Subject information sheet

University: *Comenius University in Bratislava*	
Faculty: *Faculty of Physical Education and Sport*	
Subject code:	**Subject title:** *Human Performance Testing*
Type, range and method of educational activities: *1 hour of lectures / 2 hours of seminars* *Attendance method (distance or combined if necessary)*	
Number of credits: *4*	
Recommended semester/trimester of study: *1st–2nd semester*	
Degree of study: *II.*	
Course prerequisites: *Biomechanics, Exercise Physiology*	
Conditions for completing the course: *Written test:* *A - 100 to 92 points, B - 91 to 84 points, C - 83 to 76 points, D - 75 to 68 points,* *E - 67 to 60 points, FX - 59 points or less* *Students are required to maintain a minimum of 80% attendance of scheduled classes in order to pass the course.*	
Student gets familiar with the basic physical principles of ergometry, and construction and operating modes of ergometers. Understands the importance of special sports-specific ergometers for assessing the level of special training in elite sports. *Understands the basic principles of assessing sensorimotor functions and balance abilities.* *Knows the basics of measurement theory and evaluation of reliability and validity of tests.* *Student can use the acquired knowledge and practical experience to assess the current state of training, predict performance and manage sports training.*	
Course contents: *Introduction to functional diagnostics* *Assessment of anaerobic lactate abilities* *Tests of anaerobic lactate abilities* *Aerobic ability tests* *Aerobic and anaerobic threshold* *Assessment of mechanical efficiency and economics of horizontal forms of locomotion* *Physical and physiological principles of quantification of exercise intensity* *Load sources in functional diagnostics* *Isokinetic dynamometers in diagnostics of force abilities* *Monitoring of basic biomechanical parameters during strength exercises and its importance for the diagnosis of strength skills.* *Diagnostics of strength skills* *Assessment of balance abilities* *Assessment of coordination and proprioceptive skills*	

Topic 1 and thesis
Introduction to functional diagnostics
Subject of functional diagnostics, relation of motor abilities and physiological functions, share of heredity and influence of external environment, especially training and nutrition on the level of motor abilities and physiological functions, importance of functional diagnostics in competitive and recreational sports and therapeutically focused physical activities and prescription of physical activity), basics of measurement, measurement error, reliability and validity of tests, general and special training. The importance of the method of energy coverage of muscle work for assessing the functional preconditions of sports performance. The concept of maximum performance and capacity.

Topic 2 and thesis
Assessment of anaerobic lactate abilities
Jump on a dynamic plate, physical principles of determining the height of the jump, average and maximum power from the force-time curve, "jump and reach test", jump ergometer, physical principles of determining the height of the jump and power in the concentric phase of rebound based on support duration and flight in repeated jumps, Margari's test, test on isokinetic bicycle ergometer, hanging running on a running carpet and its modification on a skating machine.

Topic 3 and thesis
Tests of anaerobic lactate abilities
Oxygen debt and maximum blood lactate levels as indicators of anaerobic lactate abilities. Wingate test and its peculiarities when using a bicycle ergometer with constant resistance, resp. in isokinetic mode), 30-second hanging run on a running carpet, Kinderman and Schnabel test, anaerobic tests on a rowing and paddling simulator.

Topic 4 and thesis
Aerobic ability tests
Measurement of maximum oxygen consumption, indirect laboratory and field methods, direct measurement of VO2 max (Douglas bag method, closed and open methods, telemetry of oxygen consumption measurement, "breath-breath" method, devices for measuring O2 and CO2 concentration and lung ventilation, their basic physical principles, Haldane's transformation, the importance of load specificity, criteria for achieving VO2 max, maximum aerobic power, maximum aerobic speed.

Topic 5 and thesis
Aerobic and anaerobic threshold
Methods for determining the aerobic and anaerobic threshold, lactate curve, fixed and individual anaerobic threshold, ventilatory-respiratory method for determining the aerobic and anaerobic threshold, electromyographic method, Conconi test, physiological mechanisms of heart rate deflection from exercise intensity. Practical importance in training diagnostics and sports training management.

Topic 6 and thesis
Assessment of mechanical efficiency and economics of horizontal forms of locomotion
Physical and physiological nature of mechanical efficiency and locomotion economics, their importance in functional diagnostics and basic principles of their determination. Physical units of mechanical efficiency and economics. The importance of sports-specific ergometers, the use of telemetry in assessing the economics of horizontal forms of locomotion in the field. Influence of body weight, speed of movement and aerodynamic drag on the economy of

horizontal locomotives.

Topic 7 and thesis
Physical and physiological principles of quantification of exercise intensity
Power, trajectory, speed, work, power. Basic modes of ergometers with constant resistance force, with constant power, with constant speed and their comparison with cycling in natural conditions. variable power, speed and power. Quantification of intensity according to the body's response, heart rate, ventilation, oxygen consumption, metabolic equivalent MET, lactate level, acid-base balance parameters.

Topic 8 and thesis
Load sources in functional diagnostics
Basic types of ergometers according to the nature of the load. Bicycle ergometer, running carpet, stepper, rowing machine, paddling machine, winch ergometer, stair ergometer (stepper), ski stimulator, flow pool (flume). Ergometer operating modes (mode with constant resistance, power, or speed of movement).

Topic 9 and thesis
Isokinetic dynamometers in diagnostics of force abilities
Isometric principle and methods of its technical implementation. Basic characteristics of isometric contraction. Advantages and disadvantages of using isokinetic muscle contraction in the diagnosis and development of strength skills. Isokinetic bicycle ergometer, its physical principles and possibilities of application in training diagnostics and rehabilitation.

Topic 10 and thesis
Monitoring of basic biomechanical parameters during strength exercises and its importance for the diagnosis of strength skills.
Physical principles, description of equipment, practical use in diagnostics and development of strength skills.

Topic 11 and thesis
Diagnostics of strength skills
Maximum force and maximum force gradient at isometric contraction. One-time maximum method, dependence of force and power on contraction rate, methods of determining individual force-velocity curves, power-velocity, importance in assessing force abilities, force endurance test, fatigue index.

Topic 12 and thesis
Assessment of balance abilities
Simple motor tests. Physical principles of monitoring the movement of the center of gravity, the concept of the center of action of pressure, the assessment of equilibrium using a dynamometric plate. Basic parameters (speed of the center of gravity, average distance of individual points of the stabilographic curve from the center), measurement error and reliability of their determination.

Topic 13 and thesis
Assessment of coordination and proprioceptive skills
Reflection time, reaction time and reaction time with selection. Anticipatory coincidence reaction time. Agility test, its importance, modifications and application in individual sports. Basic parameters, reliability of their determination and practical use.

Practical exercises

1. Anaerobic power test - Margaria-Kalamen test

2. Assessment of maximal anaerobic power at different revolution rates and the lateral strength deficit of the lower limbs on an isokinetic cycle ergometer

3. Wingate test of anaerobic capacity and power

4. Assessment of muscle strength – force and power at different velocities, muscle strength endurance

5. Assessment of muscle strength – measurement of maximum isomeric strength and rate of force development

6. Assessment of explosive strength during jumps on a force plate

7. Assessment of explosive strength during jumps on a jump ergometer - 10-s, 30-s and a longer-lasting test of repeated jumps, squat jump, countermovement jump, countermovement jump with arm swing, drop jump from different heights, jump with added weights

8. Assessment of movement speed - measuring the frequency of movements of the upper and lower limbs (tapping), straight running speed, change of direction speed, and parameters of step initiation and walking

9. Assessment of reaction and movement speed - measurement of simple reaction time, choice reaction time, and coincidence time, agility tests

10. Aerobic endurance field tests – Cooper test, Leger test, Yo-Yo Endurance test (level 1, level 2), Yo-Yo Intermittent Recovery test (level 1, level 2)

11. Assessment of body balance - static balance tests, dynamic balance tests, task-oriented balance tests, perturbation-based balance tests

12. Assessment of core muscle strength, Biering-Sørensen test, assessment of power during a lifting task and trunk rotations with different weights

13. Fulfillment of credit requirements

Recommended literature:

AUSTRALIAN INSTITUTE OF SPORT. Physiological tests for elite athletes. Champaign, IL: Human Kinetics, 2012.
ESTON, R., REILLY, T. Kinanthropometry and exercise physiology laboratory manual: tests, procedures and data. London, UK: Routledge, 2008.
HOFFMAN, J.: Norms for fitness, performance, and health. Champaign, IL: Human Kinetics, 2006.
MORROW, J. R., JACKSON, A. W., DISCH, J. G., MOOD, D. P.: Measurement and evaluation in human performance. Champaign, IL: Human Kinetics, 2011.
REMAIN, M. P., MANSKE, R. C. Functional testing in human performance. Champaign, IL: Human Kinetics, 2009.

WINTER, E. M. et al. Sport and exercise physiology testing guidelines: Volume I - Sport testing: London, UK: Routledge, 2007.
ZEMKOVÁ, E., HAMAR, D.: Sport-specific assessment of anaerobic performance. In: Lehnert, M., Psotta, R., Janura, M., Zemková, E., Malý, T. et al.: Anaerobic performance: Assessment and training (pp. 7-37). Olomouc: Univerzita Palackého v Olomouci, 2012.
ZEMKOVÁ, E., HAMAR, D. Toward an understanding of agility performance. Boskovice: Albert, 2015.
ZEMKOVÁ, E., HAMAR, D. Sport-specific assessment of the effectiveness of neuromuscular training in young athletes. In: Neuromuscular training and adaptations in young athletes (pp. 100-200). Lausanne: Frontiers Media, 2018.
ZEMKOVÁ, E. Postural sway response to exercise. Boskovice: Albert, 2019.

Language, knowledge of which is necessary to complete the course:
English

Notes:

Evaluating history:
Total number of evaluated students: *0*

A	*B*	*C*	*D*	*E*	*FX*

Lecturer:. *prof. Mgr. Erika Zemková, PhD.*

Last modification:

Supervisor: *prof. Mgr. Erika Zemková, PhD., doc. PaedDr. Branislav Antala, PhD.*