1. BASIC INFORMATION

Course	Module 3: Training III. Psychology, biomechanics, prevention and rehabilitation of injuries in sports
Degree program	Master's Degree in Sports Training and Nutrition
School	Escuela Universitaria Real Madrid – Universidad Europea / Faculty of Medicine, Health and Sports
Year	First
ECTS	6
Credit type	Compulsory
Language(s)	English
Delivery mode	Face
Semester	Anual
Academic year	2025-2026
Coordinating professor	Mr. Guillermo Muñoz Andradas / Mrs. Krizia Radesca Fabiano / Mrs. Rebeca Benítez Valero / Mr Martín Alejandro Festino

2. PRESENTATION

The module "Training III. Psychology, biomechanics, prevention, and readaptation of injuries in sports)" aims to design, plan, organize, execute and evaluate the processes of training and competition and provide students with knowledge about the psychological functioning of athletes and the importance of self-knowledge to be able to positively influence them in order to obtain the best possible performance both individually and in groups considering their ages, performance levels, general and specific objectives. Likewise, the module helps to strengthen the knowledge about kinetics and kinematics of the different movements or sports actions. In this way, the student is trained to be able to analyze, substantiate and prescribe the most appropriate exercises for each subject according to their objectives, age, level of performance and anthropometric characteristics. This enables students to understand the mechanisms of production of sports injuries, as well as the influence of different sports disciplines on their genesis. In addition, to develop in students, the resources and skills necessary so that they can design preventive interventions for sports injuries and prescribe training rehabilitation programs in order to recover function in injured athletes.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB2. That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- CB4. That students know how to communicate their conclusions – and the knowledge and ultimate reasons that support them – to specialized and non-specialized audiences in a clear and unambiguous way.

Cross-curricular competencies:

- CT2. Strategic communication. Transmit messages (ideas, concepts, feelings, arguments), both orally and in writing, strategically aligning the interests of the different agents involved in communication.
- CT5. Teamwork. Cooperate with others in achieving a shared goal, participating actively, empathically and exercising active listening and respect for all members.
- CT7. Resilience. Adapt to adverse, unexpected situations that cause stress, whether personal or professional, overcoming them and even turning them into opportunities for positive change.

Specific competencies:

- CE2. Analyze and apply physiological, biomechanical, psychological and social principles to the different fields of sport and nutrition, identifying inappropriate practices that pose a risk to health, in order to avoid and correct them in different types of population.
- CE4. Interpret research and apply new technologies in the field of training and sports nutrition.
- CE5. Manage and discriminate the methodology and procedures of scientific research in the field of training and sports nutrition applied to all ages and levels of performance.
- CE9. Design training programs and nutritional advice applicable to different sports specialties and performance levels, diagnosing the level of physical condition, motor ability and nutritional status.

Learning outcomes:

Psychology

- RA1: Analyze fundamental concepts related to the psychological aspects involved in sports performance
- RA2: Investigate the personal aspects related to the functioning of technicians that influence athletes
- RA3: To verify, from practical cases, research results, of the relationship between the different psychological variables
- RA4: Analyze psychological aspects involved in technical, tactical and physical aspects
- RA5: Carry out case studies in order to prevent possible difficulties that may occur during the development of sports practice
- RA6: Develop case studies in order to differentiate psychological aspects involved in training and competition and differences according to sports and levels achieved

Biomechanics

- RA7: Analyze knowledge related to biomechanical principles and the different mechanical parameters that are applied for the assessment of each physical capacity or execution model in any sports specialty.
- RA8: Carry out deepening and synthesis works based on a search in the fundamental bibliographic sources related to the assessment of the mechanical parameters involved in a sports gesture.
- RA 9: Handle the new technologies applied to quantify the mechanical parameters of human movement.
- RA10: Solve problems related to the effect of the forces generated and / or acting on the musculoskeletal system.
- Injury prevention and rehabilitation
- RA11: Analyze fundamental concepts related to the prevention, treatment and rehabilitation of sports injuries
- RA12: Determine, based on cases, practices, readings and searches for information from the available evidence on the prevention, treatment and rehabilitation of sports injuries.
- RA13: Carry out deepening and synthesis work based on searching the fundamental bibliographic sources related to the prevention and treatment of sports injuries.
- RA14: Develop rehabilitation programs for athletes in the face of the incidence of different injuries that can be caused during sports practice

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes

CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA1
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA2
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA3
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA4
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA5
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA6
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA7
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA8
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA9
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA10
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA11
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA12
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA13
CB2, CB4, CT2, CT5, CT7, EC2, EC4, EC5, EC9	RA14

4. CONTENT

Psychology

- Fields of application of psychology
- Psychological variables involved
- Importance of evaluation in the sports context and instruments to be used
- Psychological aspects related to training and competition
- Psychological functioning of technicians

Biomechanics

- Biomechanical principles and kinematic, kinetic, and static fundamentals.
- Fundamentals for the analysis of a motor gesture.
- Systems and technologies applied for mechanical valuation.
- Biomechanics of bodybuilding exercises.

• Biomechanics of Olympic exercises and their variants.

• Biomechanics of running, jumps and throws.

Injury prevention and rehabilitation

• Evidence and foundations of preventive and therapeutic interventions in the field of sport.

• General concepts in the care of the injured athlete.

• Short and long-term objectives in the functional recovery of injured athletes

• Biological Foundations of Tissue Healing

• Main injuries of the foot, ankle, and leg. Classification. Prevention and rehabilitation strategies.

• Main injuries of the knee, thigh, and pelvis. Classification. Prevention and rehabilitation strategies

• Chronic low back pain and physical exercise. Exercise-based therapeutic interventions.

• Main shoulder injuries. Prevention and rehabilitation strategies. Neuromuscular re-education.

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Master class
- Case method.
- Cooperative learning.
- Problem-based learning.
- Learning based on workshop teachings
- Simulation environments

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Master classes (face-to-face modality)	30
Case analysis (face-to-face modality)	5
Problem solving (face-to-face modality)	5

Oral presentations of works (face-to-face modality)	2
Preparation of reports and writings (face-to-face modality)	26
Activities in workshops and/or laboratories (face-to-face modality)	4
Self-employment (face-to-face modality)	50
Debates and colloquiums (face-to-face modality)	8
Tutoring (face-to-face modality)	18
Knowledge tests (face-to-face modality)	2
TOTAL	**150**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Face-to-face knowledge tests (face-to-face modality)	60-60%
Oral presentations (face-to-face modality)	5-10%
Reports and writings (face-to-face modality)	5-20%
Case/problem (face-to-face mode)	5-15%
Notebook of laboratory practices (face-to-face modality)	5-15%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you must complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).
The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Face-to-face knowledge tests	June-July
Oral presentations	May-June
Reports and writings	May-June
Case/problem	May-June
Notebook of laboratory practices	May-June
Face-to-face knowledge tests	June-July

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

The bibliographic search is part of the autonomous work of the student on the theme of the seminar. The teacher will be able to guide the student in this search.

1. Äärimaa V, K ää riäïnen M, Vaittinen S, Tanner J, J ärvinen T, Best T, Kalimo H. Restoration of

myofiber continuity after transaction injury by surgical suturing. Neuromuscul Disord. 2004;3:421–428. .

2. Äärimaa V, Rantanen J, Best T, Schultz E, Corr D, Kalimo H. Mild eccentric stretch injury in

Skeletal muscle causes transient effects on tensile load and cell proliferation. Scand. J Med Sci Sports. 2004;14:367–372. .

3. Ahmad CS, Redler LH, Ciccotti MG, Maffulli N, Longo UG, Bradley J. Evaluation and management of hamstring injuries. Am J Sports Med. 2013;41:2933–2947. .

4. Askling C, Malliaropoulos N, Karlsson J. High-speed running type or stretching-type of hamstring injuries makes a difference to treatment and prognosis. Br J Sports Med. 2012;46:86–87. .

5. Askling C, Tengvar M, Thorstensson A. Acute hamstring injuries in Swedish elite football: a prospective randomized controlled clinical trial comparing two rehabilitation protocols. Br J Sports Med. 2013;47:953–959. .

6. Beiner JM, Jokl P, Cholewicki J. The effects of anabolic steroids and corticosteroids on healing of muscle contusion injury. Am J Sports Med. 1999;27:2–9. .

7. Beiner JM, Jokl P. Muscle contusion injury and myositis ossificans traumatica. Clin Orthop Rel Res. 2002;403S:S110–S119. .

8. Bennett M, Best TM, Babul S, Taunton J, Lepawsky M. Hyperbaric oxygen therapy for delayed onset muscle soreness and closed soft tissue injury. Cochrane Database Syst Rev. 2005;19:CD004713. .

9. Best TM, Loitz-Ramage B, Corr DT, Vanderby R. Hyperbaric oxygen in the treatment of acute muscle stretch injuries. Results in an animal model. Am J Sports Med. 1998;26:367– 372. .

10. Bleakley C, McDonough S, MacAuley D. The use of ice in the treatment of acute soft tissue injury: A systematic review of randomized controlled trials. Am J Sports Med. 2004;34:251– 261. .

11. Brooks JHM, Fuller CW, Kemp SPT, Reddin DB. Incidence, risk and prevention of hamstring

Muscle injuries in Professional Rugby Union. Am J Sports Med. 2006;34:1297–1306. .

12. Buckwalter JA. Should bone, soft tissue, and joint injuries be treated with rest or activity? J Orthop Res. 1995;13:155–156. .

13. Chan O, Del Buono A, Best TM, Maffulli N. Acute muscle strain injuries: proposed new classification system. Knee Surg Traumatol Arthrosc. 2012;20:2356–2362. .

14. Deal DN, Tipton J, Rosencrance E, Curl WW, Smith TL. Ice reduces edema. A study of microvascular permeability in rats. J Bone & Joint Surg. 2002;84-A:1573–1578. . 7

15. Ekstrand J, Askling C, Magnusson H, Mithoefer K. Return to play after thigh muscle injury in elite football players: implementation and validation of the Munich muscle injury classification. Br J Sports Med. 2013;47:769–774. [PMC free article] .

16. Ekstrand J, H gglund M, Wald n M. Epidemiology of muscle injuries in professional football (soccer) Am J Sports Med. 2011;39:1226–1232. .

17. Guillodo Y, Bouttier R, Saraux A. Value of sonograpphy combined with clinical assessment to evaluate muscle injury severity in athletes. J Athlet Train. 2011;46:500–504. [PMC free article] .

18. Huard J, Li Y, Fu FH. Muscle injuries and repair: current trends in research. Journal of Bone & Joint Surgery. 2002;84-A:822–832. .

19. Hurme T, Kalimo H, Lehto M, Rvinen J. Healing of skeletal muscle injury. An ultrastructural and immunohistochemical study. Med Sci Sports Exerc. 1991;23:801–810. .

20. Hurme T, Rantanen J, Kalimo H. Effects of early cryotherapy in experimental skeletal muscle injury. Scand J Med & Sci Sports. 1993;3:46–51.

21. Jackson DW, Feagin JA. Quadriceps contusions in young athletes: relation of severity of injury to treatment and prognosis. J Bone & Joint Surg. 1973;55-A:95–105. .

22. J rvinen M, Lehto M, Sorvari T. Effect of some anti-inflammatory agents on the healing of ruptured muscle. An experimental study in rats. J Sports Traumatol. 1992;14:19–28.

23. Järvinen M. Healing of a crush injury in rat striated muscle. 2. A histological study of the effect of early mobilization and immobilization on the repair processes. Acta Pathol Microbiol Scand. 1975;83A:269–282. .

24. Järvinen M. Healing of a crush injury in rat striated muscle. 3. A microangiographical study of the effect of early mobilization and immobilization on capillary ingrowth. Acta Pathol Microbiol Scand. 1976;84A:85–94. .

25. Järvinen M. Healing of a crush injury in rat striated muscle. 4. Effect of early mobilization and immobilization on the tensile properties of gastrocnemius muscle. Acta Chir Scand. 1976;142:47–56. .

26. J ä rvinen TAH, J ä rvinen TLN, K ää riäinen M, Kalimo H, JärvinenM. Biology of muscle trauma. Am J Sports Med. 2005;33:745–766. .

27. Kalimo H, Rantanen J, Järvinen M. Muscle injuries in sports. Bailli re's Clinical Orthop. 1997;2:1–24.

28. Kannus P, Parkkari J, J ä rvinen TLN, J ä rvinenTAH, JärvinenM. Basic science and clinical studies coincide: active approach is needed in the treatment of sports injuries. Scand J Med Sci Sports. 2003;13:150–154. .

29. Kuang S, Kuroda K, Le Grand F, Rudnicki MA. Asymmetric self-renewal and commitment of satellite stem cells in muscle. Cell. 2007;129:999–1010. [PMC free article] . 8

30. Kujala UM, Orava S, J rvinen M. Hamstring injuries: Current trends in treatment and prevention. Sports Med. 1997;23:397–404. .

31. Levinen WM, Begfeld JA, Tessendorf W, Moorman CT., 3rd Intramuscular corticosteroid injection for hamstring injuries. A 13-year experience in the National Football League. Am J Sports Med. 2000;28:297–300. .

32. Malliaropoulos N, Isinkaye T, Tsitas K, Maffulli N. Reinjury after acute thigh muscle injuries in elite track and field athletes. Am J Sports Med. 2011;39:304–310. . .

33. Malliaropoulos N, Papacostas E, Kiritsi O, Papalada A, Gougoulias N, Maffulli N. Posterior thigh muscle injuries in elite track and field athletes. Am J Sports Med. 2010;38:1813– 1819. .

34. Malliaropoulos N, Papacostas E, Kiritsi O, Papalada A, Gougoulis N, Maffulli N. Posterior thigh muscle injuries in elite track and field athletes. Am J Sports Med. 2010;38:1813– 1819. .

35. Markert CD, Merrick MA, Kirby TE, Devor ST. Non thermal ultrasound and exercise in skeletal muscle regeneration. Arch Phys Med Rehabil. 2005;86:1304–1310. .

36. Menetrey J, Kasemkijwattana C, Fu FH, et al. Suturing versus immobilization of a muscle laceration. A morphological and functional study in a mouse model. Am J Sports Med. 1999;27:222–229. .

37. Obremsky WT, Seaber AV, Ribbeck BM, Garrett WE., Jr Biomechanical and histological assessment of controlled muscle strain injury treated with piroxicam. Am J Sports Med. 2004;22:558–561. .

38. O'Grady M, Hackney AC, Schneider K, et al. Diclofenac sodium (Voltaren) reduced exerciseinduced injury in human skeletal muscle. Med Sci Sports & Exerc. 2000;32:1191–1196. .

39. Rahusen FT, Weinhold PS, Almekinders LC. Nonsteroidal anti-inflammatory drugs and acetaminophen in the treatment of an acute muscle injury. Am J Sports Med. 2001;32:1856 1859. .

40. Rantanen J, Hurme T, Lukka R, Heino J, Hurme T, Lukka R, Heino J, Kalimo H. Satellite cell proliferation and expression of myogenin and desmin in regenerating skeletal muscle: evidence for two different populations of satellite cells. Lab Invest. 1995;72:341–347. .

41. Rantanen J, Thorsson O, Wollmer P, Hurme T, Kalimo H. Effects of therapeutic ultrasound on the regeneration of skeletal muscle myofibers after experimental muscle injury. Am J Sports Med. 1999;27:54–59. .

42. Sarimo J, Lempainen L, Mattila K, Orava S. Complete proximal hamstring avulsions: a series of 41 patients with operative treatment. Am J Sports Med. 2008;36:1110–1115. .

43. Schaser K-D, Disch AC, Stover JF, Lauffer A, Bail HJ, Mittlmeier T. Prolonged superficial local cryotherapy attenuates microcirculatory impairment, regional inflammation, and muscle necrosis following closed soft tissue injury in rats. Am J Sports Med. 2007;35:93–102. .9

44. Schneider-Kolsky ME, Hoving JL, Warren P, Connell DA. A comparison between clinical assessment and magnetic resonance imaging of acute hamstring injuries. Am J Sports Med. 2006;34:1008–1015. .

45. Sherry MA, Best TM. A comparison of 2 rehabilitation programs in the treatment of acute hamstring strains. J Orthop Sports Phys Ther. 2004;34:116–125. .

46. Thorsson O, Lilja B, Nilsson P, Westlin N. Immediate external compression in the management of an acute muscle injury. Scand J Med & Sci Sports. 1997;7:182–190. .

47. Thorsson O, Rantanen J, Hurme T, Kalimo H. Effects of nonsteroidal anti-inflammatory medication on satellite cell proliferation during muscle contraction. Am J Sports Med. 1998;26:172–176. .

48. Vaittinen S, Lukka R, Sahlgren C, Rantanen J, Hurme T, Lendahl U, Eriksson JE, Kalimo H. The expression of intermediate filament protein nestin as related to vimentin and desmin in regenerating skeletal muscle. J Neuropathol Exp Neurol. 2001;60:588–659. .

49. Warren P, Gabbe BJ, Schneider-Kolsky M, Bennell KL. Clinical predictors of time to return to competition and of recurrence following hamstring strain in elite Australian footballers. Br J Sports Med. 2010;44:415–419. .

50. Wilkin LD, Merrick MA, Kirby TE, Devor ST. Influence of therapeutic ultrasound on skeletal muscle regeneration following blunt contusion. Int J Sports Med. 2004;25:73–77. .

51. Yu JG, Thornell LE. Desmin and actin alterations in human muscles affected by delayed onset muscle soreness: a high resolution immunocytochemical study. Histochem Cell Biol. 2002;118:171–179. .

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students' inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by mean of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunity for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:

orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.