik Ling (1776-1839) (master of sword fighting) structured physical exercise sessions in three parts: warm-up, working the body and cool-down, and set the bases of the Royal Gymnastic Central Institute in Stockholm.
- Edward Hitchcock Jr. (1828-1911) contributed substantially to the development of exercise physiology in his studies on physical exercise, training and the body.
- Austin Flint Jr. (1836-1915) is one of the pioneer physicians in the study of the physiological effects of exercises.
- Victor Balk (1844-1928) introduced the economy of strengths and physical yield in athletes.
- Georges Demeny (1850-1917) used chronography and cinematography to study gait and human movement.
- George Wells Fitz, (1860-1934) set the foundations for the first department in Anatomy, Physiology and Physical Training at Harvard University in 1891.
- Pierre de Coubertin (1863-1937), French pedagogue and historian, was the founder of the International Olympic Committee and of the modern Olympic Games.
- Elli Bjorksten (1870-1947) applied knowledge related to the harmonization of the exercise.
- Elin Falk (1872-1942) described the exercises which contribute to maintaining the correct posture of the body.
- August Krogh (1874-1949) is the Nobel Prize winner for describing the mechanism of capillary blood flow in resisting or active muscle.
- Per-Olof Astrand (1922-) evaluated the working capacity of men and women of 4 to 33 years old.

In the 20<sup>th</sup> Century, research initiated by the representatives of the School of Endocrinology and Gerontology, and then by the School of Effort Physiology, contributed significantly to the understanding and deepening of the phenomena related to movement and also their effects on body functioning and health.

Sport Science has known over the past decades a profound and continuous change, due both to the progress made in the field and to the increase of human performance, which leads to the functional edge of the body.

We can also mention the valuable global effort of scientists from different domains and their work which represented the basis (or bases plural) of health status understanding and interpretations in terms of the prophylactic and therapeutic effects of motion, correlated directly with the individual fitness level. The relevant conclusion of their

research emphasizes the role of the total quantity of movement since childhood, correlated with the constitutional background, heredity, lifestyle and balanced diet, without excess (alcohol, toxic). The programs for health by exercise have thus become of actuality and physical activity planning in a diverse outdoor and indoor environment is achieved through an intense campaign for education and awareness, elements which lie at the basis of the attempts to succeed in improving human physical performances and health status at the same time.

A healthy community and the progress of a community in general, always have to be based on a good somatic and functional state of the individual. From this statement, integrating exercise into the daily activities' program becomes a major and very topical objective. The ideal of "a healthy mind in a healthy body" represents a preoccupation for the present and the future, justifying the efforts to reduce the costs of medical treatment in a modern society that has to invest first in prevention. These statements are proven by the demand of networks and working platforms between organizations of a medical, non-medical or sports nature, platforms which promote exercise, sports and the ideals and values of sports in the world with direct effects on the health status and the population's life quality and life expectancy.

### **3. Health through Movement – A Holistic Approach**

The human being is seen as an existential, biological, psychological and social entity.

The theoretical fundamentals of Sport Science emerged from sports medicine, exercise physiology, athletic training, hygiene, nutrition, psychology, pharmacology to geography and tourism.

The field of Sport Science and Physical Education extends from deciphering the need of exercise for health and performance, to the prophylaxis from diseases through physical activity and therapeutic physical exercise.

The current development of the Sport Science practice requires the development of the multidisciplinary fundamental sciences with the purpose of laying the fundamentals of sport science, as well as of sports practice, including the prophylaxis and treatment of diseases and deficiencies. As a branch of the social sciences, having as study target the healthy human and as such the study and understanding of the healthy human as a structural and functional whole, Sport Science interferes with the methods of the practices and theories of other sciences regarding the human being. Detecting the impairment of the health status involves the knowledge of the health concept and an elaboration of the classification criteria of the health status damage.

Health is maintained and develops through the interaction between the individual as a biological unity and the external environment. Physical stress, the specific physical activities and sports environment represent a part of the external conditions that may have a major influence on man's health on an individual or society level. Health is threatened as well by the absence or deficiency of certain external factors – lack of physical, psychical or social requirements, lack of communication, monotony, de-

conditioning, lack of training, lack of certain variations in activity etc. Furthermore, health threatening leads to a limitation of the functional ability (Manescu, 1991).

The World Health Organization (WHO) criteria used for detecting the modifications and alteration of the health status are: the modification of certain biochemical or morphological parameters detected by laboratory tests, modifications within the structure and functioning of the physiological systems which can be evaluated by the method of testing the workload (respiratory, cardiovascular modifications etc.), modifications of the wellbeing evaluated by anamnesis in order to identify certain suggestive symptoms such as dizziness, lack of concentration, dyspnea, palpitations etc.; modifications that could result from the action over several physiological systems (nutritional deficiency, alcohol consumption, smoking, medication usage etc.).

Modifications of certain biochemical or morphological parameters used as indicators of pre-disease states are: blood and urine tests used as indicators of internal load or/and modifications of the functional capacity of the body, called exercise or physical effort response indicators. Biochemical tests are the most sensitive, helping in the precocious finding of the health status disorders. These may indicate homeostatic or compensatory disorders or as an adverse effect on health. The World Health Organization has also published methods for expertise recovery of the health status.

The activity in physical education and sports is characterized by the combination of musculo-osteo-articular effort with the neuro-psychical one (including proprioceptor integration).

The physical effort supposes contractions of varied intensity of certain muscle groups or muscular chains over certain amounts of time (occasionally or regularly by training sessions) as long as the stimulus acts on the body (physical activity). Muscular contraction, by combining the slow and fast activity of the muscular fibers, acts on the joints and bones either to maintain them in a position, or to change the position for performing certain simple movements of flexion, extension, pronation, supination, rotation or different combinations of them (Ciucurel, 2005).

The neuro-psychical effort accompanies the musculo-osteo-articular effort and it has a major role in the coordination and control of movement, both of the locomotion effector system, and of the functional apparatuses and systems involved in effort (cardiovascular, respiratory, but also endocrine and immune systems).

Sport Science, by the study of the biological support of exercise, generates a series of testing and evaluation methods, contributes to the somatic and functional exploration of the body and lays the basic support of the chain of the exercise – health – physical performance relations (Lund, 2010). Sport Science has the task to establish its research objectives directed toward the study of its particularities and its biological and social characteristics. It has to set both the methodology of precocious diagnosing of disease, the criteria for pointing out and preventing the risk factors over health and the effects of the general and specific physical activity on the trained or untrained people by age categories, gender, degree of morpho-functional or psychological deficit, as well as to establish the measures of general and specific prophylaxis recommended. Furthermore,

it has to elaborate the entire system of prophylactic measures as a program of physical activity promoted at the level of the society/community ensuring the integration of the health status of the individual and promote an active living lifestyle of the community.

The major objectives of promoting an active living lifestyle comprise the identification and study of the causes, as well as the pathology of disorders and diseases with the aim of preventing them (Bocarro, 2008).

The orientation toward the prophylaxis of the health status of the entire community becomes essential mainly by studying the factors which cause the alteration of the health status (hereditary, congenital factors, ecological factors etc.).

Special attention should be paid to the demographical factors, urbanization and migration of the population. The study of the demographical factors points out the structure of the population by age and imposes the orientation of the health promoting strategy according to the biological and psychological aspects of each age and according to the risk factors. The social factors may favor and increase morbidity and the risk of the lack of adaptation or maladjustment (Cole, 2006).

In order to study the importance of each type of factors (toxic, traumatic) we must analyze the epidemiological studies which can establish not only the structure of the morbidity, but also the causes which determine and favor health alteration.

The way in which healthy young individuals, elderly or ill people react to effort is assessed by a series of tests pointing out the cardiovascular, respiratory and/or metabolic response of the body to different effort levels. One test-parameter which is currently deemed more and more important is the assessment of the effort intensity and this test consists of the evaluation at peak level of the individual's effort tolerance.

A different manner of assessing the effort is the evaluation based on the values of the basal metabolism, of the metabolic balance of various productive, sports and leisure activities. Based on the tests, correlations are made for efforts of progressive intensities, correlations that demonstrated quantitative differences as a support of the concept of performance of the aerobic/anaerobe effort capacity.

Under the circumstances of a technological and information expansion, the premises for the modernization and rationalization of the social, economic and medical measures are aiming at keeping, ameliorating and improving the sanogenetic status of the individual and of the society in general.

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### **Biographical Sketch**

**Prof. Luminita Georgescu MD. PhD.** is a highly appreciated professor in the Department of Natural Sciences at the Faculty of Sciences, University of Pitesti, Romania. Since 2007 she is a scientific coordinator for doctoral studies in the field of Sport Kinetics. With a vast professional experience: Vice-Dean of the Faculty of Physical Education and Sport (2007-2011), President of the Medical and Anti-doping Commission at Judo European Championships, Bucharest-Belgrade 2004 and at Judo World Cup, Bucharest (2005-2008) and , Director of the International Relations Department of the University of Pitesti (2004-2005), collaborator of the Romanian Olympic Committee, Professor Georgescu is also a sports medicine physician with a Doctoral degree in Medical Sciences. Her academic activity reflects an increased interest in developing new cross-disciplinary programs and research projects in the area of physical education, sport and health (5 books published and more than 100 articles in national and international scientific manifestations). The professional accomplishments of Professor Georgescu includes also: Member of the Executive Board of International Council of Sport Science and Physical Education, Presidium Member of International Associations of Sport Kinetics (IASK), World Leisure Organization Board of Directors Member, Associate Editor of AJESS, Health-Related Fitness and Health Promotion Section Editor of AJESS, scientific reviewer for the Romanian Journal of Physiotherapy and Romanian Sport Medicine Journal, member in multiple national and international associations, member in scientific committees and keynote and invited speaker at important conferences in the field of sport science, winner of national and international awards and distinctions.

- Patronage of the International Council of Sport Science and Physical Education awarded for organizing the International Scientific Conference, "Physical Education Sport and Health" at the University of Pitesti in Pitesti, Romania, 2008.
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