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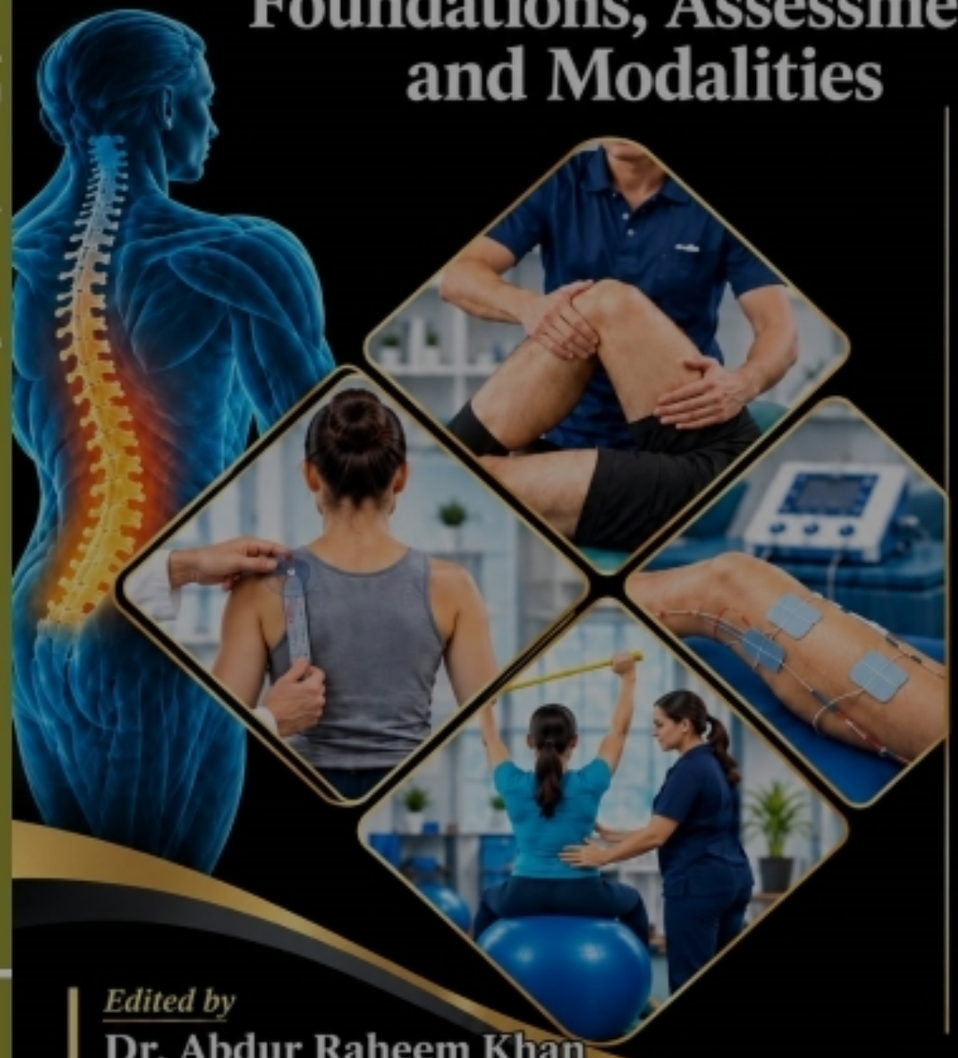
Principles and Practices of Physiotherapy

Edited by
Dr. Abdur Raheem Khan
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Principles and Practice *of* Physiotherapy:

Foundations, Assessment, and Modalities



FOUNDATIONS

ASSESSMENT

THERAPEUTIC EXERCISE

ELECTROTHERAPY & OTHER MODALITIES

FUNCTIONAL REHABILITATION

Edited by

Dr. Abdur Raheem Khan
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Chapter-4
Applied Human Physiology for Physiotherapists

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Abstract

Physiology provides the scientific foundation for understanding how the human body functions at rest, during physical activity, and in response to injury, disease, and rehabilitation. For physiotherapists, knowledge of physiology is essential because therapeutic exercise, functional training, manual therapy, respiratory interventions, cardiovascular rehabilitation, and sports rehabilitation all depend on the body's physiological responses and adaptations. Essential physiology for physiotherapy includes an understanding of homeostasis, neuromuscular function, cardiovascular and respiratory responses, energy metabolism, exercise responses, thermoregulation, autonomic control, and physiological adaptation to training. During exercise, the cardiovascular and respiratory systems increase oxygen delivery to active tissues, while skeletal muscle increases ATP production to meet metabolic demands. These responses are coordinated by neural, hormonal, and local mechanisms. Regular exercise can produce beneficial adaptations in cardiovascular fitness, muscle strength, metabolic efficiency, and autonomic regulation.

Physiological principles also help physiotherapists interpret clinical measurements such as heart rate, blood pressure, respiratory rate, oxygen saturation, perceived exertion, exercise tolerance, and recovery responses. Understanding normal physiological responses enables therapists to identify abnormal responses and modify exercise intensity appropriately. The application of physiology is therefore not limited to theoretical knowledge; it directly influences patient assessment, exercise prescription, monitoring, safety, and outcome evaluation. This chapter discusses the major physiological principles relevant to physiotherapy practice and explains their clinical significance in musculoskeletal, neurological, cardiopulmonary, geriatric, and sports rehabilitation.

Keywords: Physiology, homeostasis, exercise physiology, energy metabolism, neuromuscular function, rehabilitation.

1. Introduction

Physiology is the study of the normal functioning of the human body and its component systems. While anatomy describes the structure of the body, physiology explains how those structures function and interact. Physiotherapy is strongly dependent on physiological principles because rehabilitation aims to modify movement, restore physical capacity, improve function, and promote adaptation.

A patient performing therapeutic exercise experiences multiple physiological responses simultaneously. Heart rate increases to increase blood flow, ventilation rises to meet the increased demand for oxygen and removal of carbon dioxide, skeletal muscles increase ATP production, and the autonomic nervous system adjusts cardiovascular function. With repeated exercise, these acute responses can result in long-term adaptations [1,2].

The American College of Sports Medicine emphasizes physiological assessment and exercise prescription as important components of health and clinical exercise practice. Its current guidelines include exercise testing, physiological responses, exercise prescription, and considerations for cardiovascular, pulmonary, neurological, metabolic, and other clinical populations [1].

For physiotherapists, physiology is therefore important in three broad areas that is understanding the patient's current physiological condition, predicting responses to physical activity and therapeutic exercise and designing safe and effective rehabilitation programs.

2. Homeostasis and Its Important in Physiotherapy

Homeostasis refers to the body's ability to maintain a relatively stable internal environment despite changes occurring inside or outside the body. Important variables maintained within physiological ranges include body temperature, blood glucose, blood pressure, oxygen availability, carbon dioxide concentration, pH, and fluid balance. Homeostasis is maintained through regulatory mechanisms involving receptors, control centres, and effectors. The nervous and endocrine systems play major roles in coordinating these responses. During exercise, homeostasis is temporarily challenged. Muscle contraction increases energy consumption and metabolic activity. As a result, oxygen demand increases, carbon dioxide production rises, body temperature increases, and cardiovascular activity changes. The body responds by increasing cardiac output, ventilation, blood flow to active muscles, and heat dissipation [2,3]. For physiotherapists, understanding homeostasis is important because rehabilitation deliberately places controlled physiological stress on the body. The objective is to provide an adequate stimulus without exceeding the patient's physiological capacity.

For example, a patient with reduced cardiopulmonary reserve may develop excessive breathlessness or abnormal cardiovascular responses during exercise.