

Introduction to Exercise Physiology & Sports Performance
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Lecture - 01
Focus of Exercise & Sports physiology

Good morning ladies and gentlemen, and welcome to week 1, lecture 1 of the course on Exercise Physiology and Sports Performance. Today, we will be talking about exercise and sports physiology, and what is the focus of exercise and sports physiology. I will be covering this topic under the following heads: introduction, background, types, questions, performance analysis, performance evaluation and conclusion. For centuries, scientists have studied how the human body functions at rest during health and disease. But, during the past 100 years or so, there is a specialized group of people called physiologists, who have focused their studies on how the body functions during physical activity and sport.

We know that anatomy is the study of the organism's structure or morphology, and focuses on the basic structure of various body parts and their interrelationships. Physiology is the study of body function. Exercise and sports physiology have evolved from the fundamental disciplines of anatomy and physiology. Physiology focuses on the functions of the body structures and hence, understanding anatomy is essential to learning physiology.

Anatomy and physiology, both rely on a working knowledge of biology, chemistry, physics and other basic sciences. The physiologists study how the body's organ systems, tissues, cells and the molecules within the cells work, and how their functions are integrated to regulate the body's internal environment. This process is called homeostasis. Exercise physiology is the study of how the body functions are altered when we are exposed to exercise, and we all know that exercise is a challenge to homeostasis. Because the environment in which one performs exercise has a large impact, environmental physiology has emerged as a subdivision of exercise physiology.

There are several types of exercise physiology. Sports physiology further applies the concepts of exercise physiology to enhance sports performance and optimally train the athlete. Sports physiology derives its principles from exercise physiology. Exercise physiology and sports physiology are closely related, integrated and are often indistinguishable. Exercise and sports physiology are often considered together due to the same underlying scientific principles.

To put it simply, exercise physiology looks at how the body responds during exercise. Sports physiology looks at how the body responds during sport, and how sporting performance can be improved. Let us talk about something called exercise physiology research. Research in exercise physiology attempts to evaluate the effect of a single bout of exercise; that is called acute exercise, and repeated bouts of exercise, that is a regular training program on the human body. Another research question is to study body responses to acute exercise and training at high altitudes or in extremes of heat, humidity and cold.

Another question is to study young and old individuals, both healthy and diseased, to understand the role of exercise in the prevention of or rehabilitation from various chronic diseases. Basically, exercise physiology attempts to study the effect of a single bout of exercise on the body, a sustained training program on the body, how does the body respond to exercise or training at high altitudes or in extremes of heat, humidity and cold. We also would like to study young and old individuals, both healthy and diseased, and we also would like to understand the role of exercise in the prevention and rehabilitation from various chronic diseases. There are several questions which have to be answered in exercise physiology. Does one need to have a genetic gift of speed to be a world class runner, or is it all due to training? This may be the same for a weightlifter also, may be the same for a boxer also.

So, basically are champions born or are champions made? What will happen to your heart rate when you take an exercise test that increases in intensity every minute, or at regular intervals? Does your heart rate remain steady? Does the heart rate increase? Does it increase and then plateau, or does it not increase at all? What changes occur in your muscles as a result of an endurance training program? Will it allow you to run faster over longer distances? What fuel; carbohydrate, fat, protein or something else is most important while running a marathon? All these are questions which exercise physiology attempts to answer. Let us talk about why performance analysis, and what is performance analysis? Basically, before you put an individual in a training program, you are supposed to do a pre-participation performance analysis. Once you do that, what will it help you with? It will help to identify strengths and weaknesses of the athlete. Once you put this athlete in a training program, you will know after you finish one phase of training, and you perform the next set of performance analysis, you will know whether the training program has been effective or not. So basically; to evaluate the effectiveness of a training program, you do performance analysis.

We do it to measure fitness levels after injury or after off-season. When we do a performance analysis, we get a lot of data regarding the motor qualities of the athlete, and we can suggest training modifications to the athlete and the coach. We can do something called race predictions with performance analysis. Any athlete who undergoes regular performance analysis is psychologically very well motivated to undergo the training program, and to compete after finishing the training program. We do performance analysis to find out what is the talent which is

present in the individual, and what discipline should we allocate to this individual, so that he is able to do well depending upon his native motor qualities.

Performance evaluations: When are these done? We do something called fitness evaluations, pre-competition or pre-team selection. We do a baseline pre-training testing to find out what motor areas or what motor qualities are weak in this individual. We can do endurance athlete testing to find out what are the motor qualities which the endurance athlete is strong or weak in.

We can do something called power athlete testing, which helps us to pinpoint which muscle of the athlete is weaker, and which needs to be strengthened. We can do something called a fuel analysis, which is more commonly done in endurance events; wherein, we can tell by the heart rate what fuel the athlete is burning. There is a complex equation which is to be used, but we can definitely pick up and tell the athlete and the coach that at this heart rate your athlete is burning carbs, at this heart rate your athlete is burning fat, or at this heart rate your athlete is burning a mix. We can do race predictions of endurance events with performance analysis, and performance evaluation. It is commonly done and can be very accurately predicted.

I would like to comment with a quote by Joe Friel from the Triathletes Training Bible. He says, "Testing is of no value unless the information gained is used to improve your training, or to confirm that you are training in an appropriate manner. If you are just testing for no reason and not utilizing the data for any meaningful purpose, there is no point in your testing and it has no value." That is our take home message from this lecture. Exercise physiology is the study of body responses to exercise.

Environmental physiology and sports physiology are logical extensions of exercise physiology. Research focuses on several key areas. Performance analysis answers vital questions, and different types of performance evaluations give useful data to the athlete and to the coach.

These are the references based on which I have prepared my lecture. I would strongly urge you to go through these references to gain more knowledge and more in-depth knowledge regarding the topics which have been covered in this lecture.

References:

Exercise Physiology: Theory and Application to Fitness and Performance, 10th Edition, Scott Powers, Edward Howley and John Quindry, 2018

Physiology of Sport and Exercise 5th Edition, W. Larry Kenney, Jack H. Wilmore, David L. Costill, 2011

I thank you for your time and patience ladies and gentlemen. Do note that we will be giving you an assignment which you will have to submit at the end of the week and be aware that most of the questions will be coming from whatever has been covered in the lectures.

Thank you ladies and gentlemen for your time and patience.

Thank you and Jai Hind.