Professional Master's Degree

High Performance in Sports

Endorsed by the NBA

tech technological university

tech technological university

Professional Master's Degree

High Performance in Sports

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/in/sports-science/professional-master-degree/master-high-performance-sports

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01

Introduction

In this program in High Performance in Sports the student will have the appropriate knowledge to be able to enter the world of high-performance training with the certainty of having all the information and skills necessary to achieve their goals successfully.

The student will be highly qualified to work both in time and mark sports as well as in situational sports, which opens a wide range of possibilities for his or her labor insertion.

The complete and up-to-date information provided by this program will give the student a privileged position in front of his peers by being able to approach sports performance from the highest level in terms of physiology, statistics, nutrition and assessment.

This Professional Master's Degree is essential for professionals who want to achieve success in the world of sports performance"

In this Professional Master's Degree, you will find detailed training on key aspects of sports performance, treated with a unique didactic and depth in the current academic offer.

Each module will be taught by true specialists in the field, which guarantees the highest level of knowledge in the subject.

This Professional Master's Degree in High Performance in Sports TECH will provide the student in each module theoretical content of the highest quality and depth as can be the modules of Physiology, which will provide unique tools when it comes to understanding the "why" to achieve a correct interpretation of the data obtained through the module of Statistics, applied to High Performance in Sports to use what they learned in the assessment module. This is just a clear example of how in our program each module was designed based on building a logical and orderly knowledge on the part of the student for a better understanding and in turn a greater assimilation of the contents to be able to apply a successful intervention at a practical level.

One of the characteristics that differentiate this program from others is the relationship between the different topics of the modules at a theoretical level, but above all at a practical level so that the student obtains real examples of teams and athletes of the Highest Sports Performance worldwide, as well as from the professional world of sports, resulting in the student being able to build knowledge in the most complete way.

Another strong point of this Professional Master's Degree in High Performance is the training of students in the use of new technologies applied to Sports Performance. At this point the student will not only learn about the new technology in the field of performance, but will learn how to use it and, more importantly, how to interpret the data provided by each device and thus make better decisions in terms of training programming.

The teaching team of this Professional Master's Degree in High Performance in Sports has carefully selected each of the topics of this training to offer the student a study opportunity as complete as possible and always linked to current events.

Thus, at TECH we have set out to create contents of the highest teaching and educational quality that will turn our students into successful professionals, following the highest quality standards in teaching at an international level. Therefore, we show you this Professional Master's Degree with a rich content that will help you reach the elite of High Performance in Sports.

This **Professional Master's Degree in High Performance in Sports** contains the most complete and up-to-date scientific program on the market. The most important features include

- The development of numerous case studies presented by specialists in High Performance in Sports training
- The graphic, schematic and practical contents of the course are designed to provide all the essential information required for professional practice
- Exercises where the self-assessment process can be carried out to improve learning
- The interactive algorithm-based learning system for decision making
- Its special emphasis on innovative personal training methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

Immerse yourself in the study of this high-level Professional Master's Degree and improve your skills in High Performance in Sports"

This Professional Master's Degree, is the best investment you can make in the selection of a refresher program for two reasons: in addition to bringing your knowledge as a personal trainer up to date, you will obtain a certificate from TECH Technological University"

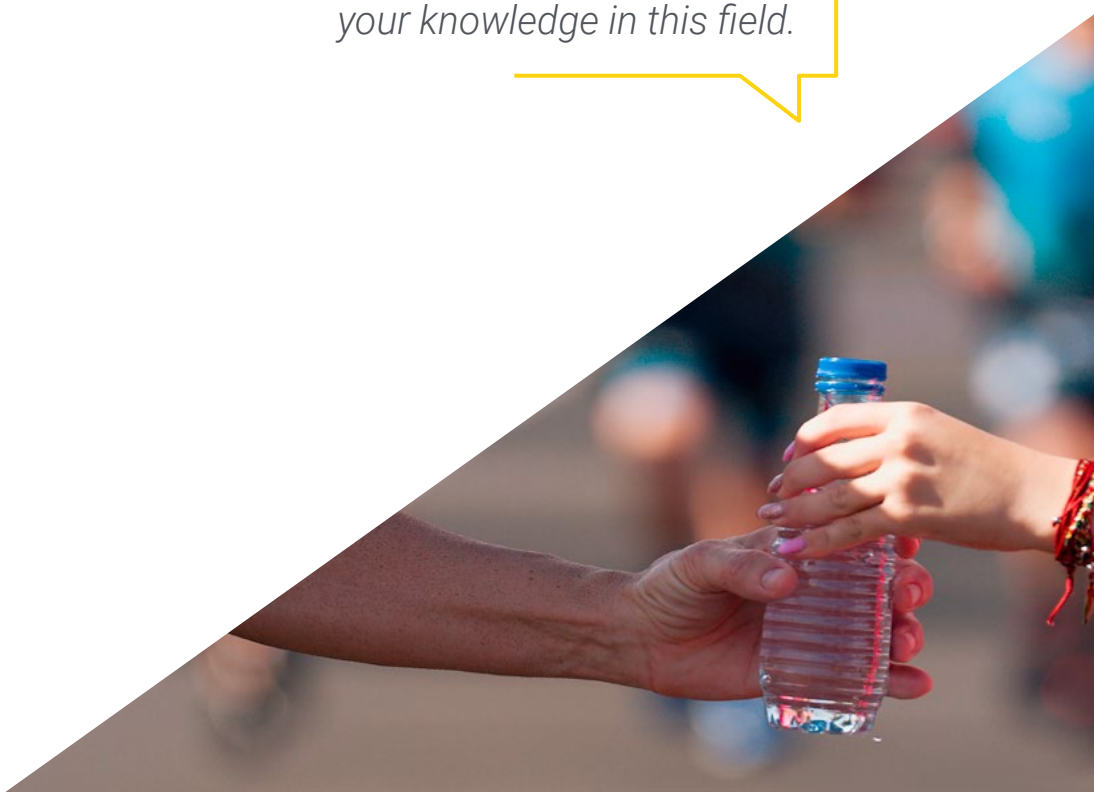
This Professional Master's Degree offers training in simulated environments, which provides an immersive learning experience designed to train for real-life situations.

This 100% online master's degree will allow you to combine your studies with your professional work while increasing your knowledge in this field.

The teaching staff includes professionals from the field of sports science, who bring their experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive training programmed to train in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the program. For this purpose, the professional will be assisted by an innovative interactive video system created by renowned and experienced experts in High Performance in Sports with extensive experience.



02

Objectives

The main objective of this program is to conduct theoretical and practical learning, so that the sports science professional can master in a practical and rigorous way the novelties in High Performance in Sports.

Our goal is to achieve academic excellence and help you achieve professional success. Don't hesitate any longer and join us”

General Objectives

- Master and apply with certainty the most current training methods to improve sports performance
- Effectively master statistics and thus be able to make correct use of the data obtained from the athlete, as well as initiate research processes
- Acquire knowledge based on the most current scientific evidence with full applicability in the practical field
- Master all the most advanced methods of sports performance assessment
- Master the principles governing Exercise Physiology, as well as Biochemistry
- Master the principles governing Biomechanics applied directly to Sports Performance
- Master the principles governing Nutrition applied to sports performance
- Successfully integrate all the knowledge acquired in the different modules in real practice

Specific Objectives

Module 1. Exercise Physiology and Physical Activity

- Specialize and interpret key aspects of biochemistry and thermodynamics
- Gain in-depth knowledge of the energy metabolic pathways and their exercise-mediated modifications and their role in human performance
- Learn key aspects of the neuromuscular system, motor control and its role in physical training
- In-depth knowledge of muscle physiology, the process of muscle contraction and the molecular basis of this process
- Specialize in the functioning of the cardiovascular and respiratory systems and oxygen utilization during exercise
- Interpret the general causes of fatigue and impact in different types and modalities of exercise
- Interpret the different physiological milestones and their application in practice

Module 2. Statistics Applied to Performance and Research

- Develop the ability to analyze data collected in the laboratory and in the field through various assessment tools
- Describe the different types of statistical analysis and their application in various situations for the understanding of phenomena that occur during training
- Develop strategies for data exploration to determine the best models to describe them
- Establish the generalities of predictive models through regression analysis that favor the incorporation of different units of analysis in the training field
- Generate the conditions for the correct interpretation of results in different types of research

Module 3. Strength Training, from Theory to Practice

- Correctly interpret all theoretical aspects defining strength and its components
- Master the most effective strength training methods
- Develop sufficient criteria to be able to support the choice of different training methods in their practical application
- Be able to objectify the strength needs of each athlete
- Master the theoretical and practical aspects that define power development
- Correctly apply strength training in the prevention and rehabilitation of injuries

Module 4. Speed Training, from Theory to Practice

- Interpret the key aspects of speed and change of direction technique
- Compare and differentiate the speed of situational sport with respect to the track and field model
- Incorporate elements of observational judgment, a technique that allows discrimination of errors in the mechanics of the race and the procedures for their correction
- Become familiar with the bioenergetic aspects of single and repeated sprinting and how they relate to the training processes
- Differentiate the mechanical aspects that may influence performance impairment and injury-producing mechanisms in sprinting
- Apply in an analytical way the different means and methods of training for the development of the different phases of speed
- Program speed training in situational sports

Module 5. Endurance Training from Theory to Practice

- Study the different adaptations generated by aerobic endurance
- Apply the physical demands of situational sports
- Select the most appropriate tests to evaluate, monitor, tabulate and fractionate aerobic workloads
- Carry out the different methods to organize training sessions
- Design training sessions taking into account the sport

Module 6. Mobility: from Theory to Performance

- Approach mobility as a basic physical capacity from a neurophysiological perspective
- Have a deep understanding of the neurophysiological principles that affect the development of mobility
- Apply stabilizing and mobilizing systems within the movement pattern
- Unpack and specify the basic concepts and objectives related to mobility training
- Develop the ability to design tasks and plans for the development of manifestations of mobility
- Apply the different methods of performance optimization through recovery methods
- Develop the ability to carry out a functional and neuromuscular assessment of the athlete
- Recognize and address the effects produced by an injury at the neuromuscular level in the athlete

Module 7. Sports Performance Assessment

- Become familiar with different types of assessment and their applicability to the field of practice
- Select the most appropriate tests for your specific needs
- Correctly and safely administer the protocols of the different tests and the interpretation of the data collected
- Apply different types of technologies currently used in the field of exercise assessment, whether in the field of health and fitness performance at any level of demand

Module 8. Planning applied to High Performance in Sports

- Understand the internal logic of planning, such as its proposed core models
- Apply the Dose-Response concept in training
- Clearly differentiate the impact of programming with planning and its dependencies
- Acquire the ability to design different planning models according to the work reality
- Apply the concepts learned in an annual and/or multi-year planning design

Module 9. Biomechanics applied to High Performance in Sports

- Specialize in the principles of Biomechanics oriented to physical education and Sport
- Apply the basic knowledge and technologies of biomechanics as a function of physical education, sport, performance and daily life
- Value the importance of protocols and the different types of biomechanical evaluation as a fundamental factor in the process of sports development and assessment
- Develop critical and analytical thinking that will allow him/her to generate innovative protocols and procedures, with different types of technology

Module 10. Nutrition applied to High Performance in Sports

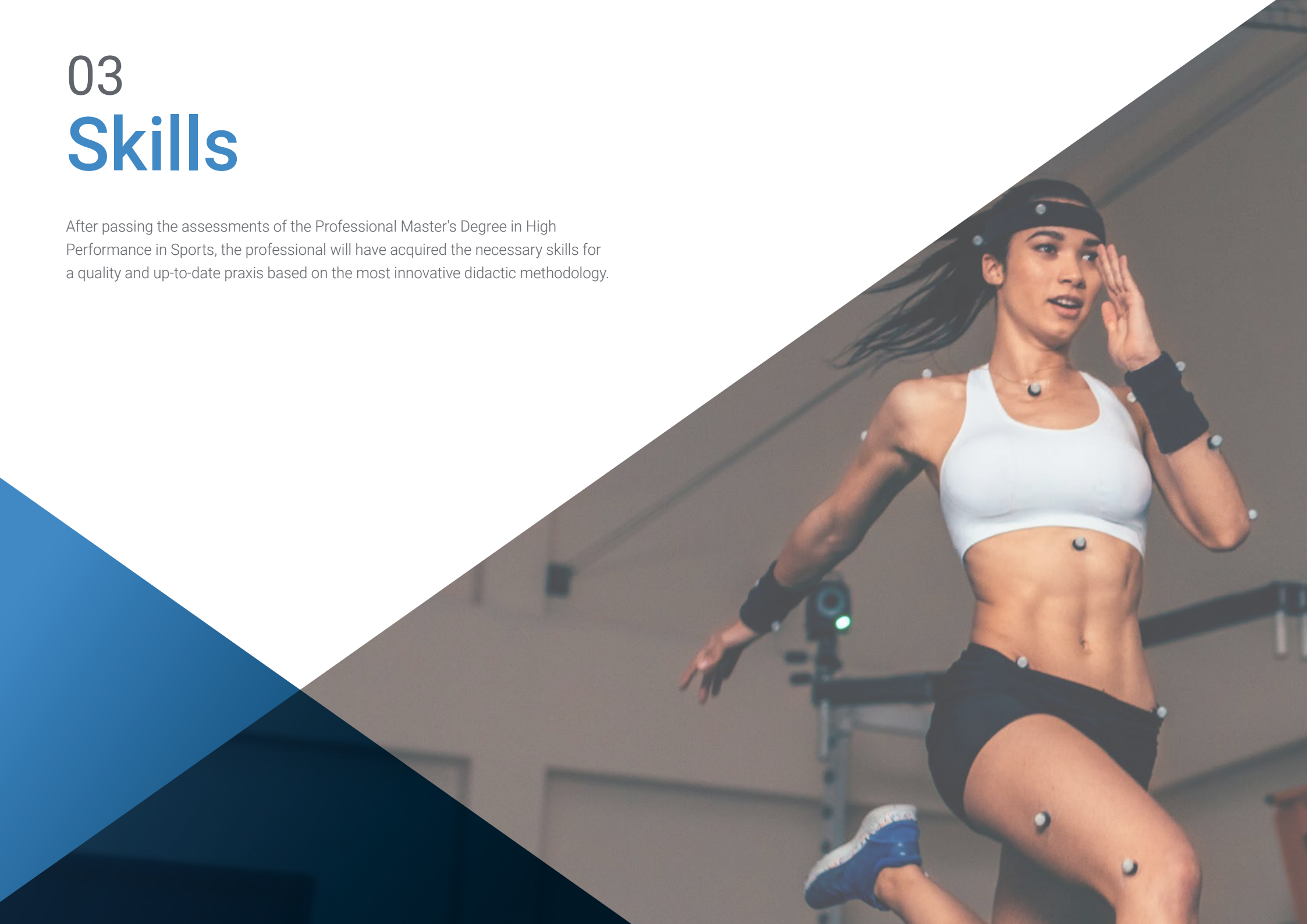
- Learn the physiological and biochemical bases of energy metabolism during physical exertion
- Learn the processes and methods of nutritional evaluation of the athlete, as well as his body composition
- Learn the different options to assess the athlete's energy expenditure
- Learn all the variables regarding nutrition in sports disciplines of very different characteristics
- Familiarize yourself with the latest scientific evidence on sports supplementation
- Handle the nutritional aspects that are associated with eating disorders and sports injuries

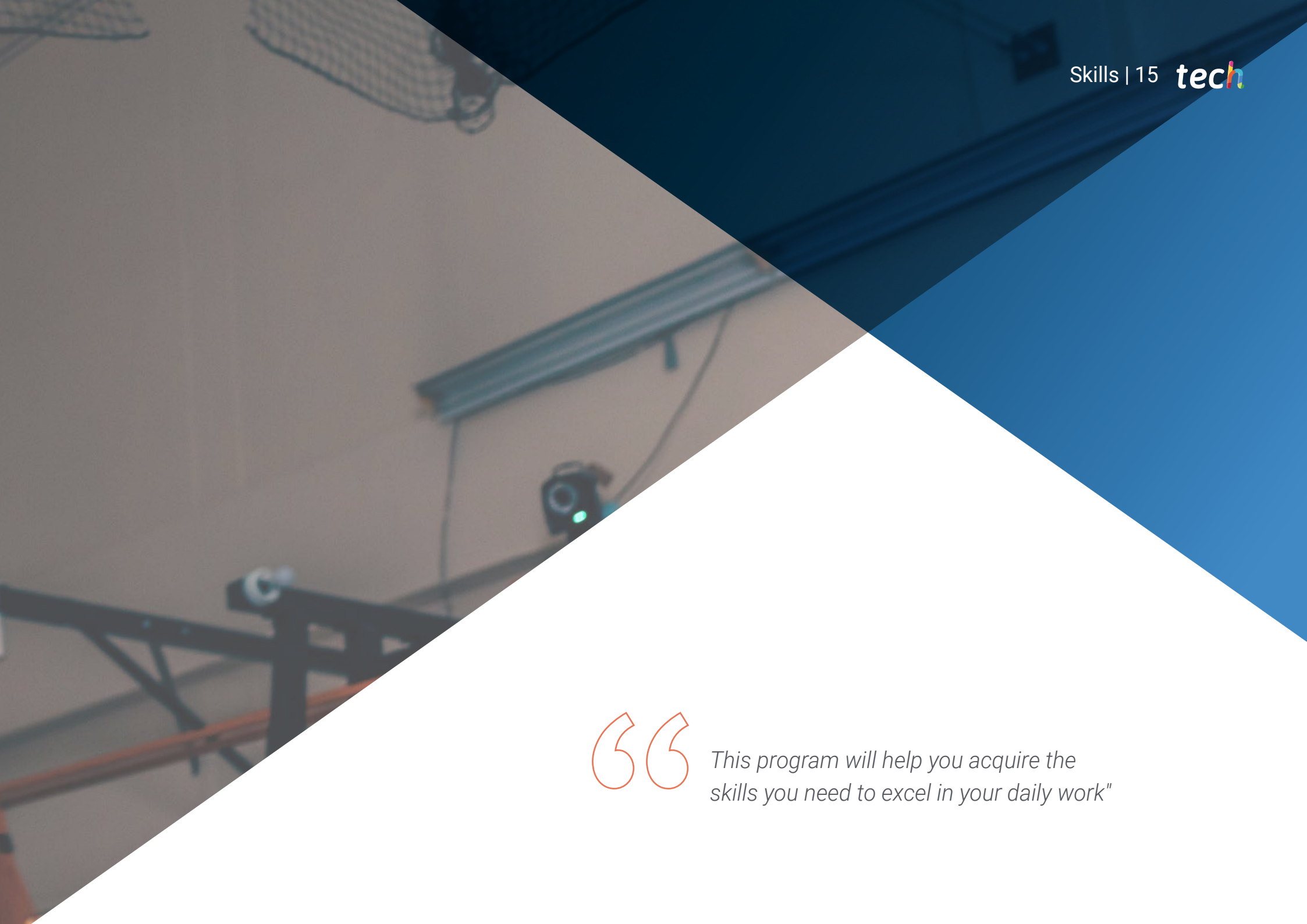
The sports field requires trained professionals, and we give you the keys to position yourself among the professional elite"

03

Skills

After passing the assessments of the Professional Master's Degree in High Performance in Sports, the professional will have acquired the necessary skills for a quality and up-to-date praxis based on the most innovative didactic methodology.





This program will help you acquire the skills you need to excel in your daily work"

General Skills

- Acquire knowledge based on the most current scientific evidence with full applicability in the practical field
- To master all the most advanced methods of sports performance evaluation

Increase your skills with our high-quality training and give your career a boost"

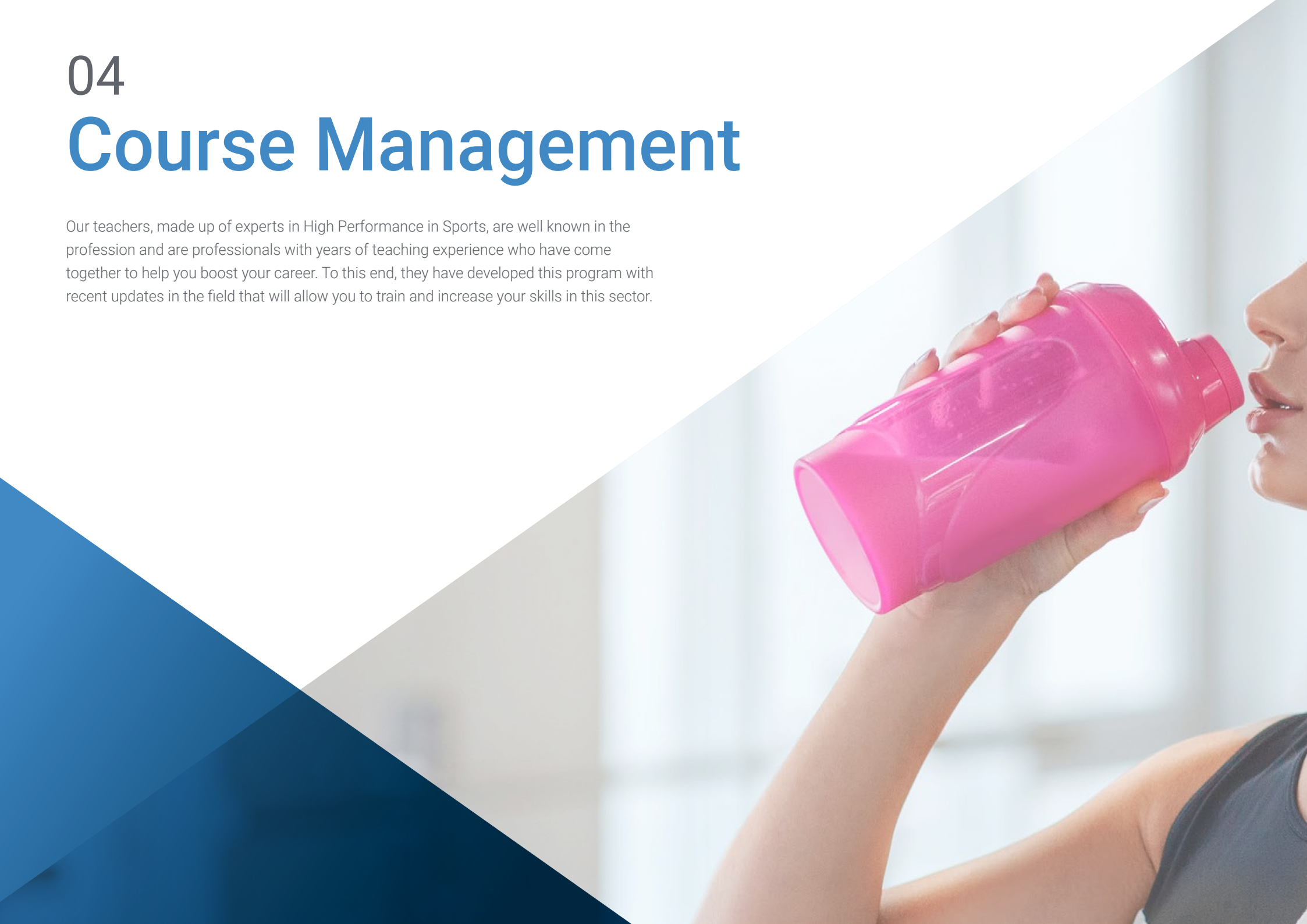
Specific Skills

- Learn key aspects of the neuromuscular system, motor control and its role in physical training
- Describe the different types of statistical analysis and their application in various situations for the understanding of phenomena that occur during training
- Correctly interpret all theoretical aspects defining strength and its components
- Incorporate elements of judgment of technical observation that make it possible to discriminate errors in the mechanics of the race and the procedures for their correction
- Select the most appropriate tests to evaluate, monitor, tabulate and fractionate aerobic workloads
- Apply stabilizing and mobilizing systems within the movement pattern
- Unpack and specify the basic concepts and objectives related to mobility training
- Correctly and safely administer the protocols of the different tests and the interpretation of the data collected
- Apply the concepts learned in an annual and/or multi-year planning design
- Apply the basic knowledge and technologies of biomechanics as a function of physical education, sport, performance and daily life
- Handle the nutritional aspects that are associated with eating disorders and sports injuries

04

Course Management

Our teachers, made up of experts in High Performance in Sports, are well known in the profession and are professionals with years of teaching experience who have come together to help you boost your career. To this end, they have developed this program with recent updates in the field that will allow you to train and increase your skills in this sector.



Learn from the best professionals and become a successful professional yourself”

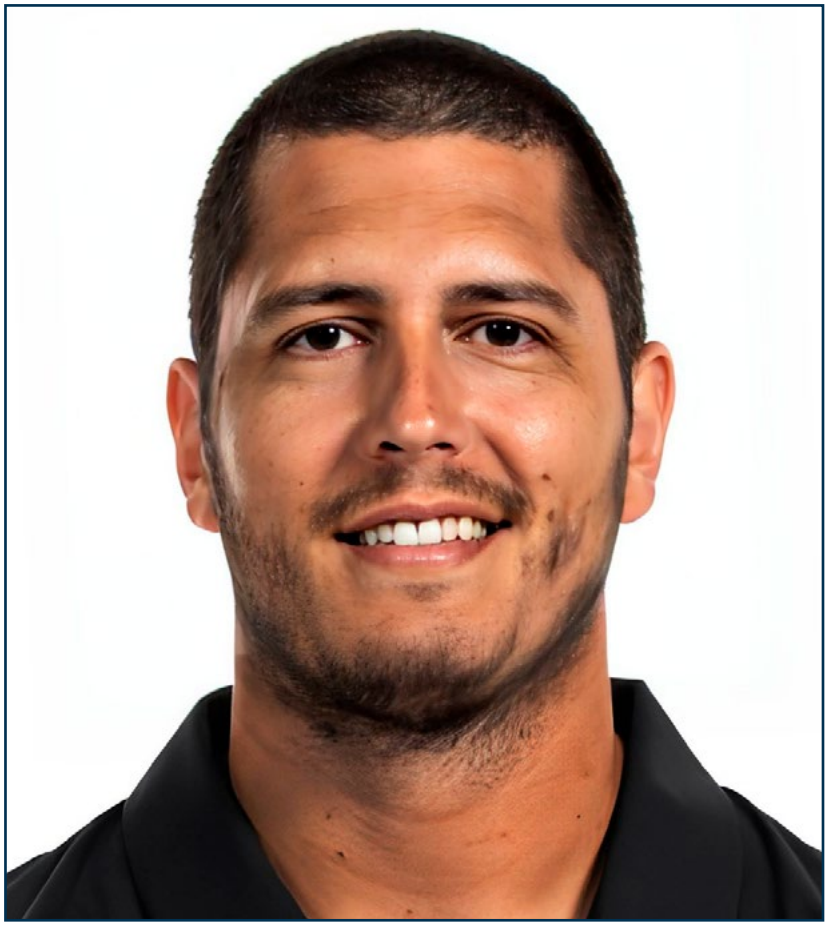
International Guest Director

Tyler Friedrich, Ph.D., is a leading personality in the international field of Sports Performance and Applied Sports Science. With a strong academic background, he has demonstrated an exceptional commitment to excellence and innovation, and has contributed to the success of numerous elite athletes internationally.

Throughout his career, Tyler Friedrich has deployed his expertise in a wide range of sporting disciplines, from football to swimming, volleyball to field hockey. His work in performance data analysis, especially through the Catapult athlete GPS system, and his integration of sports technology into performance programs, has established him as a leader in athletic performance optimization.

As Director of Sports Performance and Applied Sports Science, Dr. Friedrich has led strength and conditioning training, as well as the implementation of specific programs for several Olympic sports, including volleyball, rowing and gymnastics. Here, he has been responsible for integrating equipment services, sports performance in soccer and sports performance in Olympic sports. In addition, incorporating DAPER sports nutrition within an athlete performance team.

Also certified by USA Weightlifting and the National Strength and Conditioning Association, he is recognized for his ability to combine theoretical and practical knowledge in the development of high performance athletes. In this way, Dr. Tyler Friedrich has left an indelible mark on the world of Sports Performance, being an outstanding leader and driver of innovation in his field.

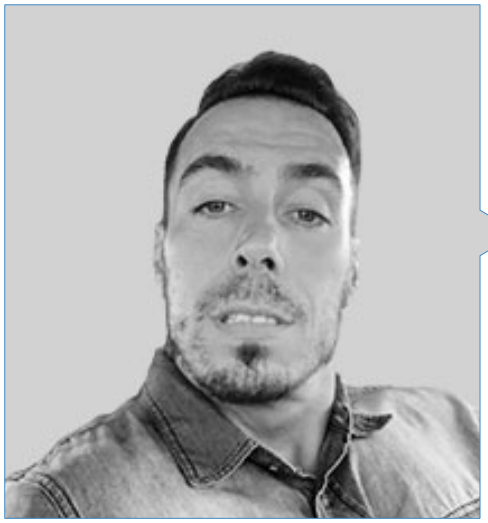


Dr. Friedrich, Tyler

- Director of Sports Performance and Applied Sports Science at Stanford University
- Sports Performance Specialist
- Associate Director of Athletics and Applied Performance at Stanford University
- Director of Olympic Sport Performance at Stanford University
- Sports Performance Coach at Stanford University
- Ph.D. in Philosophy, Health and Human Performance from Concordia University Chicago
- Master of Science in Exercise Science from the University of Dayton
- Bachelor of Science, Exercise Physiology from the University of Dayton

Thanks to TECH, you will be able to learn with the best professionals in the world"

Management



Mr. Rubina, Dardo

- CEO of Test and Training
- EDM Physical Training Coordinator
- Physical Trainer of the EDM First Team
- Master's Degree in ARD COE
- EXOS CERTIFICATION
- Specialist in Strength Training for the Prevention of Injuries, Functional and Physical-Sports Rehabilitation
- Specialist in Strength Training Applied to Physical and Sports Performance
- Certification in Weight Management and Physical Performance Technologies
- Postgraduate course in Physical Activity in Populations with Pathologies
- Diploma in Advanced Studies (DAS) University of Castilla La Mancha
- PhD in ARD

Professors

Añon, Pablo
- Master's Degree in ARD COE, CSCS - NASCA
- Physical trainer of the National Volleyball team that will attend the next Olympic Games

Carbone, Leandro
- Specialist in exercise physiology, Msc Strength and Conditioning, CSCS- NASCA, CISSN- ISSN
- Collaborator with Olympic athletes

Díaz Jareño, Juan
- Master's Degree in Physical Preparation in Soccer
- Master's Degree in Secondary Education Teaching
- Postgraduate course in personal training specialist

Del Rosso, Sebastián
- Doctor in Health Sciences
- Master's Degree in Physical Education
- Reviewer of scientific publications

García, Gastón
- Degree in Physical Education
- Endurance Training Specialist
- Lecturer in many congresses and symposiums

Masse, Juan
- Director of the Athlos study group
- Physical trainer for several professional soccer teams in South America, experienced teacher

Represas, Gustavo
- Master's Degree in ARD COE, PhD in ARD
- Head of the Biomechanics Laboratory at CAR from 1993 to the present

Vaccarini, Adrián
- Degree specialized in Sportology
- Head of the Applied Sciences Department of the Peruvian soccer federation
- Physical trainer of the Peruvian National Soccer Team (present in the last World Cup)

Ms. González Cano, Henar
- Professor of Nutrition and Body Composition, National School of Strength and Fitness (ENFAF).
- Nutritionist and Anthropometrist of GYM SPARTA
- Nutritionist and Anthropometrist at Promentium Center
- Graduate in Human Nutrition and Dietetics, University of Valladolid
- Master's Degree in Nutrition in Physical Activity and Sport, Catholic University San Antonio de Murcia

05

Structure and Content

The structure of the contents has been designed by a team of professionals knowledgeable about the implications of training in daily practice, aware of the importance of the current relevance of quality specialization in the field of High Performance in Sports and committed to quality teaching through new educational technologies.

We have the most complete and up-to-date scientific program on the market. We want to provide you with the best training"

Module 1 Exercise Physiology and Physical Activity

1.1. Thermodynamics and Bioenergetics
- 1.1.1. Definition
- 1.1.2. General Concepts
  - 1.1.2.1. Organic Chemistry
  - 1.1.2.2. Functional Groups
  - 1.1.2.3. Enzymes
  - 1.1.2.4. Coenzymes
  - 1.1.2.5. Acids and Bases
  - 1.1.2.6. PH

1.2. Energy Systems
- 1.2.1. General Concepts
  - 1.2.1.1. Capacity and Power
  - 1.2.1.2. Cytoplasmic Vs. Mitochondrial
- 1.2.2. Phosphagen Metabolism
  - 1.2.2.1. ATP - PC
  - 1.2.2.2. Pentose Pathway
  - 1.2.2.3. Nucleotide Metabolism
- 1.2.3. Carbohydrate Metabolism
  - 1.2.3.1. Glycolysis
  - 1.2.3.2. Glycogenogenesis
  - 1.2.3.3. Glycogenolysis
  - 1.2.3.4. Gluconeogenesis
- 1.2.4. Lipid Metabolism
  - 1.2.4.1. Bioactive Lipids
  - 1.2.4.2. Lipolysis
  - 1.2.4.3. Beta-oxidation
  - 1.2.4.4. De Novo Lipogenesis
- 1.2.5. Oxidative Phosphorylation
  - 1.2.5.1. Oxidative Decarboxylation of Pyruvate
  - 1.2.5.2. Krebs Cycle
  - 1.2.5.3. Electron Transport Chain
  - 1.2.5.4. ROS
  - 1.2.5.5. Mitochondrial Cross-talk

1.3. Signaling Pathways
- 1.3.1. Second Messengers
- 1.3.2. Steroid Hormones
- 1.3.3. AMPK
- 1.3.4. NAD+
- 1.3.5. PGC1

1.4. Skeletal Muscle
- 1.4.1. Structure and Function
- 1.4.2. Fibers
- 1.4.3. Innervation
- 1.4.4. Muscle Cytoarchitecture
- 1.4.5. Protein Synthesis and Breakdown
- 1.4.6. mTOR

1.5. Neuromuscular Adaptations
- 1.5.1. Motor Unit Recruitment
- 1.5.2. Synchronization
- 1.5.3. Neural Drive
- 1.5.4. Golgi Tendon Organ and Neuromuscular Spindle

1.6. Structural Adaptations
- 1.6.1. Hypertrophy
- 1.6.2. Mechano Signal Transduction
- 1.6.3. Metabolic Stress
- 1.6.4. Muscle Damage and Inflammation
- 1.6.5. Changes in Muscular Architecture

1.7. Fatigue
- 1.7.1. Central Fatigue
- 1.7.2. Peripheral Fatigue
- 1.7.3. HRV
- 1.7.4. Bioenergetic Model
- 1.7.5. Cardiovascular Model
- 1.7.6. Thermoregulator Model
- 1.7.7. Psychological Model
- 1.7.8. Central Governor Model

1.8. Maximum Oxygen Consumption
- 1.8.1. Definition
- 1.8.2. Assessment
- 1.8.3. VO2 Kinetics
- 1.8.4. VAM
- 1.8.5. Running Economics

1.9. Thresholds
- 1.9.1. Lactate and Ventilatory Threshold
- 1.9.2. MLSS
- 1.9.3. Critical Power
- 1.9.4. HIIT and LIT
- 1.9.5. Anaerobic Speed Reserve

1.10. Extreme Physiological Conditions
- 1.10.1. Height
- 1.10.2. Temperature
- 1.10.3. Diving

Module 2 Statistics Applied to Performance and Research

2.1. Notions of Probability
- 2.1.1. Simple Probability
- 2.1.2. Conditional Probability
- 2.1.3. Bayes' Theorem

2.2. Probability Distributions
- 2.2.1. Binomial Distribution
- 2.2.2. Poisson distribution
- 2.2.3. Normal Distribution

2.3. Statistical Inference
- 2.3.1. Population Parameters
- 2.3.2. Estimation of Population Parameters
- 2.3.3. Sampling Distributions Associated with the Normal Distribution
- 2.3.4. Distribution of the Sample Mean
- 2.3.5. Point Estimators
- 2.3.6. Properties of Estimators
- 2.3.7. Estimator Comparison Criteria
- 2.3.8. Estimators by Confidence Regions
- 2.3.9. Method of Obtaining Confidence Intervals
- 2.3.10. Confidence Intervals Associated With Normal Distribution
- 2.3.11. Central Limit Theorem

2.4. Hypothesis Test
- 2.4.1. P-Value
- 2.4.2. Statistical Power

2.5. Exploratory Analysis and Descriptive Statistics
- 2.5.1. Graphs and Tables
- 2.5.2. Chi-Square Test
- 2.5.3. Relative Risk
- 2.5.4. Odds Ratio

2.6. The T-Test
- 2.6.1. One-Sample T-Test
- 2.6.2. T-Test for Two Independent Samples
- 2.6.3. T-Test for Paired Samples

2.7. Correlation Analysis

2.8. Simple Linear Regression Analysis
- 2.8.1. The Regression Line and its Coefficients
- 2.8.2. Residuals
- 2.8.3. Regression Assessment Using Residuals
- 2.8.4. Coefficient of Determination

2.9. Variance and Analysis of Variance (ANOVA)
- 2.9.1. One-Way ANOVA
- 2.9.2. Two-Way ANOVA
- 2.9.3. ANOVA for Repeated Measures
- 2.9.4. Factorial ANOVA

Module 3 Strength Training, from Theory to Practice

3.1. Strength: Conceptualization
- 3.1.1. Strength Defined from a Mechanical Point of View
- 3.1.2. Strength Defined from a Physiology Point of View
- 3.1.3. Define the Concept of Applied Strength
- 3.1.4. Time-Strength Curve
  - 3.1.4.1. Interpretation
- 3.1.5. Define the Concept of Maximum Strength
- 3.1.6. Define the Concept of RFD
- 3.1.7. Define the Concept of Useful Strength
- 3.1.8. Strength- Speed-Power Curves
  - 3.1.8.1. Interpretation
- 3.1.9. Define the Concept of Strength Deficit

3.2. Training Load
- 3.2.1. Define the Concept of Strength Training Load
- 3.2.2. Define the Concept of Load
- 3.2.3. Load Concept: Volume
  - 3.2.3.1. Definition and Applicability in Practice
- 3.2.4. Load Concept: Intensity
  - 3.2.4.1. Definition and Applicability in Practice
- 3.2.5. Load Concept: Density
  - 3.2.5.1. Definition and Applicability in Practice
- 3.2.6. Define the Concept of Effort Character
  - 3.2.6.1. Definition and Applicability in Practice

3.3. Strength Training in the Prevention and Rehabilitation of Injuries
- 3.3.1. Conceptual and Operational Framework in Injury Prevention and Rehabilitation
  - 3.3.1.1. Terminology.
  - 3.3.1.2. Concepts
- 3.3.2. Strength Training and Injury Prevention and Rehabilitation Under Scientific Evidence
- 3.3.3. Methodological Process of Strength Training in Injury Prevention and Functional Recovery
  - 3.3.3.1. Defining the Method
  - 3.3.3.2. Applying the Method in Practice
- 3.3.4. Role of Core Stability (Core) in Injury Prevention
  - 3.3.4.1. Definition of Core
  - 3.3.4.2. Core Training

3.4. Plyometric Method
- 3.4.1. Physiological Mechanisms
  - 3.4.1.1. Specific General Information
- 3.4.2. Muscle Actions in Plyometric Exercises
- 3.4.3. The Stretch-Shortening Cycle (SSC)
  - 3.4.3.1. Use of Energy or Elastic Capacity
  - 3.4.3.2. Reflex Involvement Series and Parallel Elastic Energy Accumulation
- 3.4.4. CEA Classification Scheme
  - 3.4.4.1. Short CEA
  - 3.4.4.2. Long CEA
- 3.4.5. Properties of the Muscle and Tendon
- 3.4.6. Central Nervous System
  - 3.4.6.1. Recruitment
  - 3.4.6.2. Frequency (F)
  - 3.4.6.3. Synchronization
- 3.4.7. Practical Considerations

3.5. Power Training
- 3.5.1. Definition of Power
  - 3.5.1.1. Conceptual Aspects of Power
  - 3.5.1.2. The Importance of Power in a Context of Sport Performance
  - 3.5.1.3. Clarification of Power Terminology
- 3.5.2. Factors Contributing Peak Power Development
- 3.5.3. Structural Aspects Conditioning Power Production
  - 3.5.3.1. Muscle Hypertrophy
  - 3.5.3.2. Muscle Structure
  - 3.5.3.3. Ratio of Fast and Slow Fibers in a Cross Section
  - 3.5.3.4. Muscle Length and its Effect on Muscle Contraction
  - 3.5.3.5. Quantity and Characteristics of Elastic Components

3.5.4. Neural Aspects Conditioning Power Production
3.5.4.1. Action Potential
3.5.4.2. Speed of Motor Unit Recruitment
3.5.4.3. Muscle Coordination
3.5.4.4. Intermuscular Coordination
3.5.4.5. Post-Activation-Potentiation (PAP)
3.5.4.6. Neuromuscular Reflex Mechanisms and Their Incidence
3.5.5. Theoretical Aspects for Understanding the Strength-Time Curve
3.5.5.1. Strength Impulse
3.5.5.2. Phases of the Strength-Time Curve
3.5.5.3. Phases of Acceleration in the Strength-Time Curve
3.5.5.4. Maximum Acceleration Area of the Strength-Time Curve
3.5.5.5. Deceleration Phase of the Strength-Time Curve
3.5.6. Theoretical Aspects for Understanding Energy Curves
3.5.6.1. Energy-Time Curve
3.5.6.2. Energy-Displacement Curve
3.5.6.3. Optimal Workload for Maximum Energy Development
3.5.7. Practical Considerations
3.6. Vector Strength Training
3.6.1. Definition of Force Vector
3.6.1.1. Axial Vector
3.6.1.2. Horizontal Vector
3.6.1.3. Rotational Vector
3.6.2. Benefits of Using this Terminology
3.6.3. Definition of Basic Vectors in Training
3.6.3.1. Analysis of the Main Sporting Actions
3.6.3.2. Analysis of the Main Overload Exercises
3.6.3.3. Analysis of the Main Training Exercises
3.6.4. Practical Considerations
3.7. Main Methods for Strength Training
3.7.1. Own Body Weight
3.7.2. Free Exercises
3.7.3. PAP
3.7.3.1. Definition
3.7.3.2. Application of PAP Prior to Energy-Related Sports Disciplines
3.7.4. Exercises with Machines
3.7.5. Complex Training
3.7.6. Exercises and Their Transfer
3.7.7. Contrasts
3.7.8. Cluster Training
3.7.9. Practical Considerations
3.8. VBT
3.8.1. Conceptualization of the Application of VBT
3.8.1.1. Degree of Stability of Execution Speed with Each Percentage of 1MR
3.8.2. Difference Between Scheduled Load and Actual Load
3.8.2.1. Definition of the Concept
3.8.2.2. Variables Involved in the Difference Between Programmed Load and Actual Training Load
3.8.3. VBT as a Solution to the Problem of Using 1MR and nMR to Program Loads
3.8.4. VBT and Degree of Fatigue
3.8.4.1. Connection to Lactate
3.8.4.2. Connection to Ammonium
3.8.5. VBT in Relation to the Loss of Speed and Percentage of Repetitions Performed
3.8.5.1. Define the Different Degrees of Effort in the Same Series
3.8.5.2. Different Adaptations According to the Degree of Speed Loss in the Series
3.8.6. Methodological Proposals According to Different Authors
3.8.7. Practical Considerations

3.9. Strength in Connection to Hypertrophy
- 3.9.1. Hypertrophy-Inducing Mechanism: Mechanical Stress
- 3.9.2. Hypertrophy-Inducing Mechanism: Metabolic Stress
- 3.9.3. Hypertrophy-Inducing Mechanism: Muscle Damage
- 3.9.4. Hypertrophy Programming Variables
  - 3.9.4.1. Frequency (F)
  - 3.9.4.2. Volume
  - 3.9.4.3. Intensity
  - 3.9.4.4. Cadence
  - 3.9.4.5. Series and Repetitions
  - 3.9.4.6. Density
  - 3.9.4.7. Order in the Execution of Exercises
- 3.9.5. Training Variables and Their Different Structural Effects
  - 3.9.5.1. Effect on Different Types of Fiber
  - 3.9.5.2. Effects on the Tendon
  - 3.9.5.3. Bundle Length
  - 3.9.5.4. Peneation Angle
- 3.9.6. Practical Considerations

3.10. Eccentric Strength Training
- 3.10.1. Conceptual framework
  - 3.10.1.1. Definition of Eccentric Training
  - 3.10.1.2. Different Types of Eccentric Training
- 3.10.2. Eccentric Training and Performance
- 3.10.3. Eccentric Training in the Prevention and Rehabilitation of Injuries
- 3.10.4. Technology Applied to Eccentric Training
  - 3.10.4.1. Conical Pulleys
  - 3.10.4.2. Isoinertial Devices
- 3.10.5. Practical Considerations

Module 4 Speed Training, from Theory to Practice

4.1. Speed
- 4.1.1. Definition
- 4.1.2. General Concepts
  - 4.1.2.1. Manifestations of Speed
  - 4.1.2.2. Factors that Determine Performance
  - 4.1.2.3. Difference Between Speed and Quickness
  - 4.1.2.4. Segmental Speed
  - 4.1.2.5. Angular Speed
  - 4.1.2.6. Reaction Time

4.2. Dynamics and Mechanics of Linear Sprint (100m Model)
- 4.2.1. Kinematic Analysis of the Take-off
- 4.2.2. Dynamics and Strength Application During Take-off
- 4.2.3. Kinematic Analysis of the Acceleration Phase
- 4.2.4. Dynamics and Strength Application During Acceleration
- 4.2.5. Kinematic Analysis of Running at Maximum Speed
- 4.2.6. Dynamics and Strength Application During Maximum Speed

4.3. Phases of Sprinting (Technique Analysis)
- 4.3.1. Technical Description of the Take-off
- 4.3.2. Technical Description of the Race During the Acceleration Phase
  - 4.3.2.1. Technical Model of the Kinogram for the Acceleration Phase
- 4.3.3. Technical Description of the Race During the Maximum Speed Phase
  - 4.3.3.1. Technical Kinogram Model (ALTIS) for Technique Analysis
- 4.3.4. Speed Endurance

4.4. Speed Bioenergetics
- 4.4.1. Bioenergetics of Single Sprints
  - 4.4.1.1. Myoenergetics of Single Sprints
  - 4.4.1.2. ATP-PC System
  - 4.4.1.3. Glycolytic System
  - 4.4.1.4. Adenylate Kinase Reaction
- 4.4.2. Bioenergetics of Repeated Sprints
  - 4.4.2.1. Energy Comparison Between Single and Repeated Sprints
  - 4.4.2.2. Behavior of Energy Production Systems During Repeated Sprints
  - 4.4.2.3. Recovery of PC (Phosphocreatine)
  - 4.4.2.4. Connection Between Aerobic Power and Recovery Processes of PC
  - 4.4.2.5. Determinants of Performance in Repeated Sprints

4.5. Analysis of Acceleration Technique and Maximum Speed in Team Sports
- 4.5.1. Description of the Technique in Team Sports
- 4.5.2. Comparison of Sprinting Technique in Team Sports vs. Athletic Events
- 4.5.3. Timing and Motion Analysis of Speed Events in Team Sports

4.6. Methodological Approach to Teaching the Technique
- 4.6.1. Technical Teaching of the Different Phases of the Race
- 4.6.2. Common Errors and Ways to Correct Them

4.7. Means and Methods for Speed Development
- 4.7.1. Means and Methods for Acceleration Phase Training
  - 4.7.1.1. Connection of Force to Acceleration
  - 4.7.1.2. Sled
  - 4.7.1.3. Slopes
  - 4.7.1.4. Jumpability
    - 4.7.1.4.1. Building the Vertical Jump
    - 4.7.1.4.2. Building the Horizontal Jump
  - 4.7.1.5. Training the ATP/PC System
- 4.7.2. Means and Methods for Training *Top Speed*
  - 4.7.2.1. Plyometry
  - 4.7.2.2. *Overspeed*
  - 4.7.2.3. Interval-Intensive Methods
- 4.7.3. Means and Methods for Speed Endurance Development
  - 4.7.3.1. Interval-Intensive Methods
  - 4.7.3.2. Repetition Method

4.8. Agility and Change of Direction
- 4.8.1. Definition of Agility
- 4.8.2. Definition of Change of Direction
- 4.8.3. Determinants of Agility and COD
- 4.8.4. Change of Direction Technique
  - 4.8.4.1. *Shuffle*
  - 4.8.4.2. Crossover
  - 4.8.4.3. Agility and COD Training Drills

4.9. Assessment and Control of Speed Training
- 4.9.1. Strength-Speed Profile
- 4.9.2. Test With Photocells and Variants With Other Control Devices
- 4.9.3. RSA

4.10. Programming Speed Training

Module 5 Endurance Training from Theory to Practice

5.1. General Concepts
- 5.1.1. General Definitions
  - 5.1.1.1. Training
  - 5.1.1.2. Trainability
  - 5.1.1.3. Sports Physical Preparation
- 5.1.2. Objectives Endurance Training
- 5.1.3. General Principles of Training
  - 5.1.3.1. Principles of Load
  - 5.1.3.2. Principles of Organization
  - 5.1.3.3. Principles of Specialization

5.2. Physiology of Aerobic Training
- 5.2.1. Physiological Response to Aerobic Endurance Training
  - 5.2.1.1. Responses to Continuous Stress
  - 5.2.1.2. Responses to Intervallic Stress
  - 5.2.1.3. Responses to Intermittent Stress
  - 5.2.1.4. Responses to Stress in Small-Space Games
- 5.2.2. Factors Related to Aerobic Endurance Performance
  - 5.2.2.1. Aerobic Power
  - 5.2.2.2. Anaerobic Threshold
  - 5.2.2.3. Maximum Aerobic Speed
  - 5.2.2.4. Economy of Effort
  - 5.2.2.5. Use of Substrates
  - 5.2.2.6. Characteristics of Muscle Fibers
- 5.2.3. Physiological Adaptations to Aerobic Endurance
  - 5.2.3.1. Adaptations to Continuous Stress
  - 5.2.3.2. Adaptations to Intervallic Stress
  - 5.2.3.3. Adaptations to Intermittent Stress
  - 5.2.3.4. Adaptations to Stress in Small-Space Games

5.3. Situational Sports and Their Relation to Aerobic Endurance
- 5.3.1. Group I Situational Sport Demands; Soccer, Rugby and Hockey
- 5.3.2. Group II Situational Sport Demands; Basketball, Handball, Futsal
- 5.3.3. Group III Situational Sport Demands; Tennis and Volleyball

5.4. Monitoring and Assessment of Aerobic Endurance
- 5.4.1. Direct Treadmill Versus Field Evaluation
  - 5.4.1.1. VO2max Treadmill Versus Field
  - 5.4.1.2. VAM Treadmill Versus Field
  - 5.4.1.3. Maximal Aerobic Speed vs. Final Speed Reached (MAS vs FSR)
  - 5.4.1.4. Time Limit (MAS)
- 5.4.2. Continuous Indirect Tests
  - 5.4.2.1. Time Limit (FSR)
  - 5.4.2.2. 1,000m Test
  - 5.4.2.3. 5-Minute Test
- 5.4.3. Incremental and Maximum Indirect Tests
  - 5.4.3.1. UMTT, UMTT-Brue, VAMEVAL and T-Bordeaux
  - 5.4.3.2. UNCa Test; Hexagon, Track, Hare

5.4.4. Indirect Back-and-Forth and Intermittent Tests
5.4.4.1. 20m. *Shuttle Run Test* (*Course Navette*)
5.4.4.2. YoYo Test
5.4.4.3. Intermittent Test; 30-15 IFT, Carminatti, 45-15 Test
5.4.5. Specific Tests With Ball
5.4.5.1. Hoff Test
5.4.6. Proposal Based on the FSR
5.4.6.1. FSR Contact Points for Soccer, Rugby and Hockey
5.4.6.2. FSR Contact Points for Basketball, Futsal and Handball
5.5. Planning Aerobic Exercise
5.5.1. Exercise Model
5.5.2. Training Frequency
5.5.3. Duration of the Exercise
5.5.4. Training Intensity
5.5.5. Density
5.6. Methods to Develop Aerobic Endurance
5.6.1. Continuous Training
5.6.2. Interval Training
5.6.3. Intermittent Training
5.6.4. SSG Training (Small-Space Games)
5.6.5. Mixed Training (Circuits)
5.7. Program Design
5.7.1. Preseason Period
5.7.2. Competitive Period
5.7.3. Postseason Period
5.8. Special Aspects Related to Training
5.8.1. Concurrent Training
5.8.2. Strategies to Design Concurrent Training
5.8.3. Adaptations Generated by Concurrent Training
5.8.4. Differences Between Genders
5.8.5. De-Training
5.9. Aerobic Training in Children and Youth
5.9.1. General Concepts
5.9.1.1. Growth, Development and Maturation
5.9.2. Evaluation of VO2max and MAS
5.9.2.1. Indirect Measurement
5.9.2.2. Indirect Field Measurement
5.9.3. Physiological Adaptations in Children and Youth
5.9.3.1. VO2máx and MAS Adaptations
5.9.4. Design of Aerobic Training
5.9.4.1. Intermittent Method
5.9.4.2. Adherence and Motivation
5.9.4.3. Games in Small Spaces

Module 6 Mobility: from Theory to Performance

6.1. Neuromuscular System
6.1.1. Neurophysiological Principles: Inhibition and Excitability
6.1.1.1. Adaptations of the Nervous System
6.1.1.2. Strategies to Modify Corticospinal Excitability
6.1.1.3. Keys to Neuromuscular Activation
6.1.2. Somatosensory Information Systems
6.1.2.1. Information Subsystems
6.1.2.2. Types of Reflexes
6.1.2.2.1. Monosynaptic Reflexes
6.1.2.2.2. Polysynaptic Reflexes
6.1.2.2.3. Muscle-Tendinous-Articular Reflexes
6.1.2.3. Responses to Dynamic and Static Stretches
6.2. Motor Control and Movement
6.2.1. Stabilizing and Mobilising Systems
6.2.1.1. Local System: Stabilizer System
6.2.1.2. Global System: Mobilizing System
6.2.1.3. Respiratory Pattern
6.2.2. Movement Pattern
6.2.2.1. Co-Activation
6.2.2.2. *Joint* by *Joint* Theory
6.2.2.3. Primary Motion Complexes

6.3. Understanding Mobility
- 6.3.1. Key Concepts and Beliefs in Mobility
  - 6.3.1.1. Manifestations of Mobility in Sport
  - 6.3.1.2. Neurophysiological and Biomechanical Factors Influencing Mobility Development
  - 6.3.1.3. Impact of Mobility on Strength Development
- 6.3.2. Objectives of Training Mobility in Sport
  - 6.3.2.1. Mobility in the Training Session
  - 6.3.2.2. Benefits of Mobility Training
- 6.3.3. Mobility and Stability by Structures
  - 6.3.3.1. Foot-Ankle Complex
  - 6.3.3.2. Knee-Hip Complex
  - 6.3.3.3. Spine-Shoulder Complex

6.4. Training Mobility
- 6.4.1. Fundamental Block
  - 6.4.1.1. Strategies and Tools to Optimize Mobility
  - 6.4.1.2. Specific Pre-Exercise Scheme
  - 6.4.1.3. Specific Post-Exercise Scheme
- 6.4.2. Mobility and Stability in Basic Movements
  - 6.4.2.1. *Squat* & *Dead Lift*
  - 6.4.2.2. Acceleration and Multidirection

6.5. Methods of Recovery
- 6.5.1. Proposal for Effectiveness Based on Scientific Evidence

6.6. Methods for Training Mobility
- 6.6.1. Tissue-Centered Methods: Passive Tension and Active Tension Stretching
- 6.6.2. Methods Focused on Arthro-Coinematics: Isolated Stretching and Integrated Stretching
- 6.6.3. Eccentric Training

6.7. Mobility Training Programming
- 6.7.1. Effects of Stretching in the Short and Long Term
- 6.7.2. Optimal Timing for Applying Stretching

6.8. Athlete Assessment and Analysis
- 6.8.1. Functional and Neuromuscular Assessment
  - 6.8.1.1. Key Concepts in Assessment
  - 6.8.1.2. Evaluation Process
    - 6.8.1.2.1. Analyze the Movement Pattern
    - 6.8.1.2.2. Identify the Test
    - 6.8.1.2.3. Detect the Weak Links
- 6.8.2. Athlete Assessment Methodology
  - 6.8.2.1. Types of Tests
    - 6.8.2.1.1. Analytical Assessment Test
    - 6.8.2.1.2. General Assessment Test
    - 6.8.2.1.3. Specific-Dynamic Assessment Test
  - 6.8.2.2. Assessment by Structures
    - 6.8.2.2.1. Foot-Ankle Complex
    - 6.8.2.2.2. Knee-Hip Complex
    - 6.8.2.2.3. Spine-Shoulder Complex

6.9. Mobility in Injured Athletes
- 6.9.1. Pathophysiology of Injury: Effects on Mobility
  - 6.9.1.1. Muscle Structure
  - 6.9.1.2. Tendon Structure
  - 6.9.1.3. Ligament Structure
- 6.9.2. Mobility and Prevention of Injuries: Practical Case
  - 6.9.2.1. Ruptured Ischialis in the Runner

Module 7 Sports Performance Assessment

7.1. Assessment
- 7.1.1. Definitions: Test, Assessment, Measurement
- 7.1.2. Validity, Reliability
- 7.1.3. Purposes of the Evaluation

7.2. Types of Tests
- 7.2.1. Laboratory Test
  - 7.2.1.1. Strengths and Limitations of Laboratory Tests
- 7.2.2. Field Tests
  - 7.2.2.1. Strengths and Limitations of Field Tests
- 7.2.3. Direct Tests
  - 7.2.3.1. Applications and Transfer to Training
- 7.2.4. Indirect Tests
  - 7.2.4.1. Practical Considerations and Transfer to Training

7.3. Assessment of Body Composition
- 7.3.1. Bioimpedance
  - 7.3.1.1. Considerations in its Application to Field
  - 7.3.1.2. Limitations on the Validity of Its Data
- 7.3.2. Anthropometry
  - 7.3.2.1. Tools for its Implementation
  - 7.3.2.2. Models of Analysis for Body Composition
- 7.3.3. Body Mass Index (IMC)
  - 7.3.3.1. Restrictions on the Data Obtained for the Interpretation of Body Composition

7.4. Assessing Aerobic Fitness
- 7.4.1. Vo2max Test on the Treadmill
  - 7.4.1.1. Astrand Test
  - 7.4.1.2. Balke Test
  - 7.4.1.3. ACSM Test
  - 7.4.1.4. Bruce Test
  - 7.4.1.5. Foster Test
  - 7.4.1.6. Pollack Test
- 7.4.2. Cycloergometer VO2max Test
  - 7.4.2.1. Astrand. Ryhming
  - 7.4.2.2. Fox Test
- 7.4.3. Cycloergometer Power Test
  - 7.4.3.1. Wingate Test
- 7.4.4. Vo2max Test in the Field
  - 7.4.4.1. Leger Test
  - 7.4.4.2. Montreal University Test
  - 7.4.4.3. Mile Test
  - 7.4.4.4. 12-Minute Test
  - 7.4.4.5. 2.4Km Test
- 7.4.5. Field Test to Establish Training Areas
  - 7.4.5.1. 30-15 IFT Test
- 7.4.6. UNca Test
- 7.4.7. Yo-Yo Test
  - 7.4.7.1. Yo-Yo Endurance YYET Level 1 and 2
  - 7.4.7.2. Yo-Yo Intermittent Endurance YYEIT Level 1 and 2
  - 7.4.7.3. Yo-Yo Intermittent Recovery YYERT Level 1 and 2

7.5. Neuromuscular Fitness Evaluation
- 7.5.1. Submaximal Repetition Test
  - 7.5.1.1. Practical Applications for its Assessment
  - 7.5.1.2. Validated Estimation Formulas for the Different Training Exercises
- 7.5.2. 1 RM Test
  - 7.5.2.1. Protocol for its Performance
  - 7.5.2.2. Limitations of 1 RM Assessment
- 7.5.3. Horizontal Jump Test
  - 7.5.3.1. Assessment Protocols
- 7.5.4. Speed Test (5m,10m,15m, Etc.)
  - 7.5.4.1. Considerations on the Data Obtained in Time/Distance Assessments
- 7.5.5. Maximum/Submaximum Incremental Progressive Tests
  - 7.5.5.1. Validated Protocols
  - 7.5.5.2. Practical Applications

7.5.6. Vertical Jump Test
7.5.6.1. Sj Jump
7.5.6.2. CMJ Jump
7.5.6.3. ABK Jump
7.5.6.4. DJ Test
7.5.6.5. Continuous Jump Test
7.5.7. Strength/Speed Vertical/Horizontal Profiles
7.5.7.1. Morin and Samozino Assessment Protocols
7.5.7.2. Practical Applications from a Strength/Speed Profile
7.5.8. Isometric Tests With Load Cell
7.5.8.1. Voluntary Isometric Maximal Strength Test (IMS)
7.5.8.2. Bilateral Deficit Isometry Test (%BLD)
7.5.8.3. Lateral Deficit (%LD)
7.5.8.4. Hamstring/Quadriceps Ratio Test

7.6. Assessment and Monitoring Tools
7.6.1. Heart Rate Monitors
7.6.1.1. Device Characteristics
7.6.1.2. Training Areas by Heart Rate
7.6.2. Lactate Analyzers
7.6.2.1. Device Types, Performance and Characteristics
7.6.2.2. Training Zones According to the Lactate Threshold Limit (LT)
7.6.3. Gas Analyzers
7.6.3.1. Laboratory vs Portable Laptops
7.6.4. GPS
7.6.4.1. GPS Types, Characteristics, Strengths and Limitations
7.6.4.2. Metrics Established to Interpret the External Load
7.6.5. Accelerometers
7.6.5.1. Types of Accelerometers and Characteristics
7.6.5.2. Practical Applications of Data Obtained From an Accelerometer
7.6.6. Position Transducers
7.6.6.1. Types of Transducers for Vertical and Horizontal Movements
7.6.6.2. Variables Measured and Estimated by of a Position Transducer
7.6.6.3. Data Obtained from a Position Transducer and its Applications to Training Programming
7.6.7. Strength Platforms
7.6.7.1. Types and Characteristics of Strength Platforms
7.6.7.2. Variables Measured and Estimated by Means of a Strength Platform
7.6.7.3. Practical Approach to Training Programming
7.6.8. Load Cells
7.6.8.1. Cell Types, Characteristics and Performance
7.6.8.2. Uses and Applications for Sports Performance and Health
7.6.9. Photoelectric Cells
7.6.9.1. Characteristics and Limitations of the Devices
7.6.9.2. Practical Uses and Applicability
7.6.10. Mobile Applications
7.6.10.1. Description of the Most Used Apps on the Market: My Jump, PowerLift, Runmatic, Nordic

7.7. Internal and External Load
7.7.1. Objective Means of Assessment
7.7.1.1. Speed of Execution
7.7.1.2. Average Mechanical Power
7.7.1.3. GPS Device Metrics
7.7.2. Subjective Means of Assessment
7.7.2.1. PSE
7.7.2.2. sPSE
7.7.2.3. Chronic/Acute Load Ratio

7.8. Fatigue
7.8.1. General Concepts of Fatigue and Recovery
7.8.2. Assessments
7.8.2.1. Laboratory Objectives: CK, Urea, Cortisol, Etc.
7.8.2.2. Field Objectives: CMJ, Isometric Tests, etc.
7.8.2.3. Subjective: Wellness Scales, TQR, etc.
7.8.3. Recovery Strategies: Cold-Water Immersion, Nutritional Strategies, Self-Massage, Sleep

7.9. Considerations for Practical Applications
7.9.1. Vertical Jump Test Practical Applications
7.9.2. Maximum/Submaximum Incremental Progressive Test Practical Applications
7.9.3. Vertical Strength-Speed Profile. Practical Applications

Module 8 Planning Applied to High Performance in Sports

8.1. Basic Fundamentals
- 8.1.1. Adaptation Criteria
  - 8.1.1.1. General Adaptation Syndrome
  - 8.1.1.2. Current Performance Capability, Training Requirement
- 8.1.2. Fatigue, Performance, Conditioning as Tools
- 8.1.3. Dose-Response Concept and its Application

8.2. Basic Concepts and Applications
- 8.2.1. Concept and Application of the Plan
- 8.2.2. Concept and Application of Peridization
- 8.2.3. Concept and Application of Programming
- 8.2.4. Concept and Application of Load Control

8.3. Conceptual Development of Planning and its Different Models
- 8.3.1. First Historical Planning Records
- 8.3.2. First Proposals, Analyzing the Bases
- 8.3.3. Classic Models
  - 8.3.3.1. Traditional
  - 8.3.3.2. Pendulum
  - 8.3.3.3. High Loads

8.4. Models Focused on Individuality and/or Load Concentration
- 8.4.1. Blocks
- 8.4.2. Integrated Macrocycle
- 8.4.3. Integrated Model
- 8.4.4. ATR
- 8.4.5. Keeping in Shape
- 8.4.6. By Objectives
- 8.4.7. Structural Bells
- 8.4.8. Self-Regulation (APRE)

8.5. Models Focused on Specificity and/or Movement Capacity
- 8.5.1. Cognitive (or Structured Microcycle)
- 8.5.2. Tactical Periodization
- 8.5.3. Conditional Development by Movement Capacity

8.6. Criteria for Correct Programming and Periodization
- 8.6.1. Criteria for Programming and Periodization in Strength Training
- 8.6.2. Criteria for Programming and Periodization in Endurance Training
- 8.6.3. Criteria for Programming and Periodization in Speed Training
- 8.6.4. "Interference" Criteria in Scheduling and Periodization in Concurrent Training

8.7. Planning Through Load Control With a GNSS Device (GPS)
- 8.7.1. Basis of Session Saving for Appropriate Control
  - 8.7.1.1. Calculation of the *Average* Group Session for a Correct Load Analysis
  - 8.7.1.2. Common Errors in Saving and Their Impact on Plannning
- 8.7.2. Relativization of the Load, a Function of Competence
- 8.7.3. Load Control by Volume or Density, Range and Limitations

8.8. Integrating Thematic Unit 1 (Practical Application)
- 8.8.1. Construction of a Real Model of Short-Term Planning
  - 8.8.1.1. Selecting and Applying the Periodization Model
  - 8.8.1.2. Designing the Corresponding Planning

8.9. Integrating Thematic Unit 2 (Practical Application)
- 8.9.1. Producing a Pluriannual Planification
- 8.9.2. Producing an Annual Planification

Module 9 Biomechanics Applied to High Performance in Sports

9.1. Introduction to Biomechanics
- 9.1.1. Biomechanics, Concept, Introduction and Purpose of Biomechanics
  - 9.1.1.1. Its Connection to Functional Anatomy
- 9.1.2. Biomechanics and Performance
  - 9.1.2.1. Its Application to Physical Education and Sport
  - 9.1.2.2. Parts of Biomechanics, Generalities
  - 9.1.2.3. Measuring Tools
- 9.1.3. Kinematics: Basic Concepts and Practical Applications

9.2. Movement in One Dimension
- 9.2.1. Speed
  - 9.2.1.1. Concept of Speed
  - 9.2.1.2. Average speed
  - 9.2.1.3. Instant Speed
  - 9.2.1.4. Constant Speed

9.2.1.5. Variable Speed
9.2.1.6. Equations and Units
9.2.1.7. Interpretation of Space-Time and Speed-Distance Graphs
9.2.1.8. Examples in Sport
9.2.2. Acceleration
9.2.2.1. Concept of Acceleration
9.2.2.2. Average Acceleration
9.2.2.3. Instant Acceleration
9.2.2.4. Constant Acceleration
9.2.2.5. Variable Acceleration
9.2.2.6. Connection With the Speed at Constant Acceleration
9.2.2.7. Equations and Units
9.2.2.8. Interpretation of Acceleration-Distance Graphs, Connection With Speed-Time Graphs
9.2.2.9. Examples in Sport
9.2.3. Free Fall
9.2.3.1. Acceleration of Gravity
9.2.3.2. Ideal Conditions
9.2.3.3. Variations of Gravity
9.2.3.4. Equations
9.2.4. Graphical Surroundings
9.2.4.1. Accelerations and Speeds in Free Fall
9.3. Movement in a Plane
9.3.1. Speed
9.3.1.1. Concept Through its Vectorial Components
9.3.1.2. Interpreting Graphs Examples in Sport
9.3.2. Acceleration
9.3.2.1. Concept Through its Vectorial Components
9.3.2.2. Interpreting Graphs
9.3.2.3. Examples in Sport
9.3.3. Projectile Movement
9.3.3.1. Fundamental Components
9.3.3.2. Initial Speed
9.3.3.3. Initial Angle
9.3.3.4. Ideal Conditions Initial Angle for Maximum Reach
9.3.3.5. Equations Interpreting Graphs
9.3.3.6. Examples Applied to Jumps and Throws
9.4. Kinematics of Rotations
9.4.1. Angular Speed
9.4.1.1. Angular Movement
9.4.1.2. Average Angular Speed
9.4.1.3. Instant Angular Speed
9.4.1.4. Equations and Units
9.4.1.5. Interpretation and Examples in Sport
9.4.2. Angular Acceleration
9.4.2.1. Average and Instantaneous Angular Acceleration
9.4.2.2. Equations and Units
9.4.2.3. Interpretation and Examples in Sport Constant Angular Acceleration
9.5. Dynamics
9.5.1. First Law of Newton
9.5.1.1. Interpretation
9.5.1.2. Concept of Mass
9.5.1.3. Equations and Units
9.5.1.4. Examples in Sport
9.5.2. Second Law of Newton
9.5.2.1. Interpretation
9.5.2.2. Concept of Weight and Deference to Mass
9.5.2.3. Equations and Units Examples in Sport

9.5.3. Third Law of Newton
9.5.3.1. Interpretation
9.5.3.2. Equations
9.5.3.3. Centripetal and Centrifugal Force
9.5.3.4. Examples in Sport
9.5.4. Work, Power and Energy
9.5.4.1. Concept of Work
9.5.4.2. Equations, Units, Interpretation and Examples
9.5.5. Power
9.5.5.1. Equations, Units, Interpretation and Examples
9.5.6. Generalities on the Concept of Energy
9.5.6.1. Types of Energy, Units and Conversion
9.5.7. Kinetic Energy
9.5.7.1. Concept and Equations
9.5.8. Potential Elastic Energy
9.5.8.1. Concept and Equations
9.5.8.2. The Work and Energy Theorem
9.5.8.3. Interpretation from Examples in Sport
9.5.9. Amount of Movement and Collisions Interpretation
9.5.9.1. Equations Center of Mass and Movement of the Center of Mass
9.5.9.2. Collisions, Types, Equations and Graphs
9.5.9.3. Examples in Athletics
9.5.9.4. Impulsive Forces Calculation of the Initial Speed in a Jump That is Considered as a Collision

9.6. Dynamics of Rotations
9.6.1. Moment of Inertia
9.6.1.1. Moment of a Force, Concept and Units
9.6.1.2. Lever Arm
9.6.2. Kinetic Energy of Rotation
9.6.2.1. Moment of Inertia, Concept and Units
9.6.2.2. Summary of Equations
9.6.2.3. Interpretation. Examples in Sport

9.7. Statics-Mechanical Balance
9.7.1. Vectorial Algebra
9.7.1.1. Operations Between Vectors Using Graphical Methods
9.7.1.2. Addition and Substraction
9.7.1.3. Calculating Momentum
9.7.2. Center of Gravity: Concept, Properties, Interpretation of Equations
9.7.2.1. Examples in Sport Rigid Bodies Human Body Model

9.8. Biomechanical Analysis
9.8.1. Analysis of Normal Gait and Running
9.8.1.1. Center of Mass Phases and Fundamental Equations
9.8.1.2. Types of Kinematic and Dynamometric Records
9.8.1.3. Related Graphs
9.8.1.4. Connections of Graphs With Speed
9.8.2. Jumps in Sport
9.8.2.1. Decomposing Movement
9.8.2.2. Center of Gravity
9.8.2.3. Phases
9.8.2.4. Distances and Component Heights

9.9. Video Analysis
9.9.1. Different Variables Measured Through Video Analysis
9.9.2. Technological Options for Video Analysis
9.9.3. Practical Examples

9.10. Case Studies
9.10.1. Biomechanical Analysis of Acceleration
9.10.2. Biomechanical Analysis of Sprinting
9.10.3. Biomechanical Analysis of Deceleration

Module 10 Nutrition Applied to High Performance in Sports

10.1. Energy Metabolism of Physical Effort
- 10.1.1. Matter and Energy: Introduction to Thermodynamics
- 10.1.2. Physicochemical Characteristics of Macronutrients
- 10.1.3. Digestion and Metabolism of Carbohydrates
- 10.1.4. Digestion and Metabolism of Lipids
- 10.1.5. Digestion and Metabolism of Proteins
- 10.1.6. Phosphagen System
- 10.1.7. Glycolytic System
- 10.1.8. Oxidative System
- 10.1.9. Metabolic Integration
- 10.1.10. Classification of Physical Effort

10.2. Assessing Nutritional Status and Body Composition
- 10.2.1. Retrospective and Prospective Methods
- 10.2.2. ABCDE Model
- 10.2.3. Clinical Evaluation
- 10.2.4. Body composition
- 10.2.5. Indirect Methods.
- 10.2.6. Double Indirect Methods
- 10.2.7. Dual X-ray Absorptiometry
- 10.2.8. Vector Analysis of Electrical Bioimpedance
- 10.2.9. Kinanthropometry
- 10.2.10. Data Analysis in Kinanthropometry

10.3. Assessing Energy Expenditure
- 10.3.1. Components of Total Daily Energy Expenditure
- 10.3.2. Basal Metabolic Rate and Resting Energy Expenditure
- 10.3.3. Thermal Effect of Food
- 10.3.4. NEAT and Energy Expenditure Due to Physical Exertion
- 10.3.5. Technologies for Quantifying Energy Expenditure
- 10.3.6. Indirect Calorimetry
- 10.3.7. Estimation of Energy Expenditure
- 10.3.8. Ex-Post Calculations
- 10.3.9. Practical Recommendations

10.4. Bodybuilding Nutrition and Body Recomposition
- 10.4.1. Characteristics of Bodybuilding
- 10.4.2. Nutrition for *Bulking*
- 10.4.3. Nutrition for Preparation
- 10.4.4. Post-Competition Nutrition
- 10.4.5. Effective Supplements
- 10.4.6. Body Recomposition
- 10.4.7. Nutritional Strategies
- 10.4.8. Macronutrient Distribution
- 10.4.9. *Diet Breaks, Refeeds* and Intermittent Restrictions
- 10.4.10. Principles and Dangers of Pharmacology

10.5. Nutrition in Strength-Based Sports
- 10.5.1. Characteristics of Collective Sports
- 10.5.2. Energy Requirements
- 10.5.3. Protein Requirements
- 10.5.4. Distribution of Carbohydrates and Fats
- 10.5.5. Nutrition for Olympic Lifting
- 10.5.6. Nutrition for Sprint Racing
- 10.5.7. Nutrition for *Powerlifting*
- 10.5.8. Nutrition in Jumping and Throwing Sports
- 10.5.9. Nutrition in Combat-Based Sports
- 10.5.10. Morphological Characteristics of the Athlete

10.6. Nutrition in Team Sports
- 10.6.1. Characteristics of Collective Sports
- 10.6.2. Energy Requirements
- 10.6.3. Preseason Nutrition
- 10.6.4. Competitive Nutrition
- 10.6.5. Nutrition Before, During and After the Match
- 10.6.6. Fluid Replenishment
- 10.6.7. Recommendations for Lower Divisions
- 10.6.8. Nutrition in Football, Basketball and Volleyball
- 10.6.9. Nutrition in Rugby, Hockey and Baseball
- 10.6.10. Morphological Characteristics of the Athlete

10.7. Nutrition in Endurance-Based Sports
- 10.7.1. Characteristics of Endurance Sports
- 10.7.2. Energy Requirements
- 10.7.3. Glycogen Overcompensation
- 10.7.4. Energy Replenishment During Competition
- 10.7.5. Fluid Replenishment
- 10.7.6. Beverages and Sports Confectionery
- 10.7.7. Nutrition for Cycling
- 10.7.8. Nutrition for Running and Marathon
- 10.7.9. Nutrition for Triathlon
- 10.7.10. Nutrition for Other Olympic Sports

10.8. Nutritional Ergogenic Aids
- 10.8.1. Classification Systems
- 10.8.2. Creatine
- 10.8.3. Caffeine
- 10.8.4. Nitrates
- 10.8.5. β-alanin
- 10.8.6. Bicarbonate and Sodium Phosphate
- 10.8.7. Protein Supplements
- 10.8.8. Modified Carbohydrates
- 10.8.9. Herbal Extracts
- 10.8.10. Contaminant Supplementation

10.9. Eating Disorders and Sports Injuries
- 10.9.1. Anorexia
- 10.9.2. Bulimia Nervosa
- 10.9.3. Orthorexia and bigorexia
- 10.9.4. Binge Eating and Purging Disorder
- 10.9.5. Relative Energy Deficiency Syndrome
- 10.9.6. Micronutrient Deficiency
- 10.9.7. Nutrition Education and Prevention
- 10.9.8. Sports Injuries
- 10.9.9. Nutrition During Physical Rehabilitation

10.10. Advances and Research in Sports Nutrition
- 10.10.1. Nutrigenetics.
- 10.10.2. Nutrigenomics.
- 10.10.3. Modulation of the Microbiota
- 10.10.4. Probiotics and Prebiotics in Sport
- 10.10.5. Emerging Products
- 10.10.6. Systems Biology
- 10.10.7. Non-Experimental Designs
- 10.10.8. Experimental Designs
- 10.10.9. Systematic Reviews and Meta-Analyses

A unique, key and decisive training experience to boost your professional development"

06

Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"

You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.

The student will learn to solve complex situations in real business environments through collaborative activities and real cases.

A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

> *Our program prepares you to face new challenges in uncertain environments and achieve success in your career"*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question we face in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

Relearning Methodology

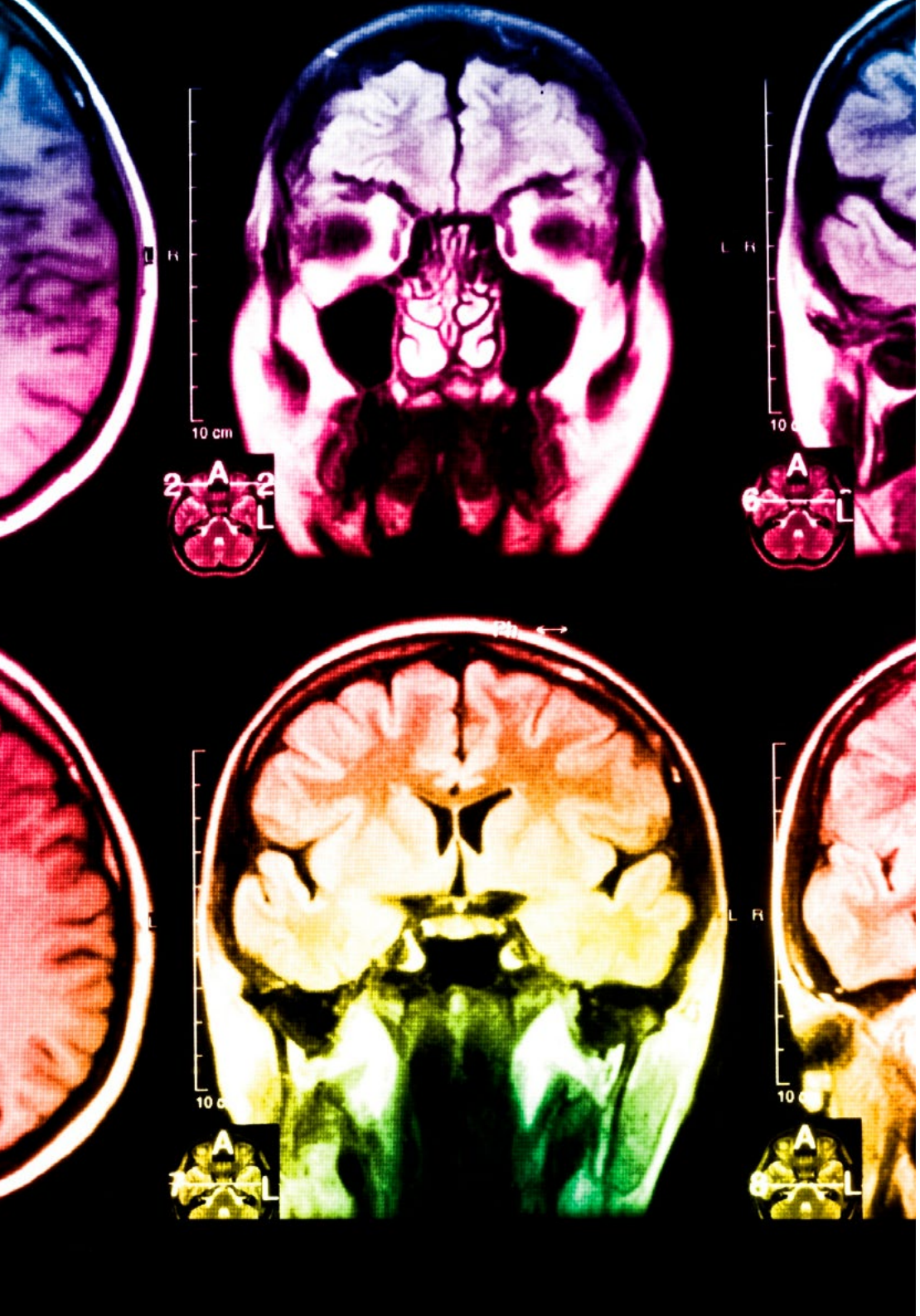
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

In 2019, we obtained the best learning results of all online universities in the world.

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. With this methodology, we have trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, markets, and financial instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

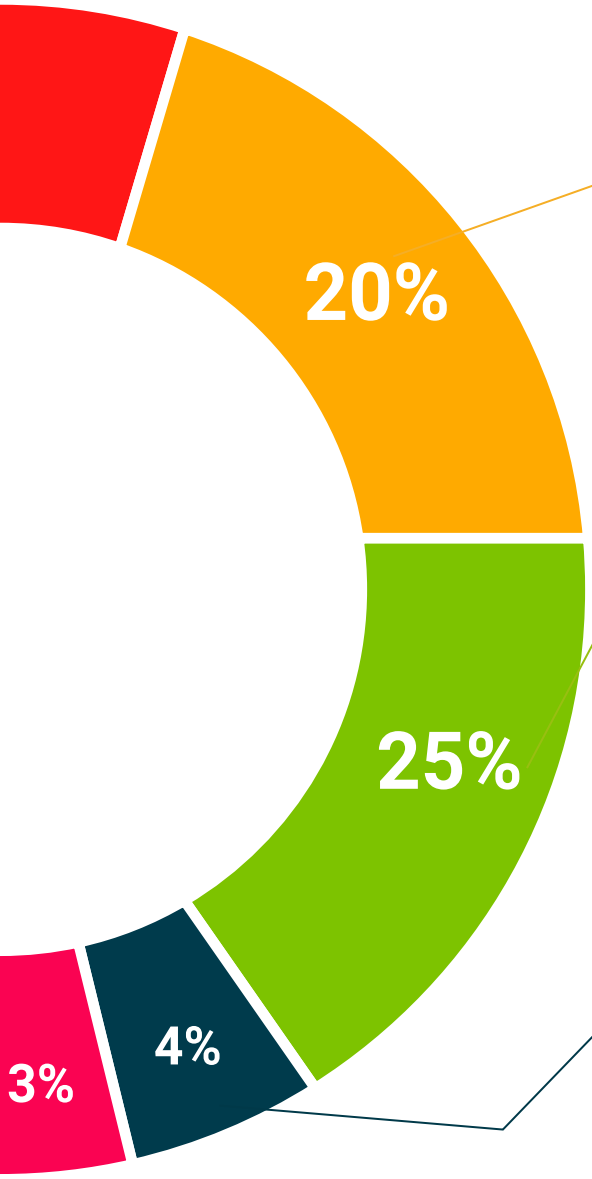
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

Practising Skills and Abilities

They will carry out activities to develop specific competencies and skills in each thematic area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.



Case Studies

Students will complete a selection of the best case studies chosen specifically for this situation. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

07

Certificate

The Professional Master's Degree in High Performance in Sports guarantees students, in addition to the most rigorous and updated education, access to a Professional Master's Degree issued by TECH Technological University.

Successfully complete this program and receive your university degree without travel or laborious paperwork”

This **Professional Master's Degree in High Performance in Sports** contains the most complete and up-to-date scientific program on the market.

After the student has passed the assessments, they will receive their corresponding **Professional Master's Degree** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Professional Master's Degree, and meets the requirements commonly demanded by labor exchanges, competitive examinations and professional career evaluation committees.

Title: **Professional Master's Degree in High Performance in Sports**

Official Nº of hours: **1,500 h.**

Endorsed by the NBA


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

High Performance in Sports

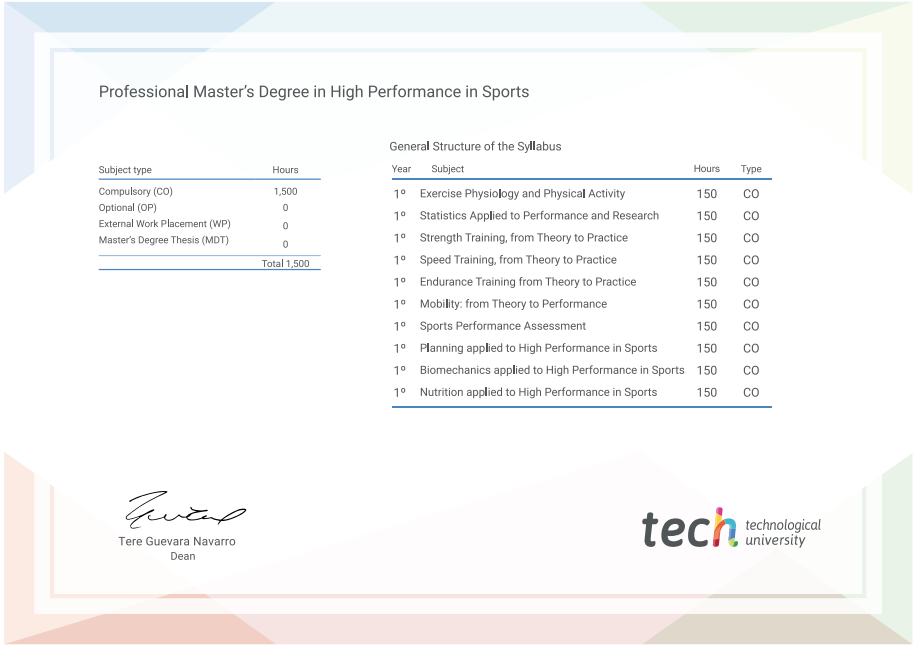
This is a qualification awarded by this University, equivalent to 1,500 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in High Performance in Sports

Subject type	Hours
Compulsory (CO)	1,500
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 1,500

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Exercise Physiology and Physical Activity	150	CO
1º	Statistics Applied to Performance and Research	150	CO
1º	Strength Training, from Theory to Practice	150	CO
1º	Speed Training, from Theory to Practice	150	CO
1º	Endurance Training from Theory to Practice	150	CO
1º	Mobility: from Theory to Performance	150	CO
1º	Sports Performance Assessment	150	CO
1º	Planning applied to High Performance in Sports	150	CO
1º	Biomechanics applied to High Performance in Sports	150	CO
1º	Nutrition applied to High Performance in Sports	150	CO

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*Apostille Convention. In the event that the student wishes to have their paper certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

tech technological university

Professional Master's Degree

High Performance in Sports

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Professional Master's Degree

High Performance in Sports

Endorsed by the NBA

tech technological university