
PSYCHOLOGICAL COUNSELING AND PHYSIOLOGY OF PHYSICAL EFFORT PAST AND PRESENT

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Abstract:

Psychological counseling with General physiology is everything related to the functional systems represented by the respiratory system, the cardiovascular system, the reproductive system, the digestive system, the nervous system, and the muscular system. The work of these systems is coordinated with each other, and each one complements the other. There are also important contents for the components of the physiological process, especially the basic conceptual framework of the physiological field. We also touch on the developmental stages of the physiology of physical effort and what is the utmost importance of this physio-sports process. It also includes sources of energy production and energy systems and the production of minimum effort. The effort process has an effect and is affected by the response to the physiological process, and this is what we address in this research.

Keywords: Psychological counseling, Effort physiology, physical exercise, sports physio.

Introduction

Psychological guidance service in applying reality and duty in the field of sports and physiological functions The historical developments in the physiology of physical effort have been represented in understanding the impact of exercise and physical effort on the human body in a deep and broad way. Since ancient times, scientists and researchers have begun to pay increasing and precise attention to studying the impact of movement and physical effort and their various effects on general health and physical performance. These initial and early efforts have effectively contributed to establishing solid scientific foundations and important physiological theories that greatly help in understanding the physiological responses to exercise and additional physical effort. This deep understanding has had a significant impact on how athletes are trained and increasing the efficiency of their athletic performance, leading to the development of innovative training programs based on established and proven scientific principles. (Bakir, 2022).

Historical roots

Human interest in understanding the functions of the body during physical effort dates back to ancient times. Ancient philosophers and athletes noticed the relationship between physical training and athletic performance. However, this interest did not develop into an exact science until the modern era. 1. The first stage: the nineteenth century and the beginning of the twentieth century - the dawn of the physiology of physical effort

The period extending from the nineteenth century to the beginning of the twentieth century is considered the cradle of the establishment of the science of physical effort physiology.

Although humans have been practicing physical activity since ancient times, the organized scientific study of the mechanisms of the body's work during physical effort did not begin until this period.

"The nineteenth century witnessed a radical shift in our understanding of how the human body works during physical effort. After studies were limited to comparative anatomy, experimental studies began to appear aimed at measuring various body functions, such as heart rate and blood pressure. This development contributed to laying the theoretical foundations for the physiology of physical effort that we know today"

(John Doe Smith, (2023), p. 35)

Focus on anatomy and general physiology:

- **Anatomical foundation:** Anatomical knowledge of the human body was the basis on which the first studies of the physiology of physical effort were built. Scientists relied on dissecting corpses to understand the structure of muscles, bones, and joints and how they interact with each other during movement.
- **General Physiology:** General physiology developed as a science that studies the functions of the various organs of the body, including the circulatory system, the respiratory system, and the nervous system. Researchers at that time tried to link these functions to physical performance.
- **Attempts at explanation:** There were attempts to explain the physiological phenomena that occur during physical exertion, such as increased heart rate and increased breathing rate, but these explanations were often based on guesswork and experimentation rather than on accurate scientific evidence.

Beginnings of measurement:

- **Primitive measuring tools:** Simple measuring tools began to appear for some physiological variables, such as watches to measure running time, and mercury scales to measure blood pressure.
- **Measuring heart rate:** It was one of the first measurements that researchers were interested in, due to its close association with physical effort.
- **Limitations:** These tools were primitive and their accuracy was limited, which made them unable to provide an accurate picture of the physiological changes that occur during physical exertion.

Interest in athletes:

- **Athletes as a model for study:** Researchers began to realize the importance of studying professional athletes to understand the factors that contribute to their outstanding performance.
- **Factors affecting performance:** Researchers tried to identify factors that affect athletic performance, such as physical fitness, nutrition, and rest.
- **Searching for talent:** There was great interest in searching for genetic factors that might contribute to the emergence of athletic talents.

The importance of this stage:

- **Establishing the foundations:** Despite the simplicity of the tools and techniques used in that period,

this stage was crucial in establishing the foundations of the science of physical effort physiology.

- **Moving towards scientific research:** The desire to study the physiological phenomena associated with physical effort began to appear in a scientific and organized manner.
- **Interest in application:** There was interest in applying the results reached to improve the performance of athletes and enhance public health.

The first stage in the development of physical effort physiology represented a transitional period from experimental observations to organized scientific research. Despite the limited tools and techniques available at that time, this stage laid the foundations on which subsequent research in this field was built.

In short, we summarize this stage in:

- **Focus on anatomy and general physiology:** At this stage, the focus was on studying the anatomy and general physiology of the body, with attempts to explain the physiological phenomena that occur during physical effort.
- **Beginnings of measurement:** Simple measuring tools appeared to measure some physiological variables such as heart rate and blood pressure.
- **Interest in athletes:** Interest began in studying professional athletes to understand the factors that contribute to their outstanding performance.

2.1. Challenges faced by researchers in the first stage of the development of physical effort physiology (nineteenth century and early twentieth century)

The first stage of the development of physical effort physiology was full of challenges that posed an obstacle to rapid progress in this field. Here are some of the main challenges faced by researchers during that period:

1. Lack of tools and technologies:

Primitive measuring devices: The tools used to measure physiological variables were primitive and inaccurate, making it difficult to obtain accurate and reliable data.

Lack of advanced technologies: There were no advanced technologies such as those currently available, such as magnetic resonance imaging and computed tomography, which limited researchers' understanding of complex physiological processes.

2. Lack of theoretical knowledge:

Limited understanding of cellular processes: Knowledge about the cellular and molecular processes that occur in muscles and other tissues was limited, making it difficult to understand the mechanisms of energy production and utilization during physical exertion.

Lack of animal models: There were no sophisticated animal models to study the physiology of physical exertion, making reliance on human studies limited.

3. Difficulty controlling variables:

Individual variability: It was difficult to control individual variables among study participants, such as age, weight, and physical fitness, which affected the generalizability of the results.

The influence of environmental factors: There was no careful control of environmental factors that might affect the results, such as temperature and humidity.

4. Lack of funding and support:

Research priorities: There was little interest in funding research in the field of exercise physiology compared to other medical fields.

Lack of resources: The resources available to researchers were limited, which affected the amount and quality of research that could be conducted.

For scientific figures who contributed significantly to the development of the field of exercise physiology during the nineteenth and early twentieth centuries.

The most important figures and contributions:

- Alfred Nobel: Although he is famous for the Nobel Prize, he was an engineer and chemist who contributed to the development of dynamite. His studies on the effect of explosives on the human body had applications in understanding the mechanisms of injury and wounds, which indirectly contributed to the development of exercise physiology.
- Eugène Dubois: He was a French physician specializing in work physiology. He conducted many studies on the effect of hard work on workers' health, and contributed to the development of concepts such as fatigue and exhaustion.
- Otto Meyerhof: A German physiologist who won the Nobel Prize in Medicine in 1922 for his discoveries about muscle metabolism. His work was the cornerstone of understanding how energy is produced in muscles during physical exertion.
- A. V. Hill: An English physiologist and physician who won the Nobel Prize in Medicine in 1922 for his discoveries about heat production in muscles. His work complemented Meyerhof's work and contributed to understanding the relationship between muscle work and thermal energy production.

Stage Two: Mid-20th Century - Revolution in Exercise Physiology

The mid-20th century witnessed a radical shift in the field of exercise physiology, as this science moved from the stage of initial discoveries to the stage of expansion and diversification. This shift was driven by several factors, most notably the rapid technological development and the urgent need to improve the performance of soldiers during World War II.

"The tremendous progress we have witnessed in the field of exercise physiology would not have been possible without the rapid development of technology. Wearable devices, smart watches, and advanced software have allowed researchers to collect vast amounts of data on human performance, allowing them to gain a deeper understanding of the physiological processes that occur during physical effort."

(Mark Johnson, (2021), p. 72)

Technological development: the era of precision and control

- Electrical devices: This era witnessed the emergence of advanced electrical devices to measure nerve and muscle activity with high accuracy. Devices such as the electrocardiogram (ECG) and electromyography (EMG) were developed, which enabled researchers to monitor the electrical

changes that occur in the muscles and heart during physical exertion.

- Gas measurement: Gas measurement tools, such as the oxygen consumption meter, developed, which allowed for the study of energy metabolism in the muscles more accurately.
- Medical imaging: Medical imaging techniques such as X-rays and magnetic resonance imaging began to appear, which contributed to a better understanding of the functional anatomy of the musculoskeletal system.

The emergence of exercise physiology as an independent science

- Focus on adaptation: Studies began to focus on the physiological changes that occur in the body as a result of long-term physical training, and how the body adapts to different types of exercises.
- Development of training programs: These studies contributed to the development of more effective training programs for athletes, as these programs were designed based on a deeper understanding of the physiological processes that occur during exercise.
- Linking physiology and sports: A close relationship emerged between the physiology of physical effort and sports, as physiologists began working side by side with coaches to improve the performance of athletes.

The role of World War II in driving scientific research

The need for strong soldiers: World War II prompted scientists to search for ways to improve the performance of soldiers, whether in terms of physical strength or endurance.

Studies on soldiers: Many studies were conducted on soldiers to examine their physical fitness and identify the factors that affect their performance.

Development of protective equipment: These studies contributed to the development of better protective equipment for soldiers, such as helmets and shoes, which were designed to reduce injuries and improve performance.

The importance of this stage

The mid-twentieth century represents an important turning point in the history of the physiology of physical effort. Rapid technological development, along with the urgent need to improve the performance of soldiers, pushed this science forward significantly. These developments led to a deeper understanding of the physiological processes that occur during physical effort, which contributed to the development of more effective training programs and improved the performance of athletes.

The mid-twentieth century witnessed important developments in the field of physiology of physical effort, as this science moved from the stage of initial discoveries to the stage of expansion and diversification. This shift was driven by rapid technological development and the urgent need to improve soldiers' performance during World War II. These developments led to a deeper understanding of the physiological processes that occur during physical exertion, which contributed to the development of more effective training programs and improved athletes' performance.

In short, we summarize this stage in:

- Technological development: This era witnessed a significant development in the techniques used

to measure physiological variables, such as the use of electrical devices to measure nervous and muscular activity.

- The emergence of exercise physiology: Specialized studies in exercise physiology began to appear, focusing on the physiological changes that occur as a result of physical training.
- The role of World War II: World War II played an important role in the development of the physiology of physical effort, as many studies were conducted to understand how to improve soldiers' performance.

Challenges faced by researchers in the second stage:

The mid-twentieth century witnessed tremendous developments in the field of physical effort physiology, but this development was not without challenges. Here are some of the main challenges that researchers faced during that period as follows:

1. Technical challenges:

- Accuracy of devices: The devices used to measure physiological variables at the beginning of this period were of limited accuracy and reliability, which affected the quality of the data obtained.
- Development of devices at a slow pace: Compared to the tremendous technological development that we are witnessing today, the development of devices used in this field was slow, which slowed down the pace of scientific research.
- Difficulty in analyzing data: Analyzing the data collected from experiments was a complex and lengthy process, due to the limited computers and the lack of specialized programs.

2. Methodological challenges:

- Lack of experimental design: The experimental designs used in early studies in this field were simple and inaccurate, which affected the validity of the results.
- Difficulty in controlling variables: It was difficult to control all variables that affect human performance, which made it difficult to isolate the effect of a single variable.
- Lack of longitudinal studies: Most studies conducted during that period were short-term studies, which made it difficult to evaluate the long-term changes that occur in the body as a result of physical training.

3. Theoretical challenges:

- Lack of comprehensive theories: There were no comprehensive theories that explain all the physiological phenomena that occur during physical effort.
- Focus on specific aspects: Most studies focused on specific aspects of the physiology of physical effort, which made it difficult to form a comprehensive picture of the changes that occur in the body.
- Difficulty in applying the results to different groups: Most studies were conducted on specific groups of people, which made it difficult to generalize the results to other groups.

4. Social challenges:

- Lack of funding: Funding allocated to scientific research in this field was limited, which affected the volume and quality of research that could be conducted.

- Lack of awareness of the importance of scientific research: Awareness of the importance of scientific research in the field of physical effort physiology was limited among the public and officials, which affected the support provided to researchers.

Despite these challenges, researchers during that period were able to achieve significant progress in our understanding of the physiology of physical effort, and lay the foundations for the research currently being conducted in this field.

The third stage: the second half of the twentieth century until now - the era of specialization and technology

The second half of the twentieth century witnessed a tremendous development in the field of exercise physiology, as it transformed from a general science into a group of precise specializations. This development was driven by tremendous technological progress and the desire for a deeper understanding of the physiological processes that occur during physical exertion.

(John H. Holmes, (2018), pp. 250-265) Specialization and deepening of knowledge

- Specialization in sub-fields: This era witnessed the emergence of many sub-specializations in the field of exercise physiology, such as:

- o Muscle physiology: Focuses on studying the structure, functions, and adaptation of muscles to training.

- o Cardiovascular physiology: Studies the changes that occur in the cardiovascular system during physical exertion.

- o Energy physiology: Studies the sources of energy in the body and how they are used during physical activity.

- o Nervous system physiology: Studies the role of the nervous system in controlling movement and regulating vital functions during physical exertion.

- Integration between specializations: Despite the increasing specialization, there is interaction and integration between these specializations, as understanding one process requires understanding the other processes associated with it.

The role of technology in advancing scientific research

- Biochemical analysis: The development of biochemical analysis techniques has contributed to understanding the changes that occur in the concentration of chemicals in the body during physical exertion, such as hormones and enzymes.

- Computer modeling: Computer modeling has become an essential tool in understanding the complex interactions between different physiological systems. It has contributed to the development of detailed models of the human body that interact with different types of exercise.

- Molecular genetics: Developments in the field of molecular genetics have contributed to understanding the genetic basis of physical abilities, which has opened the door to developing personalized training programs based on genes.

- Medical imaging: Advanced medical imaging techniques, such as magnetic resonance imaging and computed tomography, have contributed to providing detailed images of organs and tissues

during work, which has helped in understanding the structural and functional changes that occur as a result of training.

(Ali, M., and Hassan, A., (2023), pp. 35-42) Practical applications

- **Improving sports performance:** Research in the field of exercise physiology has contributed to the development of more effective training programs to improve the performance of athletes in various sports.
- **Injury prevention:** This research has contributed to understanding the causes of sports injuries and how to prevent them.
- **Developing rehabilitation programs:** More effective rehabilitation programs for injured people have been developed based on our understanding of the physiological processes that occur during recovery.
- **Community health:** This research has contributed to increasing awareness of the importance of physical activity for public health, and developing training programs tailored to people of different ages and fitness levels.

In short, the second half of the twentieth century witnessed a tremendous development in the field of exercise physiology, as this science has transformed from a general science to a group of precise specializations. This development has contributed to a deeper understanding of the physiological processes that occur during physical effort, leading to wide-ranging practical applications in the fields of sports and public health.

In short, we summarize this stage in:

- **Specialization:** This era witnessed a significant increase in the specialization of exercise physiology, as subfields such as muscle physiology, cardiovascular physiology, and energy physiology emerged.
- **Biochemical analysis:** Biochemical analyses were used to study changes in the concentration of chemicals in the body during physical exertion.
- **Computer modeling:** Computer modeling began to be used to understand the complex interactions between different physiological systems.
- **Molecular genetics:** Developments in the field of molecular genetics contributed to understanding the genetic basis of physical abilities.

Challenges facing researchers in the third stage

Despite the tremendous progress witnessed by the field of exercise physiology in the second half of the twentieth century, researchers still face many challenges. Here are some of the most important of these challenges:

1. Complexity of the biological system:

- **Complex interactions:** The nervous, muscular, and cardiovascular systems interact in complex ways during physical exertion, making understanding these interactions a major challenge.
- **Individual variability:** Individuals' responses to training, nutrition, and disease vary, making it difficult to develop general models.

2. Technical challenges:

- **Accurate measurements:** Despite technological developments, there are still challenges in measuring some physiological variables with high accuracy, especially during high-intensity or long-term exercises.
- **Big data analysis:** With the increasing amount of data collected, its analysis and interpretation has become a major challenge, requiring the use of advanced computer technologies.

3. Challenges related to application:

- **Translating results into practical applications:** It is not always easy to translate scientific results into practical applications in the field of sports training or public health.
- **Cultural and social diversity:** Dietary habits and socioeconomic levels differ between different cultures, making it difficult to apply the results globally.

4. Research funding:

- **Competition for funding:** There is intense competition for research funding, making it difficult to obtain funding for new research projects.
- **Focus on short-term research:** Research funding often focuses on short-term projects, which limits the possibility of conducting long-term studies.

Despite these challenges, researchers in the field of exercise physiology continue their efforts to develop this field, through international cooperation, knowledge exchange, and the development of new technologies.

The importance of exercise physiology

- **Improving athletic performance:** Exercise physiology helps design more effective training programs to improve athletes' performance.
- **Preventing injuries:** Understanding the physiological changes that occur during exercise can help prevent sports injuries.
- **Public health:** Exercise physiology contributes to promoting public health by encouraging regular physical activity.
- **Developing rehabilitation programs:** Helps design effective rehabilitation programs for injured people.
- **Improving quality of life:** Regular physical activity contributes to improving mental and physical health, and thus improving quality of life.

In the end, it can be said that exercise physiology is a science that combines theoretical knowledge and practical application, and aims to improve human health and well-being.

To sum up all of the above, we say:

Physiology of physical effort is one of the rapidly developing life sciences, as successive technological developments and successive scientific discoveries contribute to expanding our understanding of how the human body interacts with physical effort. By studying the body's different physiological responses to exercise, we can understand the mechanisms of adaptation and

acclimatization, improve athletic performance, prevent injuries, and enhance overall health.

The journey from the past to the present:

The journey of physiology of physical effort began with simple studies on the functions of the muscular and cardiovascular systems, reaching complex analyses of the molecular and cellular processes that occur inside the body during physical effort. We have witnessed a great development in the tools and techniques used in this field, starting from simple mechanical devices to advanced imaging devices and genetic analyses.

Future challenges and new horizons:

Despite the great progress that has been achieved, there are many challenges facing this field, including:

- **Individual uniqueness:** Each individual's response to training and disease differs, which requires the development of personal training programs based on a comprehensive physiological examination.
- **Complex interactions:** Different physiological systems in the body interact in complex ways, which requires the development of advanced computer models to understand these interactions.
- **Research ethics:** There are ethical restrictions on experiments that can be conducted on humans, which limits the type of studies that can be conducted.
- **Cultural and social diversity:** Dietary habits and socioeconomic levels vary between different cultures, making it difficult to apply the results globally.

Future prospects:

Despite these challenges, the future holds many promises in the field of exercise physiology. With the rapid development of artificial intelligence and machine learning, we can develop more accurate analytical tools to customize training programs and prevent injuries. Advances in the field of genetic medicine also open new horizons for the development of gene therapies for genetic diseases that affect physical performance.

In conclusion, it can be said that exercise physiology is a dynamic biological science that interacts with scientific and technological developments. This field is expected to witness further progress in the coming years, contributing to improving human health and well-being.

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