

CHARACTERISTICS OF ATHLETICS

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ABSTRACT

Athletics, which is the basis of human physical achievements, includes many disciplines that test the limits of human capabilities. From sprinting to pole vaulting, the field of athletics studies the complex physiological, biomechanical, and psychological aspects that lead to performance and excellence. This article explores the scientific complexities that underpin different sports disciplines, highlighting the physiological adaptations, biomechanical principles, and mental strategies that shape athletic prowess.

Keywords: athletics, physiological adaptations, biomechanical principles, sports psychology, performance improvement

INTRODUCTION

As the epitome of human physical performance, athletics encompasses a variety of disciplines that attract audiences around the world. Whether it's the explosive power of sprinters, the endurance of marathoners, or the precision of gymnasts, every sport demonstrates the incredible capabilities of the human body and mind. Behind these amazing advances lie many scientific principles that guide performance, training and injury prevention.

Physiological adaptations in athletics:

At the core of athletic performance are complex physiological adaptations that occur in response to training stimuli. Endurance athletes have increased cardiovascular efficiency, characterized by increased stroke volume, cardiac output, and oxygen uptake. In contrast, strength athletes such as sprinters demonstrate high-twitch muscle fiber recruitment and anaerobic capacity, providing rapid bursts of energy. Understanding these physiological adaptations is essential for developing training programs tailored to the demands of specific sports.

Physiological adaptations in athletics are fundamental to understanding and optimizing athletic performance across disciplines. Athletes undergo complex physiological changes in response to training stimuli, shaping their capabilities and performance outcomes. Strength athletes such as endurance athletes and sprinters exhibit specific physiological adaptations that are fine-tuned to meet the specific demands of their sport.

Endurance athletes, distinguished by their ability to withstand long-term physical exertion, demonstrate remarkable adaptations of the cardiovascular system. These adaptations include an increase in stroke volume, which refers to the amount of blood pumped by the heart with each beat, and an increase in cardiac output, the amount of blood pumped by the heart per minute. In addition, endurance athletes exhibit higher oxygen uptake efficiency, which allows their muscles to use oxygen more efficiently during sustained activity. These cardiovascular adaptations are critical to sustaining long-term physical activity while maintaining optimal performance.

On the other hand, strength athletes such as sprinters and powerlifters rely on bursts of energy and high-intensity movements. Sprinters have a particular preference for fast-twitch muscle fibers, which are specialized for fast, powerful contractions. These athletes also have high anaerobic capacity, which allows them to generate energy quickly without relying on oxygen consumption. By tapping into their high-twitch muscle fibers and anaerobic energy systems, sprinters can achieve rapid acceleration and maintain maximal power over short distances.

Understanding these specific physiological adaptations of endurance and strength athletes is important in developing effective training programs tailored to the demands of specific sports. While endurance training regimens focus on increasing cardiovascular efficiency, aerobic capacity, and endurance performance, strength training programs for sprinters prioritize the development of explosive power, muscular strength, and anaerobic capacity. By tailoring training strategies to the physiological demands of each sport, coaches and athletes can optimize performance, reduce the risk of injury, and achieve peak athletic performance.

Biomechanical principles in athletic movement:

The biomechanics of athletic movement play a critical role in optimizing performance and reducing the risk of injury. From the angle of foot strike in running to the trajectory of a javelin throw, every athletic movement is governed by biomechanical principles that determine efficiency and effectiveness. Coaches and athletes can analyze the forces, moments, and mechanisms involved in athletic movements and improve technique to improve performance. Biomechanical principles in athletic movement are essential to maximize performance, increase efficiency, and reduce the risk of injury in a variety of sports disciplines. Whether it's the accuracy of a foot strike in running or the trajectory of a javelin throw, every athletic movement is intricately governed by biomechanical principles that demand optimal execution and efficiency.

Analyzing the biomechanics of athletic movements involves understanding the interactions of forces, moments, and mechanical principles that affect performance. By analyzing movement mechanics, coaches and athletes can identify areas of improvement, improve technique, and optimize performance. Some basic biomechanical considerations in athletics:

1. Foot strike while running:

- Foot strike angle and position during running significantly affects performance and injury risk.
- Correct foot strike mechanics can improve running efficiency, reduce ground reaction forces and reduce the risk of overuse injuries.
- Coaches and athletes can analyze foot strike to optimize running technique and stride efficiency.

2. Shooting mechanics:

- In sports such as the javelin, shot put, or discus, trajectory and release mechanics are critical to achieving maximum distance and accuracy.
- Understanding the optimal release angle, arm placement and follow-through can improve throwing efficiency.

- Biomechanical analysis of throwing movements helps athletes improve their technique and generate greater power and speed.

3. Jumping and landing technique:

- Jumping and landing biomechanics are very important in sports such as long jump, high jump and basketball.

- Proper jump mechanics involve maximizing takeoff power, maintaining optimal body position in the air, and executing a safe and efficient landing.

- By studying the forces involved in jumping and landing, athletes can improve their vertical jump, reduce joint forces, and prevent injuries.

4. Mechanics of the swimming stroke:

- Swimming relies on efficient stroke mechanics to minimize drag in the water and maximize movement.

- Analyzing the entry, catch, pull and kick phases of swimming strokes can help swimmers improve stroke efficiency and speed.

- Biomechanical feedback can help swimmers adjust their technique to achieve optimal hydrodynamic performance.

By integrating biomechanical principles into training and technique improvement, coaches and athletes can unlock opportunities to improve performance and prevent injury. By analyzing movement mechanics in detail, athletes can fine-tune their skills, optimize performance, and push the boundaries of athletic excellence in their respective disciplines. Embracing biomechanics as the foundation of athletic development can lead to significant gains in performance and overall athletic success.

Mental Strategies and Sports Psychology:

In addition to the physical field, sports psychology plays an important role in the formation of sports performance. Mental strategies such as goal setting, visualization, and arousal regulation can increase focus, confidence, and resilience in a competitive environment. Athletes who master the psychological aspects of sports can use their mental toughness to overcome adversity, manage pressure, and perform to their full potential on the field.

SUMMARY

Athletics, which is a combination of science and art, allows for a deep study of the capabilities of the human body and mind. By uncovering the physiological, biomechanical, and psychological intricacies of athletic performance, researchers, coaches, and athletes can unlock new frontiers of excellence and push the boundaries of human potential. As we delve deeper into the scientific underpinnings of athletics, we continue to gain a greater appreciation for the remarkable achievements of individuals who dare to dream, strive for greatness, and redefine the boundaries of human achievement.

In conclusion, the physiological adaptations observed in endurance and strength athletes highlight the human body's remarkable ability to adapt to and excel in a variety of athletic activities. By studying the subtleties of cardiovascular efficiency, muscle recruitment, and

energy utilization systems, researchers and coaches can unlock the secrets to improving athletic performance and pushing the limits of human potential in the world of athletics.

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