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INVESTIGAÇÃO BIOMÉDICA E BIOFARMACÊUTICA IBB

CONFERENCE PROCEEDINGS

A brief note…

We register with justifiable enthusiasm the 2025 National Physiology Congress, held on October 11, 2025, in Rio Maior at the ESDRM - the Rio Maior Sports School - Santarém Polytechnic Institute. This event took place thirty-four years after the last recorded National Physiology Congress, held in December 1991 at the Institute of Physiology of the Faculty of Medicine of the University of Lisbon.

In the book of abstracts published at the time, containing fifty-nine abstracts, the names of great physiologists from referenced physiology centers appear. Although gone, these left a school of knowledge that has continued. We remember

Armando Moreno
Fausto Pontes
Hugo Gil Ferreira
Joaquim Silva Carvalho
Jose Manuel Pina Cabral
Luis Silva Carvalho
Soares Fortunato

The 1991 National Congress involved some young authors who would go on to occupy prominent positions in the Portuguese Academy and particularly in Physiology and Medicine, including

- Antonio Almeida Dias, Full Professor, President of the CESPU Group and President of APESP
- Carlos Nunes Filipe, Full Professor, Director of the Physiology Institute at Nova Medical School
- João José Pedroso de Lima Full Professor, Faculty of Medicine, U Porto, Founder of ICBAS
- Jose A R Duarte, Full Professor, Sports School, U Porto
- Raquel Seiça Full Professor, Director of the Physiology Institute, Faculty of Medicine, U Coimbra (retired)
- Roncon de Albuquerque Catedrático Faculdade Medicina U Porto (retired)

Despite this apparent time gap, there was … there is … no doubt about the value and dynamics of national physiology. This 2025 edition, with its national scope and decentralized nature, involved sixty-five abstracts distributed between oral communications and poster presentations, representing around one hundred affiliated institutions, twenty of which were foreign. We consider it a success.

Therefore, we recognize this congress as a continuum of progress that this society wants to consolidate, thinking above all of younger people for whom the physiology of the present and the future should be the main ground for discovery and the creation of knowledge.

We thank our corporate and institutional partners, without whom this national assembly would not have been possible. To all participants, to our organizing and scientific committees, and all of those who have made this path possible, a big thanks. Well Done.

Luis Monteiro Rodrigues

Organizing Committee

Luís Monteiro Rodrigues, *CBIOS - Universidade Lusófona, Lisboa*
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Rafael Oliveira, *Escola Superior de Desporto de Rio Maior (ESDRM), IPSantarém*

CONGRESS SPONSORS

AWARD SPONSORS

AWARD WINNERS

Prémio de Excelência em Investigação
Award for Excellence in Research

Sponsored by MDPI - Physiologia

Joana Sacramento
INOVA4Health, NOVA Medical School, Faculdade de Ciências Médicas
Universidade NOVA de Lisboa, Lisboa, Portugal

Prémio para Estagiário pós-graduado de Mérito
Graduate Trainee Merit Award

Andreia Amaro
Institute of Clinical and Biomedical Research (iCBR), CIBB - Centre for Innovative Biomedicine and Biotechnology and Faculty of Medicine, University of Coimbra

Menções Honrosas

Helena Rico Pereira
Institute of Biophysics and Biomedical Engineering, Faculty of Sciences, University of Lisbon; NOVA School of Science and Technology, Uninova CTS and LASI, NOVA University of Lisbon, Campus de Caparica

Daniela Rosendo-Silva
Coimbra Institute for Clinical and Biomedical Research (iCBR) and Institute of Physiology, Faculty of Medicine; University of Coimbra, Center for Innovative Biomedicine and Biotechnology (CIBB); Polytechnic University of Coimbra, Coimbra Health School (ESTeSC)

Prémio Melhor Poster
Best Poster Award

Sponsored by The Physiological Society

"Cinnamaldehyde, silibinin and sulforaphane potentiate the release of GLP-1 and PYY from gut cells"

Diana Sousa, Paulo J. Oliveira, João Malva, Paulo Matafome

Presented by **Diana Sousa**

Menções Honrosas

"Enhanced Contextual Traumatic Memory Persists Despite Unaltered Fear Acquisition and Anxiety in Mild Diabetes"

Mariana Cruz, João Munhoz, Helena Fernandes, Paulo Correia-de-Sá, Mónica Moreira-Rodrigues

Presented by **Mariana Cruz**

"Acute and Chronic Multimodal Responses to Whole-Body Electromyostimulation (WB-EMS): Integrating Cardiovascular, Neurological and Metabolic Biomarker Dynamics"

Flávio Ferreira, Hugo Ferreira, Henrique Silva

Presented by **Flávio Ferreira**

08:00 – 09:00	**Welcome and Installation**
Opening **09:00 – 09:15**	**President of the Polytechnical Institute of Santarém IPS** **President of the Rio Maior School of Sport ESDRM** **SPF Directive Board**

SESSION SPARC *Moderators* Rafael Oliveira, ESDRM-IPS & Telmo Pereira, ESCTS-IPC	
09:30 – 11:00	**OC 1.1** Effects of innovative "living low - training high" methods on performance and physiological responses in well trained swimmers Dália Curto, Cristina Bento, Catarina Matias, Mario Espada, José Morgado, Manuel Nicolau, Talita Fernandes, Cristovão Rosa, Ricardo Minhalma, Joana Reis **OC 1.2** The Effect of Resistance Training Proximity-to-Failure on Bioimpedance Metrics in Resistance-Trained Males and Females Tiago Vasconcelos, Ana Alves Ruivo, João Paulo Brito, Rafael Oliveira **OC 1.3** Sprint-by-Sprint vs Accumulated Set Analysis of Muscle Oxygenation in Upper-Body Repeated Sprints Cristóvão H. Rosa, Cristina P. Monteiro, Cláudia Barata, Mário C. Espada, Maria João Valamatos, André Bento, Ricardo J. Minhalma, Joana Filipa Reis **OC 1.4** Integrating Threshold-Focused Cycling and Running Technique Training to Enhance Strength, VO_2 Max, and Running Biomechanics: A New Approach Ester Alves, José Fonseca, João Munhoz, David Rosa, Mónica Rodrigues **OC 1.6** Physical Fitness Comparisons Between Singles and Doubles Badminton Players from the Portuguese National Team André Pito, Rafael Oliveira, Renato Fernandes, Jorge Cação, Nuno Pimenta

	OC 1.7 Post-exercise circulatory occlusion differentially modulates soleus spinal and supraspinal excitability André Gonçalves, Andréia Terra, Rodrigo Marques, P. Pezarat-Correia, Carolina Vila-Chã, Gonçalo Mendonça
POSTER VISIT **& Coffee break** **11:00 – 12:00** **11:05 – 11:20** **11:25 – 11:40**	On site Poster Presentation (by 1st author) Areas V & S SESSION 1: V1.01 to V1.05 and S1.11 to S1.15 SESSION 2: V2.06 to V2.10 and S2.16 to S2.19 *Moderated by the Scientific Commission*

SESSION NEUROMA *Moderators* Cristina Sena, Physiology Institute FMUC & Miguel Brito, ESCTS-IPL	
12:00 – 13:15	**OC 2.8** Evaluation of the Physiological and Cognitive Effects of the Use of Exoskeletons in Overhead Tasks in the Automotive Industry Daniely Vieira, Filomena Carnide, Ana Assunção, Tiago Carvalho, Vera Gomes, António Veloso, Hugo Fereira **OC 2.9** Connecting the Dots Between CKD and Muscle Wasting: Is Nrf2 Involved? Sara Mendes, Adriana Rodrigues, Tiago Duarte, Diogo V. Leal, Henrique Almeida, João L. Viana, Elisabete Silva **OC 2.10** Lack of Adrenaline Mitigates Age-Associated Fear Memory and Thus Stress Susceptibility João Munhoz, João Santos, Rafaela Seixas, Ana Oliveira, Mónica Moreira-Rodrigues **OC 2.11** Impact of aging on the rat behavioural responses to mismatch novelty and mismatch novelty training: correlation with hippocampal and prefrontal cortex monoaminergic markers Diana Cunha-Reis, Daniela Fernandes, Vasco Pinto, Rafael Ajuda, Angela Amaro-Leal, Fátima Aidil-Carvalho **OC 2.12** Classification of EEG Signals Evoked by Pure Odorant Molecules Using Deep Learning Models Diogo Alves da Silva, Inês Inácio, Duarte Oliveira-Saraiva, Helena Rico Pereira, Filomena Martins, Hugo Ferreira

	OC 2.13 Can we predict brain volumes from linear measurements in neonatal MRI? Tânia Vaz, Nima Naseh, Bárbara Coutinho-Ferreira, Margarida Paulino-Miguel, Lena Hellström-Westas, Nuno Canto-Moreira, Nuno Matela, Hugo Ferreira **OC 2.14** Divergence Between Tau PET and Anatomical MRI Asymmetry in Alzheimer's Disease and Cognitively Normal Aging Helena Rico Pereira, José Manuel Fonseca, and Hugo Alexandre Ferreira
13:15 – 14:15	**LUNCH PAUSE AND POSTER VISIT**

KEYNOTE SPEAKER *Moderator* João Brito, ESDRM-IPS	
14:15 – 15:00	**Professor José Gomes Pereira** *Universidade de Lisboa, Faculdade de Motricidade Humana* **“Cardiovascular and Respiratory Physiology – Applicability from Sports to Clinics”**

SESSION MECHAN1 *Moderators* Diana Cunha-Reis (FCUL-BioISI) & Paulo Matafome (iCBR FMUC and H&TRC ESCTS-IPC)	
15:00 – 16:30	**OC 3.15** The protective effect of taurine during the molecular evolution of the visual cortex in animal models of obesity and type 2 diabetes Beatriz Caramelo, Vera M. Mendes, Adriana Cortez, Tamaeh Monteiro-Alfredo, José Sereno, João Martins, Miguel Castelo-Branco, Bruno Manadas, Paulo Matafome **OC 3.16** Gestational chronic intermittent hypoxia does not affect whole-body metabolism or liver function in offspring, regardless of sex Joana F. Sacramento, Esther Valverde-Perez, Margarida B. Almeida, Elena Olea, Jesus Prieto-Lloret, Asuncion Rocher, Silvia V. Conde

	OC 3.17 Cold and Restraint Stress Exacerbates 5-Fluorouracil-Induced Intestinal Mucositis in Mice Lorena Duarte Silva, Victória Martins Santos Rodrigues, Lucas Henrique Marques Rodrigues, João Lucas Silva Pinheiro, Cecília Lourena Olímpia Aragão Cunha, Ana Luiza Costa Ferreira, Paulo Correia-de-Sá, Moisés Tolentino Bento Silva, Marcellus Henrique Loiola Ponte Souza, Renan Oliveira Silva Damasceno **OC 3.18** Increased Gastrointestinal Angiotensin Converting Enzyme Activity in Streptozotocin-induced Diabetic Rats Marisa Esteves-Monteiro, Joana Castanheira-Moreira, Mariana Ferreira-Duarte, Manuela Morato, Margarida Duarte-Araújo **OC 3.19** Maternal obesity disrupts offspring central neuroendocrine mechanisms in a sex-dependent manner Andreia Amaro, Filipa I. Baptista, Miguel Castelo-Branco, Paulo Matafome **OC 3.20** Grape Pomace Flour Modulates Lipid Profile and PON1 Activity in a Rat Model of Dyslipidemia Raphaela Cassol Piccoli, Marisa Nicolai, Paula Pereira, Francieli Moro Stefanello, Roselia Maria Spanevello, Maria Lídia Palma, Rejane Giacomelli Tavares **OC 3.21** Dopamine regulates NPY and melanocortin systems in the adipose tissue: therapeutic targets for metabolic diseases Eduardo Lopes, Diana Sousa, Sílvia Conde, Daniela Rosendo-Silva, Paulo Matafome
POSTER VISIT & Coffee break **16:30 – 17:30** **16:35 – 16:50** **17:00 – 17:15**	On site Poster Presentation (by 1st author) Areas U & R SESSION 3: U3.20 to U3.24 and R3.30 to R3.33 SESSION 4: U4.25 to U4.29 and R4.34 to R4.37 *Moderated by the Scientific Commission*

SESSION MECHAN2 *Moderators* Carmen Brás Silva, RISE Health, Fac. Med. U Porto & Elisabete Silva, CBIOS – U Lusófona	
17:30 – 18:30	**OC 4.22** GLUT-1 Expression in Human Placentas: Fetal Sex-Dependent Differences Emerge with Advanced Maternal Age Elisabete Silva, Ana Rita Pinheiro, Adriana Rodrigues, Liliana Matos, José Costa, Sara Ricardo, Luís Guedes-Martins, Henrique Almeida

	OC 4.23 Modulating adipocyte metabolism in vitro through a novel curcumin derivative Marlene Marlene Rodrigues, Daniela Rosendo-Silva, Paulo Matafome, Sónia Silva **OC 4.24** Trunk Flexors, Lumbar Lordosis, Pelvic Tilt, and Functional Disability as Mediators of Pain Sensitivity in Post-Bariatric Surgery Patients Saira Waqqar, Tiago Montanha, Nelson Azevedo, Eduardo Lima-da-Costa, Hélder Fonseca, José Carlos Ribeiro **OC 4.25** Comparative study of the relationship between TyG and AIP indices with the development of insulin resistance and adipose tissue dysfunction in individuals with obesity without T2D Carina Carvalho Magalhães, Daniela Rosendo-Silva, João Figueiredo, Paulo Matafome **OC 4.26** Effect of an 8-week exercise program under hypoxia conditions in Type II Diabetes and Prediabetic patients in cardiorespiratory variables Tatiana Neto, S. Pais, A. Raimundo, M. Botelho, C. Guerreiro, R. Minhalma **OC 4.27** Pomegranate Polyphenols and Metabolic Health: Exploring Nutritional Prevention of Type 2 Diabetes Regina Menezes, Andreia Gomes, Mafalda Alves, Joana Chinita, Ângela Rocha, Guilherme Martins, Patricia Rodrigues, Sofia Ferreira, Carolina Pires, Ana Vasconcelos, Emilia Borba Alves **OC 4.28** The bacterial load in visceral adipose tissue is increased in obese individuals with hyperglycemia and correlated with intestinal permeability Daniela Rosendo-Silva and Paulo Matafome
Closure **18:30 –**	**Awards Ceremony** **Wrap-up and Final Remarks** **Announcement on the 4th International SPF Meeting 2026**

TITLE LIST

ORAL PRESENTATIONS

POSTER PRESENTATIONS

OC 1.1

Title	**Effects of innovative "living low - training high" methods on performance and physiological responses in well trained swimmers**
Authors	Dália Curto [1,2], Cristina Bento [1,2], Catarina Matias [3], Mario Espada [4], José Morgado [3,5], Manuel Nicolau [1,2], Talita Fernandes [1], Cristovão Rosa [1,2], Ricardo Minhalma [6], Joana Reis [1,2]
Affiliations	1 - Laboratório Fisiologia e Bioquímica do Exercício, Faculdade de Motricidade Humana, Oeiras, Portugal; 2 - CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Cruz-Quebrada-Dafundo, Portugal; 3 - CIDEFES - Universidade Lusófona, Lisboa, Portugal; 4 - Escola de Educação, Instituto Politécnico de Setúbal, Setúbal, Portugal; 5 - CIFI2D, Universidade do Porto, Porto, Portugal; 6 - Escola Superior de Educação e Comunicação, Universidade do Algarve, Faro, Portugal
Abstract	This study aimed to compare the effects of repeated sprint (RS) training performed on a ski-ergometer under hypoxic (RSH, FIO_2= 14.5%) versus normoxic (RSN, FIO_2= 20.9%) conditions on swimmers' performance. Additionally, it sought to assess cardiorespiratory, metabolic, and muscle oxygenation adaptations after four weeks of training. Twenty-four competitive swimmers were randomly assigned to either RSH or RSN groups. Both groups completed two weekly sessions of RS training consisting of 3 sets of 5 × 10-second all-out sprints with 20-seconds of rest, in addition to their usual swim training. Pre- and post-intervention assessments included an incremental test to exhaustion (to measure $\dot{V}O_2$max and ventilatory thresholds), a 100m front.crawl sprint (to evaluate $\dot{V}O_2$peak and peak lactate), and a 200m ski-ergometer effort (to analyze $\dot{V}O_2$ and triceps brachii muscle deoxyhemoglobin kinetics, and contribution of energy systems). Both RSH and RSN groups demonstrated significant improvements in $\dot{V}O_2$max (RSH: +11.9 ± 8,4; RSN: +10.2 ± 9,7%, $p<0.05$) and time to exhaustion (RSH: 13,4 ± 7,9; RSN: 15,9 ± 8,6%, $p<0.05$). No changes were observed in 100m swim times or VO_2peak, though blood lactate levels decreased significantly in both groups (RSH: -16,9 ± 4,8; RSN: -12,0 ± 5,2%, $p<0.05$). Performance in the 200m ski-ergometer improved (RSH: −8.2 ± 5,9%; RSN: −6.5 ± 5,2%, $p<0.05$) along with increased anaerobic alactic energy contribution (RSH: +28.3 ± 10,5%; RSN: +31.5 ± 11,7%, $p<0.05$). These findings suggest that RS training, regardless of oxygen condition, enhances aerobic performance and anaerobic alactic energy contribution, improving ergometric performance, though swimming performance remained unchanged. *Keywords:* repeated sprint training, hypoxia, swimming, muscle oxygenation, VO_2

OC 1.2

Title	**The Effect of Resistance Training Proximity-to-Failure on Bioimpedance Metrics in Resistance-Trained Males and Females**
Authors	Tiago Vasconcelos [1,2], Ana Alves Ruivo [1,2], João Paulo Brito [1,3,4], Rafael Oliveira [1,3,4]
Affiliations	1 - Research Center in Sports Sciences, Health Sciences and Human Development, CIDESD, Covilhã, Portugal; 2 - Department of Sport Sciences, University of Beira Interior, Covilhã, Portugal; 3 - Santarém Polytechnic University, School of Sport, Rio Maior, Portugal; 4 - Life Quality Research Center (CIEQV), Santarém Polytechnic University, Santarém, Portugal
Abstract	Resistance training (RT) protocols, particularly proximity to failure (FAIL vs. 2 RIR), influence physiological adaptations. This 8-week study investigated their impact on bioimpedance variables, including Phase Angle (PhA), a key cellular health marker. The aim was to quantify pre-post changes and sex-specific differences. A within-participant study (11 males, 8 females; age: 20.4 ± 1.7 and 24.8 ± 4.8 years) randomized limbs to FAIL or 2-RIR, for unilateral Scott curl and unilateral leg extension exercises. Bioimpedance (InBody S10) measured Phase Angle (50 kHz), body composition, and water compartments pre-post training. Paired t-tests analyzed pre-post changes; independent t-tests compared group differences. Significant pre-post changes ($p < 0.05$) were observed across most bioimpedance variables. For females, notable changes included an increased left arm extracellular water to total body water ratio ($p = 0.018$) and decreased right arm soft lean mass ($p = 0.006$). Males exhibited a more extensive pattern of changes: total body water, intracellular water, extracellular water, and fat-free mass generally decreased, while fat mass increased (all $p < 0.05$). Segmental water and lean mass responses varied significantly across different body parts. Phase Angle consistently changed across all segments for both sexes. This study reveals that RT significantly impacts Bioelectrical Impedance Vector Analysis, and PhA. The changes were diverse, with distinct patterns emerging between sexes regarding water compartments, FM, and LM. These findings, derived from a specific unilateral protocol, suggest that even within controlled exercise variations, RT influences body composition, warranting further investigation into broader training contexts. *Keywords:* Resistance Training, Phase Angle, Bioimpedance, Body Composition

OC 1.3

Title

Sprint-by-Sprint vs Accumulated Set Analysis of Muscle Oxygenation in Upper-Body Repeated Sprints

Authors

Cristóvão H. Rosa [1,2], Cristina P. Monteiro [1,2], Cláudia Barata [1], Mário C. Espada [2,3,4,5,6], Maria João Valamatos [2,7], André Bento [1], Ricardo J. Minhalma [4,8], Joana Filipa Reis [1,2,9]

Affiliations

1 - Laboratory of Physiology and Biochemistry of Exercise, Faculdade de Motricidade Humana, Universidade de Lisboa, Oeiras, Portugal;
2 - CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Lisbon, Portugal;
3 - Instituto Politécnico de Setúbal, Escola Superior de Educação, Setúbal, Portugal
4 - Sport Physical Activity and Health Research & Innovation Center (SPRINT), Rio Maior, Portugal;
5 - Comprehensive Health Research Centre (CHRC), University of Évora, Évora, Portugal;
6 - Life Quality Research Centre (CIEQV), Setúbal, Portugal;
7 - Neuromuscular Research Laboratory, Faculdade Motricidade Humana, Universidade Lisboa, Oeiras, Portugal;
8 - Escola Superior de Educacao e Comunicacao, Universidade do Algarve, Faro, Portugal;
9 - Portugal Football School, Portuguese Football Federation, FPF, Cruz-Quebrada, Portugal

Abstract

Investigating muscle oxygenation dynamics during repeated sprints (RS) can reveal rapid changes in O_2 delivery and utilization. While sprint-by-sprint analysis excels at identifying peaks and nadirs, accumulated integrals of each effort block can mitigate the type I and II errors introduced by multiple repeated measures and may accurately capture the overall response to the training task. The aim of this exploratory study was to compare these two methods in an upper-body RS protocol using muscle oxygenation variables. Twelve trained athletes performed two protocols (RS in normoxia (RSN) and RS with voluntary hypoventilation at low lung volume (RS-VHL)) on an arm-cycle ergometer. Each protocol comprised two sets of six 6-s sprints with 24-s of passive recovery. Near-InfraRed Spectroscopy measured oxyhaemoglobin (O_2Hb), deoxyhaemoglobin (HHb), and tissue saturation index (TOI). For sprint-by-sprint data the highest HHb and lowest O_2Hb/TOI per sprint (6-s moving average) were registered. For the accumulated data integrals of each set from first sprint onset to 24-s after last sprint were calculated. Sprint-by-sprint analysis revealed larger HHb peaks and more pronounced O_2Hb/TOI when compared to integrals. RS-VHL increased HHb peak by 8% sprint-by-sprint ($p < 0.01$) but only 4% when using integrals ($p = 0.13$). Accumulated integrals smooth transient fluctuations and lower type I and II error risks, furthermore revealed significant time × condition interactions, useful when a comprehensive overview is desired. Sprint-by-sprint analysis provides superior temporal resolution and sensitivity to metabolic stress. Combining both methods may better balance sensitivity and error control, guiding methodological choices in exercise physiology research.

Keywords: Muscle oxygenation; Voluntary Hypoventilation at Low Lung Volume; Repeated Sprints

OC 1.4

Title	**Integrating Threshold-Focused Cycling and Running Technique Training to Enhance Strength, VO_2 Max, and Running Biomechanics: A New Approach**
Authors	Ester Alves, José Fonseca, João Munhoz, David Rosa, Mónica Rodrigues
Affiliations	Instituto de Ciências Biomédicas Abel Salazar - ICBAS, Unidade Multidisciplinar de Investigação Biomédica (UMIB), Estádio Clinica
Abstract	This study investigates an innovative training methodology combining cycling and running sessions at intensities defined by each athlete's anaerobic threshold. It aims to improve Trail Running performance by evaluating whether this integrated approach enhances metabolic, biomechanical, strength, and body composition parameters. A total of 31 athletes, aged 26 to 60, were recruited and divided into two groups. The Test Group followed a structured four-month training program integrating cycling and running sessions, tailored to individuals and monitored via the TrainingPeaks platform. The Control Group underwent baseline and final assessments without any intervention. Evaluations were conducted in two phases, measuring key performance indicators using BodyMetrix (assessed body composition and muscle quality), ActivForce 2 Dynamometer (measures knee flexor and extensor strength and peak force), COSMED Gas Analyzer (evaluates cardiopulmonary capacity (VO_2 max)), and MotionMetrix System (analyzes running biomechanics). The Test Group demonstrated increases in key physical performance variables, including VO2 Max, maximum speed attained, and both right knee extensor and flexor strength in both knees, when comparing assessments. In contrast, the Control Group experienced a decline in cadence, whereas the Test Group maintained consistent cadence levels throughout the study. However, we acknowledge a crucial shortcoming in our protocol: we did not reduce training intensity prior to the evaluation sessions for the test group. We believe that had we implemented a tapering phase, the results could have been even more significant. Nevertheless, we are encouraged by the improvements observed—especially in what we consider the most critical variable for running performance. *Keywords:* Physical performance variables, training methodology, Threshold, Cycling and Running, Strength, VO_2 Max, and Running Biomechanics

OC 1.6

Title	**Physical Fitness Comparisons Between Singles and Doubles Badminton Players from the Portuguese National Team**
Authors	André Pito [1], Rafael Oliveira [1,2,3], Renato Fernandes [1], Jorge Cação [1], Nuno Pimenta [1,4]
Affiliations	1 - Santarém Polytechnic University, School of Sport, Rio Maior, Portugal; 2 - Life Quality Research Centre (CIEQV), Santarém, Portugal; 3 - Research Center in Sport Sciences, Health Sciences and Human Development (CIDESD), Santarém, Portugal; 4 - Sport Physical Activity and Health Research & Innovation Center (SPRINT), Santarém, Portugal
Abstract	Badminton is a complex sport influenced by multiple performance factors. According to the literature, the most relevant characteristics for success in badminton are technical skill, physical fitness, and body composition. However, the differences between singles and doubles players are limited. This study aimed to compare various fitness and body composition markers between singles and doubles athletes from the Portuguese National Badminton Team. Fourteen (age, 22.4±4.1) and 9 doubles (age, 21.8±2.5) elite Portuguese badminton players were evaluated in agility, body composition, lower limb power, and cardiovascular endurance. Weekly training volume was also assessed. The assessments were conducted over four days during a national team training camp. The only meaningful difference was the weekly training volume which showed a higher value for singles and doubles. Moreover, there was a slight tendency for higher values in the remaining variables for singles when compared with doubles, but no other significant differences were found. Despite the higher training volume for singles, the findings suggest that other variables than physical fitness maybe more relevant to identify differences between singles and doubles athletes.
	Keywords: Badminton, Fitness, Sports Performance

OC 1.7

Title	**Post-exercise circulatory occlusion differentially modulates soleus spinal and supraspinal excitability**
Authors	André Gonçalves [1,2], Andréia Terra [1,3], Rodrigo Marques [1], P. Pezarat-Correia [2,4], Carolina Vila-Chã [5,6], Gonçalo Mendonça [1,2]
Affiliations	1 - Neuromuscular Research Lab, Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, 1499-002, Cruz Quebrada, Portugal; 2 - Interdisciplinary Center for the Study of Human Performance (CIPER), Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, 1499-002, Cruz Quebrada, Portugal; 3 - Human Performance Research Laboratory, Universidade Federal de Alfenas, 37133-840, Santa Clara, Alfenas, MG, Brasil; 4 - Egas Moniz Center for Interdisciplinary Research (CiiEM), Egas Moniz School of Health and Science, Monte da Caparica, 2829-511, Almada, Portugal; 5 - Higher School of Sport, Well-Being and Biomedical Systems, Polytechnic University of Cávado and Ave, Vila Frescaínha S. Martinho, 4750-810, Barcelos, Portugal; 6 - Sport, Physical Activity and Health Research & Innovation Center (SPRINT), Av. Dr. Mário Soares, 2040-413, Rio Maior, Portugal
Abstract	*Abstract withheld at the authors' request*

OC 2.8

Title	**Evaluation of the Physiological and Cognitive Effects of the Use of Exoskeletons in Overhead Tasks in the Automotive Industry**
Authors	Daniely Vieira [1], Filomena Carnide [1], Ana Assunção [1], Tiago Carvalho [3], Vera Gomes [4], António Veloso [1], Hugo Fereira [2]
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Abstract	Overhead work imposes high physical and cognitive demands, increasing the risk of fatigue and musculoskeletal injuries [1]. This study aimed to evaluate the effects of using passive exoskeletons on physiological and mental workload parameters during overhead tasks. Eight automotive industry workers participated in a crossover experimental protocol, performing typical assembly tasks with and without the Skelex 360-XFR and Neck Support exoskeletons. Data collection included surface electromyography (SEMG), commonly used to quantify muscle activity and fatigue in exoskeleton studies [2] electroencephalography (EEG), which allows the evaluation of mental workload and attentional processes [3-5] and plethysmography (PPG). The results showed a significant reduction in perceived exertion (M=3.1 vs M=5.9, $p<0.001$)[4,5], in the activation of the anterior deltoid ($p=0.021$), middle deltoid ($p=0.047$), and upper trapezius ($p=0.013$) muscles, as well as in heart rate ($p=0.003$) and respiratory rate ($p=0.017$). EEG analysis indicated lower cognitive workload ($p=0.005$), increased attentional focus ($p=0.034$), and reduced emotional valence ($p=0.004$) when using the exoskeletons. These findings suggest that the use of exoskeletons leads to a simultaneous reduction in both physiological and cognitive workload without impairing task performance, although with a slight tendency toward negative emotional responses. It is concluded that exoskeletons may be considered a viable ergonomic solution in industrial settings, provided their implementation is accompanied by specific training and continuous monitoring. *Keywords:* Mental workload; Exoskeletons; Electroencephalography; Surface electromyography; Occupational biomechanics.

OC 2.9

Title	**Connecting the Dots Between CKD and Muscle Wasting: Is Nrf2 Involved?**
Authors	Sara Mendes [1], Adriana Rodrigues [2,3], Tiago Duarte [2], Diogo V. Leal [1], Henrique Almeida [2,3], João L. Viana [1], Elisabete Silva [2,4,5]
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Abstract	Chronic Kidney Disease (CKD) is being seen as a model of accelerated aging, with patients exhibiting low cardiorespiratory and muscular fitness. Alterations in the nuclear factor erythroid 2–related factor 2(Nrf2) pathway in CKD have been reported to contribute to the disease progression and associated morbidity. Identifying Nrf2's roles and associated mechanisms is important to better understand CKD progression. This work aimed at evaluating the role of Nrf2 during renal and skeletal muscle aging. For this, tissue samples from renal and skeletal muscle of wild-type (WT) and Nrf2-KO mice were obtained at the ages of 8-12 (juvenile-J) or 38-42 (adult-A) weeks. Tissue sections were stained with hematoxylin & eosin (H&E) and Picrosirius Red (PSR) for morphological examinations and tissue fibrosis quantification, respectively. IgG deposition (a driver of fibrosis) was evaluated by western blotting. Statistical analysis was performed using a two-way ANOVA followed by Tukey's post hoc test. Results show no changes in the parameters evaluated when comparing the J groups (JWT vs. JNrf2-KO). Significant increases in glomerular and muscle fiber area were observed in JWT compared with ANrf2-KO (glomerulus: 2.04x, $p<0.01$; fibers: 1.9x, $p<0.05$), but not compared with AWT. The increase in the glomerular area was paralleled by a significant decrease in their number (1.03x, $p<0.05$), but the same was not observed on muscle fibers. IgG deposition increased with age (1.24x, $p<0.01$), and were more predominantly accumulated in the kidney, compared with the muscle (1.16x, $p<0.01$). In the kidney, IgGs were more abundant in AWT (2.78x, $p<0.05$) and ANrf2-KO (4.00x, $p<0.0001$) groups (in comparison to YWT) and, as expected, tissue fibrosis was also higher (AWT – 3.35x $p< 0.001$; ANrf2-KO – 3.93x $p<0.0001$). However, when compared to JWT, muscle IgG was more abundant only in the ANrf2-KO group (2.9x, $p<0.05$), yet fibrosis was not different. In conclusion, markers of tissue aging and dysfunction are more evident in the kidney than in muscle, being exacerbated by the absence Nrf2 expression. The mechanism underlying the role of the Nrf2 pathway in the protection against renal and kidney damage needs further investigation. *Keywords:* NRF2; Kidney damage; Skeletal muscle ageing; CKD

OC 2.10

Title	**Lack of Adrenaline Mitigates Age-Associated Fear Memory and Thus Stress Susceptibility**
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Abstract	Aging has been associated with physiological changes in the brain, particularly affecting fear memory extinction, leading to prolonged freezing behavior in older mice. This impairment correlates with decreased neurogenesis in the hippocampus, a region essential for contextual learning and memory. We aimed to study the influence of adrenaline on age-related changes in contextual fear memory. An elderly and an adult cohort of male wild-type (WT) and adrenaline-deficient mice (129x1/SvJ) underwent fear conditioning. Mice were exposed to 3 foot-shocks (2 s, 0.6 mA) followed by contextual reminder exposure the following day. Response to foot shocks and freezing were evaluated. Hippocampal gene expression was assessed by qPCR. Results were analyzed using Student's t-test and Two-Way ANOVA ($P < 0.05$). On the fear acquisition day, no differences in vocalization, jumping, or freezing were observed between WT elderly and adult mice, indicating a similar shock perception despite age differences. On the context day, WT elderly mice showed an increase in freezing behavior, which may indicate that elderly individuals formed stronger contextual fear memories, a trend not observed in elderly adrenaline-deficient mice. In WT animals, hippocampal gene expression of NR4A2 is decreased in elderly mice, while no differences were observed in other memory-related genes such as NR4A3, Npas4 and BDNF. In conclusion, adrenaline may play a critical role in modulating the formation and consolidation of fear memories in the elderly. The decreased NR4A2 expression might suggest a link to this process, indicating reduced susceptibility to stress-related memory impairments. Work supported by FCT/FEDER (UIDB/04308/2025 and UIDP/04308/2025). *Keywords:* Adrenaline; Contextual Fear Memory; Aging

OC 2.11

Title	**Impact of aging on the rat behavioural responses to mismatch novelty and mismatch novelty training: correlation with hippocampal and prefrontal cortex monoaminergic markers**
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Abstract	The hippocampus (HIPP) and the prefrontal cortex (PFC), key brain regions for higher cognitive processes like decision-making, attention, memory and executive function are strongly affected by aging, which also affects brain neurotransmission and synaptic plasticity. We previously showed that mismatch novelty training (MNT) has a major impact on learning and memory1–3. In this work we set out to investigate the impact of aging on mismatch novelty (MN) responses and HIPP and PFC monoaminergic transporter balance and the influence of MNT on learning and memory tasks. The MN test and mismatch MNT were conducted in male Wistar rats aged 3-4 to 21 months as described [1,2,4] and cognitive ability was evaluated using the radial-arm maze (RAM). The protein levels of general (synaptophysin), GABAergic (gephyrin, GAT-1), glutamatergic (PSD-95, GluA1, GluA2) and monoaminergic (SERT, DAT) synaptic markers were detected by western-blot in total PFC and HIPP membranes [4]. Animal handling was according to EU laws. The behavioural responses of rats to MN were progressively diminished from early adulthood (3-4M) to middle-age (12M) as evaluated by the decrease in the number of nose pokes (21.0±1.5 vs. 12.1±1.7, n=7) and time sent in the periphery of the holeboard (296.0±1.0 vs. 279.8±6.1, n=7). This was concurrent with a biphasic variation of most synaptic markers (synaptophysin, PSD-95 and gephyrin, SERT, DAT, n=4-6), increasing from young adulthood (3-4M) to middle age (12M) and then declining at 21M ($P<0.05$, One-way ANOVA). MNT was more effective in middle-aged rats than in juvenile and young adults as evaluated by the performance in the RAM test ($P<0.05$, One-way ANOVA). Altogether this suggests that a progressive impairment in HIPP and PFC monoaminergic transmission contributes to age-related cognitive decline and altered responses to MN. Furthermore, MNT showed more impact on cognition in middle-aged rats than in juvenile or young adult rats, suggesting the need to test the impact of mismatch novelty training in cognitive performance in aged rats. *Keywords:* mismatch novelty; aging, cognitive decline, prefrontal cortex, hippocampus, monoamines

OC 2.12

Title	**Classification of EEG Signals Evoked by Pure Odorant Molecules Using Deep Learning Models**
Authors	Diogo Alves da Silva, Inês Inácio, Duarte Oliveira-Saraiva, Helena Rico Pereira, Filomena Martins, Hugo Ferreira
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Abstract	Human olfactory perception is influenced by the structural and physicochemical properties of odorant molecules, particularly their molecular structure and binding capabilities with olfactory receptors. This study presents an innovative approach to approximating an artificial olfactory system by classifying EEG signals elicited by pure olfactory stimuli. EEG data were recorded in response to five odorants, each representing a distinct chemical functional group (alcohol, amide, carboxylic acid, ester, and aldehyde), delivered via a custom-built olfactometer developed in the laboratory. Participants' sensory feedback was complemented by EEG signal classification using a three-dimensional convolutional neural network (3D-CNN), applied to three temporal windows: [100–300 ms], [300–500 ms], and [100–500 ms]. The results showed that the 3D-CNN accurately classified the odorants, with all validation accuracies above 0.60. The highest performance was observed in the [300–500 ms] window, typically associated with higher-order cognitive and evaluative processing. In the [100–300 ms] window—linked to early sensory processing—classification patterns revealed a consistent distinction based on hydrogen bonding potential: functional groups capable of hydrogen bonding were more frequently misclassified among themselves, while binary classifications between bonding and non-bonding groups yielded higher accuracy. These findings align with literature suggesting that olfactory receptor families can be distinguished by their molecular interaction profiles. In conclusion, the proposed approach approximates a cortical olfactory system using deep learning to classify EEG signals in response to odorants, in a manner consistent with theories of molecular binding and neural encoding. This study opens new directions for neuroscience research and brain-computer interfaces. *Keywords:* Olfactory perception; EEG signal classification; Deep learning; Odorant molecules; Brain-computer interfaces

OC 2.13

Title	**Can we predict brain volumes from linear measurements in neonatal MRI?**
Authors	Tânia Vaz [1], Nima Naseh [2], Bárbara Coutinho-Ferreira [3], Margarida Paulino-Miguel [4], Lena Hellström-Westas [2], Nuno Canto-Moreira [5], Nuno Matela [1], Hugo Ferreira [1]
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Abstract	The linear measurements in neonatal brain magnetic resonance imaging (MRI) can be used to quantify brain growth and understand the normal brain development. It is a simpler and clinically feasible alternative to brain volume analysis. Therefore, the purpose of this study was to develop predictive models for estimating brain volumes based on biometric measurements. Six manual linear measurements (biparietal diameter (BPD), fronto-occipital diameter (FOD), interhemispheric distance (IHD), transverse cerebellar diameter (TCD), deep grey matter area (DGMA), and head circumference (HC)) and eight MANTiS generated brain volumes (cortical grey matter (CGM), white matter (WM), cerebral spinal fluid (CSF), deep nuclear grey matter (DNGM), cerebellum (CB), brainstem (BS), total brain (TB), and intracranial volume) were extracted from 48 preterm infants on term-equivalent-age T2-weighted-MR images. Multiple linear regression (MLR) with a forward-stepwise method was used, resorting to the IBM-SPSS-v29 software. MLR predicted neonatal brain volumes using biometric measurements with variable success. Intracranial volume achieved highest predictability (89.0%) with HC as greatest influence. DNGM reached 80.8% predictability (DGMA as major predictor), TB volume 78.1% (BPD and FOD as main predictors), and CGM 71.5% (FOD as primary predictor). Moderate predictions included CB (64.1%), CSF (63.2%), and BS (62.1%). WM showed limited predictability (18.0%), suggesting linear measurements are insufficient for this volume. Linear biometric measures effectively predict complex brain volumes in neonates, particularly intracranial and some subcortical structures, offering an estimation alternative when clinical volumetric assessment tools are unavailable. Acknowledgements: Fundação para a Ciência e a Tecnologia (IBEB-Strategic-Program-UID/00645/2025 and Bolsa de Investigação para Doutoramento 2022.12483.BD).

Keywords: biometry; brain volume; linear measurements; neonatal MRI; preterm. |

OC 2.14

Title	**Divergence Between Tau PET and Anatomical MRI Asymmetry in Alzheimer's Disease and Cognitively Normal Aging**
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Abstract	Hemispheric asymmetry in neuroimaging biomarkers may offer clinically relevant insights into spatial dynamics and lateralized vulnerability in Alzheimer's disease (AD). In this study, we examined the relationship between asymmetry indices from tau PET (SUV_AI) and structural MRI (VOLUME_AI) in cognitively normal (CN) individuals and AD patients. Correlations between SUV_AI and VOLUME_AI were generally weak at the individual level across diagnoses (Spearman r = –0.27 to 0.15, FDR-corrected p right vs. left 0) showed greater left-dominant volume loss (VOLUME_AI) than those with right-dominant tau (FDR p < 0.027). Notably, AD patients with left-lateralized tau showed significantly more volume atrophy than CN individuals with similar tau asymmetry (FDR p < 0.027). These findings highlight the importance of considering asymmetry directionality—not just magnitude—in neuroimaging biomarkers and underscore the value of asymmetry analyses in distinguishing between pathological and normative ageing trajectories. However, further studies are needed to clarify how tau PET asymmetry contributes to neurodegeneration and symptom development in AD. *Keywords:* Alzheimer's disease, tau PET, MRI, brain asymmetry

OC 3.15

Title	**The protective effect of taurine during the molecular evolution of the visual cortex in animal models of obesity and type 2 diabetes**
Authors	Beatriz Caramelo [1,2], Vera M. Mendes [2], Adriana Cortez [2], Tamaeh Monteiro-Alfredo [1,4], José Sereno [2,4], João Martins [1,4], Miguel Castelo-Branco [4], Bruno Manadas [2], Paulo Matafome [1,5]
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Abstract	Obesity and type 2 diabetes (T2D) is linked to neurological complications. The visual cortex (VC) presents hyperactivation, followed by its later atrophy with T2D progression. Both occur prior to visual difficulty. The latter is only observed with VC hypoactivation. Thus, biochemical changes occur prior to symptomatic alterations. Hence, we would benefit from biomarkers in earlier stages. In fact, we recently showed a taurine-involving compensatory mechanism in high-fat diet (HFD)-fed and streptozotocin (STZ)-injected rats, against a hyperactive primary VC (V1). We aim to corroborate this and analyse the underlying synaptic and metabolic dysregulation. 3 animal models (male Wistar rat): control (SD, 10 weeks (w)); obesity (HFD, 10w); T2D (HFD, 10w + low STZ dose (35 mg/kg), 4th w). Then, all rats underwent 1H-MRS to analyse metabolites involved in synapses and other mechanisms; and fMRI to study the LED light-stimulated hemodynamic response. The animals were sacrificed, and VC was collected for proteomics. Proteins (VIP > 1 or $p < 0.05$) were used for cluster analysis (Mfuzz package, RStudio). We identified 3 clusters of proteins based on their changes in the groups. The first cluster identified proteins with an upregulation in HFD rats and further upregulation in T2D. The latter has proteins involved in glutamatergic synapse, specifically in the NMDAR-involving synapse and SNARE complex, as well as inhibitory metabotropic receptors. Meanwhile, cluster 2 identified proteins with a HFD upregulation and its maintenance in T2D. This cluster also includes proteins of glutamatergic synapse. But these are now specific to glutamate transport and synthesis, as well as calcium transport. Altogether, it potentiates the hyperactive V1 in T2D ($p=0.226$ vs SD). Cluster 2 also demonstrates the augmentation of proteins involved in the GABAergic synapse. In contrast, cluster 3 shows a decreased GABA synthesis in T2D. In contrast, taurine (GABAAR agonist) levels are increased in T2D ($p=0.0211$ vs SD, $p=0.0153$ vs HFD). Such seems to potentiate the GABAergic synapse, against hyperexcitation as a protective mechanism. In fact, taurine is negatively correlated with elevated glutamine levels in T2D ($p=0.0252$ vs SD). Cluster 3 also shows downregulation of proteins involved in

myelination and cytoskeleton organization in T2D. In obesity and early stages of T2D, taurine and its inhibitory activity, once bound to the GABAAR, may confer a compensatory mechanism to counteract the hyperactivity and associated excitotoxicity in V1.

Keywords: Neurometabolism, Obesity

OC 3.16

Title	**Gestational chronic intermittent hypoxia does not affect whole-body metabolism or liver function in offspring, regardless of sex**
Authors	Joana F. Sacramento [1], Esther Valverde-Perez [2,3], Margarida B. Almeida [2], Elena Olea [3,4], Jesus Prieto-Lloret [2,3], Asuncion Rocher [2,3], Silvia V. Conde [1,2,3]
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Abstract	Obstructive sleep apnea (OSA), marked by intermittent hypoxia, is associated with obesity, type 2 diabetes and metabolic associated fatty liver disease. In pregnancy, intermittent hypoxia may alter fetal programming and increase the risk of long-term metabolic issues in offspring. Here, we explore the effects of gestational OSA on offspring metabolic function, and hepatic glucose metabolism, inflammation and oxidative stress. Experiments were performed on pregnant female Wistar rats submitted to a chronic intermittent hypoxia (CIH) protocol (cycles of 40s to 5%O2, 8h/day), during the last two weeks of pregnancy. Offspring were evaluated at 1, 3, and 12 months of age for weight, glucose tolerance and insulin sensitivity. Markers of glucose metabolism (glucokinase, pyruvate kinase and glucose-6-phosphatase), inflammation (NF-kB, IL-1R, IL-6R, TNF-αR, and NRLP3) and antioxidant enzymes (Catalase, SOD-1, and iNOS) were assessed in the liver. Experiments were approved by the University of Valladolid Institutional Committee for Animal Care and Use. Gestational CIH did not change weight, glucose tolerance and insulin sensitivity in the offspring, except for a transient increase in glucose intolerance observed in 3-month-old females (17%), which attenuated by 12 months (29%, $p>0.001$). Moreover, gestational CIH did not modify hepatic glucose metabolism markers, inflammation and antioxidant defense. However, TNF-αR increased by 501 ($p>0.0001$) and 571% in control 12-month-old male and female, respectively, an effect that was also observed in the CIH offspring. No sexual dimorphism was observed. In conclusion, gestational CIH do not predispose offspring to long-term metabolic dysfunction later in life and not affect biological ageing, regardless of sex. *Keywords:* chronic intermittent hypoxia, pregnancy, metabolic dysfunction, hepatic function, offspring

OC 3.17

Title	**Cold and Restraint Stress Exacerbates 5-Fluorouracil-Induced Intestinal Mucositis in Mice**
Authors	Lorena Duarte Silva [1], Victória Martins Santos Rodrigues [1], Lucas Henrique Marques Rodrigues [1], João Lucas Silva Pinheiro [1], Cecília Lourena Olímpia Aragão Cunha [1], Ana Luiza Costa Ferreira [1], Paulo Correia-de-Sá [3], Moisés Tolentino Bento Silva [4], Marcellus Henrique Loiola Ponte Souza [3], Renan Oliveira Silva Damasceno [1]
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Abstract	Intestinal mucositis is a common adverse effect of 5-fluorouracil (5-FU) chemotherapy. Although stress is known to worsen gastrointestinal inflammation, its role in 5-FU-induced intestinal disorder remains poorly understood. This study investigated the impact of cold and restraint stress on 5-FU-induced intestinal mucositis in mice. Balb/c mice (Protocol 27/2024) were subjected to daily stress using restraint tubes for 8 days (2 h at 4 °C + 6 h at RT). On day 6, animals received 5-FU (450 mg/kg, i.p.) and were euthanized on day 9. Body weight, intestinal length, leukocyte, adrenal weight, villus morphometry, MPO, oxidative stress markers gastrointestinal transit, and fecal fluid were assessed. Mice treated with 5-FU or Stress+5-FU (S+5-FU) showed significant body weight loss and leukopenia compared to control or stress groups. Adrenal weight increased in both Stress, 5-FU and S+5-FU versus control. Intestinal shortening was noted in the 5-FU (47.5±1.4 cm) and S+5-FU (45.2±0.5 cm) groups versus control (51.5±1.5 cm). Villus height was markedly reduced in S+5-FU (496.1±40.7 µm) versus 5-FU (959.9±30.3 µm), Stress (1131±27.0 µm) and control (1288.0±40.1 µm). MPO activity increased in 5-FU (1.41±0.31 U/mg) and was intensified in S+5-FU (2.41±0.28 U/mg), compared to control (0.11±0.05 U/mg). NP-SH levels decreased in 5-FU (124.5±20.9 mg/g) and S+5-FU (162.7±18.8 mg/g) groups versus control (209.3±17.6 mg/g) and Stress (243.7±47.7 mg/g), while MDA and 4-HNE were elevated in 5-FU (6.3±0.5 mg/g and 0.150±0.009 O.D.) and S+5-FU (6.5±0.83 mg/g and 0.16±0.01 O.D.) versus control (4.2±0.4 mg/g and 0.108±0.005 O.D.) and Stress (3.2±0.4 mg/g and 0.11±0.007 O.D.). Fecal fluid content increased in the Stress (63.7±2.4%) and S+5-FU (49.8±6.9%) groups, but not in 5-FU (36.31±10,33%) versus control (19.8±4.3%). Gastrointestinal transit was delayed in S+5-FU (1.90±0.09%) compared to 5-FU (2.30±0.09%) and control (2.83±0.14%). Stress potentiates 5-FU-induced intestinal mucositis, suggesting that stress management may represent a strategy to mitigate gastrointestinal toxicity during chemotherapy *Keywords:* Stress; 5-fluorouracil; Intestinal mucositis

OC 3.18

Title	**Increased Gastrointestinal Angiotensin Converting Enzyme Activity in Streptozotocin-induced Diabetic Rats**
Authors	Marisa Esteves-Monteiro [1,2,3], Joana Castanheira-Moreira [2], Mariana Ferreira-Duarte [1,3], Manuela Morato [1,3], Margarida Duarte-Araújo [1,2]
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Abstract	Gastrointestinal complications significantly contribute to morbidity in diabetes, yet the role of the local renin–angiotensin system in gut remodeling remains poorly defined. This study investigated systemic and intestinal segment-specific changes in angiotensin-converting enzyme (ACE) activity in streptozotocin (STZ)-induced diabetic rats. All protocols were approved by the local animal welfare committee (ORBEA 515/2024). Type 1 Diabetes was induced in adult male Wistar rats by a single intraperitoneal injection of STZ (55mg/kg,n=8). Age-matched non-injected Wistar rats served as controls (CTRL,n=8). After 14 days, blood and gastrointestinal segments (stomach, duodenum, jejunum, ileum, and colon) were collected for enzymatic assays. ACE activity was quantified by a fluorimetric assay using Z-FHL and h-HL as substrates, and the ratio Z-FHL/h-HL was calculated. Circulating ACE Z-FHL and h-HL activities were elevated in diabetic animals compared to controls (in nmol/mL/min, Z-FHL– CTRL:737.7 [589.7;755.6], STZ:1186 [1067;1412]; h-HL– CTRL:146 [113.2;167.3], STZ:300.4 [219.6;325.9). The Z-FHL/h-HL ratio exceeded 1 but was similar across both experimental groups. ACE Z-FHL activity was higher in all intestinal segments examined in the STZ group. ACE h-HL activity was increased in the stomach, jejunum, and duodenum of the STZ animals but not in ileum and colon. The Z-FHL/h-HL ratio remained above 1 and was generally consistent between groups, except in the jejunum and duodenum of STZ animals, where a decreased ratio was observed. In conclusion, diabetes enhanced ACE activity both systemically and locally in the gut, supporting a role for local angiotensin II in gastrointestinal remodeling. Moreover, the Z-FHL/h-HL ratio remained above 1 and, in most cases, approached 4.5, indicating a predominance of N-domain ACE activity, which may promote tissue injury by degrading protective peptides like angiotensin 1–7 and Ac-SDKP. Acknowledgements: FCT Partnership Agreement FCT/MCTES (UIDP/50006/2020 DOI 10.54499/UIDP/50006/2020) through national funds and FCT PhD scholarship (10.54499/2020.06502.BD) to M.E.-M. *Keywords:* diabetes; streptozotocin rats; gastrointestinal tract; angiotensin-converting enzyme

OC 3.19

Title

Maternal obesity disrupts offspring central neuroendocrine mechanisms in a sex-dependent manner

Authors

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Abstract

Maternal obesogenic environments during the perinatal period can disrupt central mechanisms regulating energy balance, increasing offspring risk for obesity, metabolic syndrome and neurodevelopmental disorders. This study aimed to address how maternal obesity modulates central energy balance pathways in early postnatal life in a sex-dependent manner. Female Wistar rats (12 weeks old) were fed either a standard diet (control) or a 60% high-fat (HF) diet for 8 weeks before mating with age-matched males. From birth until weaning day (P21), offspring body weight was monitored weekly. At P21, offspring were subjected to a glucose tolerance test, plasma was obtained for lipid profile, and the prefrontal cortex (PFC) and hypothalamus were collected for molecular analysis, and plasma was obtained for lipid profile characterization. After 4 weeks on the HF diet, the dams presented increased body weight, accompanied by increased glycemia levels and impaired insulin sensitivity. During lactation, male and female offspring from HF mothers presented increased body weight gain. At P21, both sexes from HF group displayed elevated fasting glycemia, cholesterol, triglycerides and free fatty acid levels, along with impaired glucose response. These metabolic alterations were accompanied by increased neuropeptide (NPY) receptor levels - NPY1R and NPY5R – in PFC of male offspring. Furthermore, male offspring exhibited increased GABAa receptor levels and its associated proteins. In contrast, in the hypothalamus, NPY1R and NPY5R levels were reduced, without changes in GABAa receptor levels. Regarding female offspring, no significant changes were observed. Maternal obesity disrupts central neurometabolic and energy balance pathways in a sex- and region-specific manner.

Keywords: perinatal period, maternal obesity, energy balance

OC 3.20

Title	**Grape Pomace Flour Modulates Lipid Profile and PON1 Activity in a Rat Model of Dyslipidemia**
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Abstract	Introduction: The wine industry generates large amounts of byproducts, such as grape pomace flour (GPF), which can be repurposed into functional foods. GPF has shown potential in managing metabolic disorders like dyslipidemia (DYS), a condition marked by abnormal lipid levels and increased cardiovascular risk. The enzyme paraoxonase-1 (PON1) is a key biomarker of cardiovascular health. Aim: This study aimed to evaluate the effects of GPF from Arinto (WGPF) and Touriga Nacional (RGPF) grape varieties on serum lipid profile and PON1 activity in a rat model of dyslipidemia. Methods: 40 adult male Wistar rats (CEUA 033578/2022-14) were divided into five groups: Control (CT), Dyslipidemia (DYS), DYS+Orlistat (50 mg/kg, orally), DYS+10% WGPF (DYS+WGPF), and DYS+10% RGPF (DYS+RGPF). Dyslipidemia was induced on day 89 with a single intraperitoneal injection of Tyloxapol (300 mg/kg). On day 90, animals were euthanized, and serum was collected to measure triacylglycerol (TG), total cholesterol (TC), high-density lipoprotein (HDL), and PON1 activity. Results: Tyloxapol significantly increased TG levels ($P<0.01$). GPF-treated groups showed a non-significant trend toward TG reduction. The DYS+RGPF group showed a significant increase in TC ($P<0.01$) and HDL compared to DYS and DYS+Orlistat ($P<0.05$), suggesting cardiovascular benefits. PON1 activity was significantly reduced by dyslipidemia ($P<0.01$), and only GPF treatments significantly preserved its activity ($P<0.05$). Conclusion: GPF from both grape varieties may offer protective effects against dyslipidemia by improving lipid profiles and preserving PON1 activity and cardiovascular health. *Keywords:* Grape pomace flour; dyslipidemia; PON1; serum lipid profile

OC 3.21

Title	**Dopamine regulates NPY and melanocortin systems in the adipose tissue: therapeutic targets for metabolic diseases**
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Abstract	Background and aims: Neuropeptide Y (NPY), Dopamine, and Melanocortin (MC) systems are key regulators of energy balance at the central level and have been shown to exist in adipose tissue (AT). This study investigates their peripheral crosstalk and metabolic effects within AT. Materials and methods: We used 3T3-L1 preadipocytes and adipocytes, along with ex vivo rat AT samples, treated with dopamine, NPY3-36, α-MSH, and dopamine receptor (DR) antagonists to assess interactions and metabolic consequences. Goto-Kakizaki (GK) rats fed a high-calorie diet received bromocriptine, a Dopamine 2-like receptor agonist. MC (MCRs) and NPY receptors (NPYRs) levels were measured in different peripheral tissues. Visceral AT (VAT) samples from individuals with obesity were analyzed for gene expression of the systems machinery by qPCR, and correlations were assessed using the Spearman r test. Results: In human VAT, MCRs and NPYR2 and 4 expression strongly correlated with DR1 expression. Bromocriptine treatment in rats led to extensive remodeling of MC and NPY systems in epididymal AT, including upregulation of MCR3 and 4, NPYR1 and 5, and elevated NPY and α-MSH peptide levels. In 3T3-L1 cells, dopamine exposure combined with receptor blockage revealed that D4R inhibition significantly reduced MCR3 levels in adipocytes and NPYR1 in preadipocytes. Regarding the metabolic outcomes, dopamine and α-MSH co-treatment enhanced catabolic signaling, shown by increased hormone-sensitive lipase (HSL) activation in ex vivo mesenteric AT, and both HSL and ATP-citrate lyase (ACL) activation in 3T3-L1 adipocytes. Conclusion: These findings demonstrate significant correlations between dopamine, NPY and MC systems in human VAT. Bromocriptine modulates both NPYergic and melanocortinergic systems in AT, and D4R appears to be fundamental in NPY and MC receptor regulation in adipocytes and preadipocytes. This supports the presence of a peripheral crosstalk among these systems, potentially contributing to the modulation of adipose tissue catabolism. *Keywords:* Adipose Tissue; Dopamine; Melanocortin; NPY; Energy Balance

OC 4.22

Title	**GLUT-1 Expression in Human Placentas: Fetal Sex-Dependent Differences Emerge with Advanced Maternal Age**
Authors	Elisabete Silva [1,2], Ana Rita Pinheiro [1,2,3], Adriana Rodrigues [1,2,3], Liliana Matos [1,2], José Costa [2,4,5], Sara Ricardo [6], Luís Guedes-Martins [1,2,7], Henrique Almeida [8,9]
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Abstract	Advanced maternal age is associated with an increased risk of impaired placentation, potentially mediated by alterations in uterine redox homeostasis. We hypothesized that such local redox imbalance negatively affects the placental metabolic profile. In previous studies, we demonstrated a significant reduction in the expression of glucose transporter 1 (GLUT1) and perilipin-2 (PLIN2) in placentas from reproductively aged women (≥33 years) [1]. It is well established that the placental environment may differ according to fetal sex, a factor that may also influence its metabolic characteristics. In this study, we investigated whether fetal sex further modulates the expression of key metabolic markers. Human term placentas were collected from women aged 22 to 41 years and stratified by fetal sex. The expression of GLUT1 and PLIN2 was assessed by immunohistochemistry. The study was approved by the local Ethics Committee, and all participants provided informed consent. In placentas from reproductively aged women, GLUT1 expression was significantly higher in samples from female fetuses compared to male fetuses (female: 3.98; male: 2.83; $p = 0.0088$). This sex-related difference was not observed in placentas from younger women (<33 years; $p = 0.2471$). No significant sex-dependent differences in PLIN2 expression were observed, either in younger ($p = 0.1222$) or in reproductively aged pregnancies ($p = 0.7894$). These findings indicate that fetal sex modulates placental glucose transport capacity in the context of maternal aging and underscore the importance of accounting for sex-specific variables in studies of placental metabolism. [1] Pinheiro, A. R., Rodrigues, A. R., Matos, L., Costa, J. J., Ricardo, S., Guedes-Martins, L., Almeida, H., Silva, E. (2025). Antioxidant treatment attenuates age-related placenta GLUT-1 and PLIN-2 downregulation. Placenta, 160, 60-66. *Keywords:* Placenta; Fetal sex; GLUT-1; PLIN-2; Maternal age

OC 4.23

Title	**Modulating adipocyte metabolism in vitro through a novel curcumin derivative**
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Abstract	Curcumin is a natural polyphenol well-known for its anti-inflammatory, antioxidant, and anti-obesity properties. To improve its bioavailability and biological efficacy, our research group has synthesized a novel curcumin derivative, "Derivative 27" and showed its higher antidiabetic effect in animal models. This study aims to investigate its mechanism of action particularly on lipid metabolism in differentiated mouse 3T3-L1 mature adipocytes. To assess cell viability, differentiated adipocytes were treated with curcumin and its derivative (48 hours; 0.5µm to 40µM). For Oil Red O lipid staining, after the differentiation cocktail (day 0), adipocytes were chronically treated with curcumin (10µM) and Derivative 27 (10µM and 2.5µM) every 72 hours until day 12. Western Blot analysis for AMPK phosphorylation was also performed, to investigate the catabolic activity of the compounds, in which adipocytes were exposed on day 10 to curcumin (10µM and 2.5µM) and Derivative 27 (10µM, 5µM, 2.5µM and 0.5µM) followed by a second treatment 24hours later before cell harvesting. The Resazurin assay revealed no statistically significant alterations in cell viability for either compound. Oil Red O staining demonstrated that chronic administration of the Derivative 27 significantly reduced lipid accumulation at both 2.5µM and 10µM concentrations compared to the vehicle control. Western blot analysis also indicated increased AMPK phosphorylation in cells treated with Derivative 27 and curcumin. In conclusion, these findings suggest that both native curcumin and the Derivative 27 modulate lipid metabolism in mature adipocytes in vitro. *Keywords:* Curcumin; Curcumin derivative; 3T3-L1 cells; Obesity; lipid metabolism.

OC 4.24

Title

Trunk Flexors, Lumbar Lordosis, Pelvic Tilt, and Functional Disability as Mediators of Pain Sensitivity in Post-Bariatric Surgery Patients

Authors

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Abstract

Post-BS patients with weight regain are often fat mass dominant, favoring low body lean mass on the long-term which may influence pain sensitivity. The impact of body composition on pain sensitivity and its underlying mechanism(s), however, are not fully understood. The study aims to examine the relationship between body composition and pain sensitivity and health-related physical fitness parameters mediating this relationship. Forty post-BS patients with weight regain after 18 to 24 months of surgery (51.4 ± 6.8 years: 32.31±3.0 kg/m2) were recruited. Body composition (DXA), Pressure Pain Threshold (PPT: Algometer), spine posture and mobility (Spinal Mouse; IDIAG M360®), trunk and leg muscle strength (isokinetic dynamometer), VO2peak (CPET), fear of movement (Tampa scale) and functional disability (ODI) were assessed. Linear regression was performed to examine the relationship between body composition and pain sensitivity. Mediation analysis used to determine the effect of body composition on pain sensitivity is mediated by health-related physical fitness parameters. Total lean mass was found a significant predictor (10.8%) of PPT variance (ß=0.328; P=0.039). In opposition, trunk lean mass, total and trunk fat mass % were not significant PPT predictors (P>0.05). Full mediation was observed for the effect of total lean mass on PPT through trunk flexors PT/BW, lumbar lordosis, pelvic tilt, and ODI (B=0.1466, SE =0.0619, 95% CI [0.0356:0.2793]). It suggests low lean mass may decrease pressure pain threshold (high pain sensitivity) in post-BS patients with weight regain issues that appear to be influenced by weak trunk flexors, altered lumbar lordosis and pelvic tilt angle, and functional disability. Acknowledgements: This project is supported by Fundacao para a Ciencia e a Tecnologia (FCT) UIDB/00617/2020 ,UIDP/00617/2020 CIAFEL, ITR, Faculty of Sport, University of Porto (FADEUP), and S. João Academic Hospital Center (HSJ), Portugal. Saira Waqqar and Tiago Montanha acknowledges FCT for PhD fellowship (2023. 00444.BD) and (2021. 05532.BD) respectively.

Keywords: Body composition, Low back, pressure pain threshold, pain sensitivity, post-bariatric surgery

OC 4.25

Title	**Comparative study of the relationship between TyG and AIP indices with the development of insulin resistance and adipose tissue dysfunction in individuals with obesity without T2D**
Authors	Carina Carvalho Magalhães [1,2], Daniela Rosendo-Silva [1,2], João Figueiredo [3], Paulo Matafome [1,2,3]
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Abstract	The Triglyceride-Glucose (TyG) index and the Atherogenic Index of Plasma (AIP) index have been described as predictors of metabolic dysfunction, although their relationship with insulin resistance (IR) and adipose tissue (AT) dysfunction is not yet fully understood. Here, we study the relationship between the TyG and AIP indices with the development of IR and AT dysfunction to assess their clinical utility in the early detection of IR. In individuals with Obesity (n=47) at different stages of the disease (insulin sensitivity; IR and normoglycemia; pre-diabetes) recruited at ULS Coimbra, we analyzed univariate and multivariate correlations of TyG and AIP indices with lipid and glucose profiles, IR, adipokines, and the gene expression of AT. ROC curves were used to evaluate the predictive performance of indices in identifying IR. The TyG and AIP indices correlated with Ox_HOMA2 index, Ox_b_cell, Total Cholesterol, Insulin and Adiponectin levels. Additionally, TyG and AIP indices correlated negatively with the expression of genes associated with AT metabolism and antioxidant response and positively with pro-inflammatory genes, being more evident in the IR and normoglycemic group. The models that best predicted TyG (R^2adj=0,459) and AIP (R^2adj=0,421) indices shared very similarities. Urea, Ox_b_cell, Total Cholesterol, Adiponectin, and HbA1c were the best predictors for AIP index, differing only in leptin instead of adiponectin as a predictor of TyG index. The subsets that best predicted TyG (R2adj=0,275) and AIP (R2adj=0,343) indices included ADIPOQ, PRDM16, CAT, NFE2L2 and HAGH_GLO2; and ADIPOQ, PRDM16, IL1B, CAT and GLO1, respectively. Then, we found that the combined multivariate model including TyG and AIP indices, BMI and adiponectin levels showed higher predictive power (AUC=0,907). Both indices correlate with clinical parameters and the expression of genes from AT linked with metabolic dysfunction during the development of IR, and their determination may be useful in the early clinical detection of these alterations. *Keywords:* Adipose tissue; AIP index; Insulin Resistance; Obesity; TyG index

OC 4.26

Title

Effect of an 8-week exercise program under hypoxia conditions in Type II Diabetes and Prediabetic patients in cardiorespiratory variables

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Abstract

Diabetes Mellitus is a chronic condition that benefits from non-pharmacological strategies such as exercise, especially under hypoxic conditions. In cardiopulmonary exercise testing (CPET), the first ventilatory threshold (VT1) is a key indicator of the metabolic response. This study aim to observe how exercise in hypoxia conditions impacts in cardiopulmonary variables, such as VT1. Fourty nine Type II diabetics and prediabetic patients, divided 3 groups: hypoxia (N=16), normoxia (N=15) and control (N=18) volunteered to participate in a eight-week exercise study. Exercise groups trained under either hypoxia or normoxia; the control group maintained usual activity. Subjects perform two visits to the laboratory to scope cardiopulmonary exercise limitations and to establish VT1 from an incremental protocol exercise stress test. The cardiorespiratory variables of interest were exercise duration, duration and load at the VT1. Significance level was p≤.05. After 8 weeks of intervention both groups had higher exercise duration and load on the VT1 (THipox: 483,75±158,02 s; TNorm: 471,33±182,90s; TCont: 311,11±115,35s p=0,003) and load (WVT1Hipox: 79,06±31,21 w; WVT1Norm: 74±30,43w; WVT1Cont: 57,5±16,47 p=0,046). Normoxia group increase the time to reach VT1 (TVT1Norm: 426,67±123,39 s, TVT1Hipox: 447,5±121,319 s, TVT1Cont: 362,78±69,86 s p=0,038). The delayed onset of VT1 in both training groups indicates improved cardiorespiratory fitness and metabolic efficiency, particularly in the hypoxic group. This adaptation reflects a greater ability to maintain aerobic metabolism at higher intensities, increased tolerance to physiological stress and delayed lactate accumulation. This has a positive effect on the functional, metabolic and cardiovascular health of patients.

Keywords: Type II Diabetic, Prediabetic, Hypoxia, Exercise, cardiorespiratory fitness

OC 4.27

Title	**Pomegranate Polyphenols and Metabolic Health: Exploring Nutritional Prevention of Type 2 Diabetes**
Authors	Regina Menezes [1], Andreia Gomes [1], Mafalda Alves [2], Joana Chinita [2], Ângela Rocha [2], Guilherme Martins [2], Patricia Rodrigues [2], Sofia Ferreira [1,3], Carolina Pires [4], Ana Vasconcelos [2], Emilia Borba Alves [1]
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Abstract	Diets rich in polyphenols, such as pomegranate ellagitannins, can ameliorate metabolic health. Ellagitannins, metabolized through digestion and by the intestinal microbiota into urolithins, have been shown in vitro to protect pancreatic beta cells by attenuating IAPP-induced cytotoxicity. Given the established role of islet amyloid polypeptide (IAPP) aggregation in the pathogenesis of type 2 diabetes mellitus (T2DM), this study aimed to investigate the effect of ellagitannin supplementation on the regulation of IAPP in non-pathological conditions, exploring their potential role in beta cell function and metabolic homeostasis. A 12-week, double-blind, randomized, placebo-controlled study was conducted with 69 participants without diabetes (52.2% women, 47.8% men; mean age 54.4 ± 7.93 years) recruited from a primary healthcare center. Participants were randomly assigned to receive either an ellagitannin-rich pomegranate extract supplement (n = 37) or a placebo (n = 32). Sociodemographic data, blood, and urine samples were collected to assess biochemical markers and urolithin metabolites. Statistical analyses examined inter- and intra-group differences. The study received ethical approval (CE.ECTS/P05-24). At baseline, more than 70% of participants were classified at high risk of developing T2DM, with no significant differences between groups ($p \geq 0.05$ for all variables). After intervention, the group taking the supplement showed a tendency towards the reduction of the glycemic profile, IAPP, and proIAPP levels. This trend was not observed in the placebo group. Within the supplement group, baseline and 12-weeks intervention comparison showed a significant decrease in IAPP and proIAPP levels. Urolithins were significantly different between groups because of the interindividual variability, with the placebo group showing 75.9% of non-urolithin producers. Pomegranate-derived urolithins may help regulate IAPP, suggesting that ellagitannin-rich diets could support early nutritional strategies for preventing type 2 diabetes and preserving beta-cell function. *Keywords:* Ellagitannins, Urolithins, Islet Amyloid Polypeptide, Type 2 Diabetes Mellitus Prevention, Beta-cell Function

OC 4.28

Title	**The bacterial load in visceral adipose tissue is increased in obese individuals with hyperglycemia and correlated with intestinal permeability**
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Abstract	Obesity and type 2 diabetes (T2D) are frequently associated with increased intestinal permeability, which may allow the extravasation of bacterial metabolites and bacteria into the circulation, contributing to the chronic, low-grade inflammation that characterizes metabolic disease. Bacterial DNA has been recently identified in the adipose tissue of individuals T2D. We investigated the presence of bacterial DNA in the omental adipose tissue of individuals with obesity at distinct stages of metabolic dysregulation, to precisely depict when bacterial translocation happens during the metabolic sequelae of obesity. The study complied with the principles outlined in the Declaration of Helsinki. We extracted, under rigorous experimental sterile conditions, and quantified the bacterial 16S rRNA gene in omental adipose tissue samples of a cohort comprising insulin-sensitive, insulin-resistant, prediabetic, and T2D individuals. Plasma levels of lipopolysaccharide binding protein (LBP) and intestinal fatty acid binding protein (FABP2) were determined to infer on intestinal permeability. Bacterial DNA was found in the range of 1-100 pg/µg of DNA isolate, and was increased in prediabetes and T2D groups ($p=0.0013$ and $p=0.0782$ versus the insulin-sensitive group). Omental bacterial DNA was positively correlated with HbA1c and fasting glycemia ($r=0.537$, $p=0.001$ and $r=0.467$, $p=0.003$) and with adipose tissue TNFA expression ($r=0.661$, $p<0.05$) and plasma FABP2 levels (0.829, $p<0.05$), the latter two in the T2D group exclusively. Bacterial DNA is present in the omental adipose tissue of individuals with obesity, is particularly increased in prediabetes and T2D, and correlates with disease progression, adipose tissue inflammation, and increased intestinal barrier permeability. *Keywords:* Obesity, adipose tissue, microbiota, intestinal permeability

V 1.01

Title	**Aptamer-Based BioFET System for Multiple Urinary Biomarker Detection with Future Smart Toilet Integration: Creatinine Detection and GFR Estimation**
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Abstract	Creatinine is a key biomarker for assessing renal function and maintaining hydro-electrolytic balance. In particular, continuous monitoring of creatinine levels holds promise of improving the early detection and management of acute and chronic kidney diseases, respectively. In this work, we present the development of a biosensor based on field-effect transistors (BioFETs) functionalized with aptamers, for the continuous monitoring of creatinine, as integrated into a smart toilet. Our BioFET system comprises microfabricated gold electrodes, working as Extended-Gates (EGs) where the aptamers are immobilized, coupled with available commercial MOSFETs acting as the transducer elements. To enable sensor reuse, a temperature-based regeneration protocol was implemented. After creatinine detection, warm water was applied to the EGs pads, followed by rinsing with phosphate-buffered saline (PBS). The biosensor showed good repeatability, maintaining a reliable signal over at least four detection-regeneration cycles. Sensitivity tests using buffer solutions spiked with physiologically-relevant creatinine concentrations demonstrated a clear and linear response, with increased creatinine levels correlated with higher current values. Furthermore, the glomerular filtration rate (GFR) response was estimated from the calibration curve and creatinine concentrations using the 2021 CKD-EPI Creatinine equation, therefore enabling direct and real-time estimation of renal function. In conclusion, this reusable aptamer-based BioFET, designed for future integration into a smart toilet, offers a novel non-invasive platform for monitoring biomarkers in urine in real-time, enabling the study of renal physiology in an unprecedented manner. Future work will focus on the multiplexing capabilities to detect multiple renal biomarkers simultaneously. *Keywords:* Creatinine; GFR; Biosensor; BioFETs

V 1.02

Title	**Human skin cartography of epidermal water physiology - analysis of the Proportional Skin Index across regions**
Authors	Ana Júlio [1]*, Ana Júlia F. Garcia [2]*, Catarina Pereira-Leite [1], Leticia Kakuda [2], Patricia M. B. G. Maia Campos [2], Luís Monteiro Rodrigues [1]
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Abstract	Human skin is known for its morphological heterogeneity across the body which seems to result from a complex physiology clearly not completely understood. Common variables such as transepidermal water loss (TEWL) and epidermal water content are known to differ - significantly in some cases - in various body regions. This study was designed to further understand skin heterogeneity and its representativity regarding human skin cartography on water balance related variables. A convenience sample of healthy participants (n=22, 26±5 years old) was recruited within the university population. Non-invasive technologies were used. TEWL was measured using a Tewameter® TM300 (Courage+Khazaka Electronic), and superficial and deep epidermal hydration were measured using a Corneometer® CM825 PC (Courage+Khazaka Electronic) and MoistureMeter EpidDtec (Delfin Technologies), respectively. Measurements were taken from different regions (head, upper and lower limb), from which the Proportional Skin Index (PSIx) was calculated and compared with the regional means to test the variable representativity regarding the entire skin. The number of samples from each region were chosen accordingly with its approximate extension in the human body, providing 15.5% representativity regarding the whole-body skin. For TEWL, mean values obtained in the cheek and hand (palm as dorsal) significantly differ from the calculated PSIx. Regarding epidermal hydration, no differences were observed between sites within the same body region. However, for deep hydration, mean values obtained in the forehead and cheek were significantly higher than the calculated PSIx. Our results confirm that skin morphological heterogeneity might involve significant functional differences between regions. This means that for some variables, regional measurements might not represent the entire organ, limiting any simple extrapolation. This new PSIx index may help to improve data estimates in different (body location) settings.

V 1.03

Title	**Sunscreens as Anti-Aging Tools: Exploring the Bioactivity of Ascorbyl Tetraisopalmitate and D-Panthenol**
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Abstract	Continuous exposure to environmental factors such as air pollution and solar radiation significantly contributes to premature skin aging. In this context, the development of topical sunscreens enriched with multifunctional ingredients possessing hydrating and antioxidant properties represents a promising strategy to prevent or delay skin aging. This study aimed to evaluate the cytocompatibility, antioxidant potential, and enzyme inhibitory properties of ascorbyl tetraisopalmitate (ATIP) and provitamin B5 (D-panthenol), incorporated into sunscreen formulations, using in vitro approaches. The biocompatibility of the active ingredients was assessed via MTT assay in HaCaT keratinocytes following 3 and 24 h incubation periods. Antioxidant activity was determined using the DPPH radical scavenging assay, before and after a 30 min of UV exposure. Additionally, the inhibitory effects of the active compounds on tyrosinase and elastase – two enzymes involved in hyperpigmentation and loss of skin elasticity – were evaluated. ATIP demonstrated promising antioxidant activity in both UV-protected and UV-exposed conditions, while both active compounds were compatible with HaCaT keratinocytes under both tested conditions. Furthermore, both compounds exhibited inhibitory effects on tyrosinase and elastase activity. These findings support the potential use of ATIP and D-panthenol in multifunctional sunscreen formulations designed to delay key physiological mechanisms underlying skin aging. *Keywords:* Skin Aging, Cytocompatibility, Antioxidant potential, Tyrosinase, Elastase

V 1.04

Title	**Enhanced Contextual Traumatic Memory Persists Despite Unaltered Fear Acquisition and Anxiety in Mild Diabetes**
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Abstract	Although post-traumatic stress disorder (PTSD) is associated with war mental effects, PTSD also arises from traumatic medical consequences. Uncontrolled diabetes may negatively influence the acquisition, generalization and inability to extinguish fear memories. Here, we aim to unravel the mechanisms underlying fear memory alterations associated to trauma in a mild type 1 diabetic model, which mimics the commonest situation in human beings. Mice (129x1/SvJ) were injected i.p. with streptozotocin 100 mg/kg or vehicle (sodium-citrate buffer, pH 4.5) 7 to 10 days before testing, to induce early stage type 1 diabetes. Mice were exposed on days 0 and 1 to 15 foot-shocks (10s, 1mA) to induce PTSD, followed by a contextual reminder exposure on days 2 and 7; the percentage of freezing was evaluated. The elevated plus maze, light/dark and open field tests were used to evaluate anxiety. The hot-plate test was used to evaluate neuropathic pain. Two-Way ANOVA and Students´ t-test were used for statistical analyses; $P<0.05$ represent significant differences. PTSD-diabetic mice displayed increased freezing compared to the PTSD-vehicle group during contextual exposure (with an effect of group and group-time interaction for the first and an effect of group for the second context), but not during acquisition. No significant differences were observed in behavioral tests. Thus, despite no alterations in fear memory acquisition, generalization and anxiety behavior were observed in mild diabetes, mice still exhibited enhanced short and long term contextual traumatic memories. Work supported by FCT / FEDER (UIDB/04308/2025 and UIDP/04308/2025).

Keywords: PTSD; Post-Traumatic Stress Disorder; Diabetes; Fear memory |

V 1.05

Title	**Uncovering Unique Patterns of Ovarian Ageing in the Cat**
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Abstract	The ovary is one of the first organs to show signs of biological aging, which impacts the entire body. Several hallmarks of ageing have been identified in ovarian tissue, including the presence of multinucleated giant cells with increased lipofuscin accumulation [1]. Our group has identified their presence in several species, including mice, rats, goats, sheep, and dogs [2-4]. However, their presence has not been confirmed in feline ovaries, particularly in reproductively aged individuals, highlighting the relevance of studying ovarian ageing in cats. In the present study, approved by ethics committee, ovaries from 9 domestic female cats (aged between, 7 months to 18 years) and 6 street female cats (estimated age, ≥ 6 years) were included and grouped as follows: domestic cats < 6 years, domestic cats ≥ 6 years, and street cats ≥ 6 years. Hematoxylin and Eosin (H&E) staining was performed to assess follicular reserve, and Sudan Black B (SBB) staining was employed to detect lipofuscin accumulation, a senescence marker observed in ovarian multinucleated giant cells. In this preliminary analysis, and regarding domestic cats, a weak negative Pearson correlation (r = –0.32), with no statistical significance, was observed between age and follicle count. Interestingly, there were also no differences between the number of primary and primordial follicles between young domestic cats and reproductively aged street cats (≥ 6 years). Lipofuscin deposits were identified only in one domestic cat aged 18 years and in three street cats (≥ 6 years), while domestic cats under 6 years showed minimal or absent lipofuscin staining. These results contrast with findings in other mammals, where MNGCs are seen earlier and increase significantly with age. This study demonstrates interspecies variation in ovarian ageing, underscoring the importance of elucidating the mechanisms behind it. This work was supported by Fundação para a Ciência e a Tecnologia (FCT) through the projects UIDB/00772/2020 (Doi: 10.54499/UIDB/00772/2020) and LA/P/0059/2020 and the fellowship awarded to Natália Rigos PRT/BD/154993/2023. [1] Ansere VA, Ali-

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Keywords: Multinucleated giant cells; reproductive ageing; feline ovary; ovarian ageing; senescent cells

V 2.06

Title	**Analysis of Placebo-Induced Neurological Responses and its Physiological Consequences**
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Abstract	The placebo effect, and its counterpart the nocebo effect, remain an important yet largely unknown part of clinical treatment. It is a clinically significant neurophysiological phenomenon, it has been linked with brain activity in regions, such as the prefrontal cortex and periaqueductal gray matter, directly modulating endocrine, immune, and autonomic responses (Kaptchuk et al., Nat Commun 2024; Peciña et al., NeuroImage 2023). Yet, critical gaps persist in understanding the mechanisms behind how changes in thought patterns, conscious or subconscious, orchestrate downstream physiological changes. Recent studies have, however, suggested a relationship between specific brain activity and placebo-like physiological responses (Kaptchuk, T. J. et al. (2024). Nature Communications). Furthermore, advances in MRI and EEG technology have allowed for a more through mapping of cerebral thought patterns, and the ability to engage in neuromodulation to induce specific responses (Baud et al., Brain 2024). This study proposes a detailed analysis of placebo-related thought patterns via sham transcranial electric stimulation (tES) to induce a placebo effect, and its effects on task performance. These results will be compared to data taken from four other groups performing the same task: a control group, a group whose placebo is a pill said to improve brain function, a group with both placebos, and a group without placebos but informed that other groups have access to performance enhancers. This will serve to determine if there is an identifiable pattern common between placebo responses and study possible nocebo effects. *Keywords:* placebo, eTS, neurophysiology, neuromodulation, neurology, brain patterns

V 2.07

Title	**Active Learning for Health Literacy: Teaching Physiology across Educational Levels**
Authors	Carolina Pires, Elisabete Silva, Marta Esgalhado, Marisa Nicolai, Luís Monteiro Rodrigues
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Abstract	Health literacy (HL) is a key determinant of health at all levels. However, HL remains poorly integrated across formal education. The current project aimed to promote HL among secondary school students through innovative active learning strategies. The initiative was also meant to consolidate fundamental morphological and functional concepts from physiology and functional anatomy among the participating university students. Activity planning followed a structured methodology: thematic definition, learning objectives, resource selection, and evaluation strategies, following ethical principles. Professors were responsible for the overall pedagogical design and provided scientific supervision and guidance throughout the implementation of activities. In parallel, university students acted as peer facilitators, offering continuous support to the secondary school students during the sessions. The activities took place at Universidade Lusófona for two weeks and included microscopic observation of adipose tissue, virtual anatomical exploration using an Anatomage table, and an introduction to anthropometric techniques by university students certified by International Society for the Advancement of Kinanthropometry-ISAK. In collaboration, university and secondary students created a lifestyle and health questionnaire, which they later applied to external respondents. This process encouraged data collection, interpretation, and reflection on the relationship between lifestyle and adipose tissue characteristics. Learning outcomes were assessed through direct observation and analyses of satisfaction questionnaire results. Findings revealed improvements among all students' understanding of adipose tissue, metabolism, health, and a noticeable increase in interest in health sciences among secondary students. The active learning environment was perceived as more engaging than traditional formats, while also promoting teamwork, critical thinking, and scientific curiosity. This initiative stands out for its effective integration of activities across educational levels and its emphasis on peer collaboration, thereby creating a shared and enriching learning experience. These findings support active learning as a scalable strategy to bridge HL gaps across education, with implications for curriculum development and interdisciplinary collaboration. *Keywords:* health literacy; physiology education; active learning; secondary students, higher education

V 2.08

Title	**Physiology Education in Health Sciences: Comparing Student Perspectives in Universities and Polytechnics**
Authors	João Gregório, Luís Monteiro Rodrigues
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Abstract	Physiology is a core discipline in health sciences, but its complexity and extension of contents often challenge students. Despite the growing use of student-centered approaches, little is known about how learners from different higher education contexts—universities and (poly)technical institutes—perceive physiology education. This study compares students' perceptions, experiences, and barriers across these two settings in Portugal. Undergraduate students from health sciences responded to our digital questionnaire covering course experience, perceived relevance and difficulty, assessment methods and study habits. In total, 138 students (14 from polytechnic, 124 from university) participated. The majority were female (86% polytechnic, 70% university). University students were slightly older (23.1 vs. 20.6 years) and enrolled in more diverse programs. Top challenges in learning physiology included extensive content (polytechnic: 85.7%, university: 71%), high workload (64.3% vs. 63.7%), and inadequate teaching-learning systems (polytechnic: 50%). Reasoning demands were more often cited by university students (50.8%). Additionally, 28.6% of polytechnic students found the discipline's purpose unclear (vs. 11.3% in university). Over 80% of all students agreed physiology is essential in health education. More university students recognized its complexity (42.7% vs. 28.6%), while polytechnic students more often emphasized memorization (50% vs. 33.9%). Regarding assessment, final exams were reported by 46.8% at university and 28.6% at polytechnic; continuous assessment was more common in polytechnics (92.8% vs. 76.6%). Physiology was widely seen as relevant yet demanding. Rated 5/5 in relevance by 45% of university and 43% of polytechnic students, it was considered difficult or very difficult by 59% and 36%, respectively. A negative correlation between relevance and difficulty ($\rho = -0.20$, $p = 0.02$) suggests students who value the subject tend to find it less difficult. It is clear that while Physiology importance is recognized across institutions, perceptions vary. Context-specific strategies, such as active learning and clearer objectives, might enhance engagement and outcomes. *Keywords:* Physiology Education, Student Perceptions, Health Sciences, Polytechnic vs University, Curriculum Design

V 2.09

Title	**Teaching Human Physiology to Biomedical Engineering students: unique challenges, innovative solutions**
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Abstract	Teaching Human Physiology to Biomedical Engineering (BME) students presents a unique challenge, requiring an approach that merges foundational biological knowledge with technological insight and application. At the Faculty of Sciences of the University of Lisbon, we implemented an updated curriculum tailored to the interdisciplinary nature of BME, aiming to enhance engagement and foster system-level understanding. Theoretical classes employed an expository format enriched with presentations of medical devices and digital twin models aligned with each physiological system, linking core concepts to real-world biomedical applications. Practical sessions were structured around interactive and simulation-based learning, including: neuronal electrophysiology modeling; cardiovascular function and adaptation; glucose homeostasis using continuous glucose monitoring and closed-loop insulin pumps; and immune system simulations covering pathogen response, vaccination, autoimmunity, cancer immunotherapy, and transplant immunology. Additionally, lab activities included: motor imagery analysis using brain-computer interfaces: gait and balance analysis using electromyographic signals and smartphone actigraphy and video; and sensorial assessment, therefore connecting physiological function with biomedical signal acquisition and interpretation. Assessment integrated continuous practical evaluations, a mid-term and final written test, and a student-led oral presentation on topics of personal interest (e.g., sports physiology, extreme environments, music and the brain). These adaptations aimed to cultivate not only knowledge retention but also creativity, critical thinking, and translational understanding in future biomedical engineers. This model highlights a forward-thinking, multidisciplinary teaching approach, reinforcing physiology education with biomedical relevance and technological integration, preparing students for emerging challenges in healthcare innovation. *Keywords:* Teaching; Human Physiology; Biomedical Engineering; Challenges; Innovation;

V 2.10

Title	**Comparison between the European Society of Cardiology and the American Heart Association Guidelines' cutoffs for Arterial Hypertension diagnosis**
Authors	Nora Taiek [1], El Hangouche Abdelkader Jalil [1,2]
Affiliations	1 - Department of Physiology, Faculty of Medicine and Pharmacy of Tangier, Abdelmalek Essaâdi University, Tangier, Morocco; 2 - New England University, Tangier, Morocco
Abstract	Arterial hypertension (AH) has become a public health problem worldwide. Given the importance of effective management of AH in reducing cardiovascular morbidity and mortality worldwide, evidence-based clinical guidelines have been developed to provide clinicians with an organized framework allowing them to establish an accurate diagnosis of AH, namely, the American Heart Association (AHA) and the European Society of Cardiology (ESC). Overall, both guidelines state similar recommendations. However, considerable debate remains regarding the optimal blood pressure (BP) cutoffs. The ESC defines AH with a 140/90 mmHg threshold, while AHA cutoffs are 130/80 mmHg. This pilot study was undertaken as a foundational step toward a larger project of AH prevalence in Morocco. This survey aims to compare the AH prevalence based on both the European and American thresholds for AH diagnoses. Our study participants included the elderly (≥60 years), and hypertensive participants were excluded. To assess the difference in prevalence between the European and American guidelines, AH was defined based on both recommendations' thresholds. The study included 200 participants, with a predominance of the male gender, 121(60.5%) and 79(39.5%) females; the mean age was 67.19±5.9. The mean systolic and diastolic BP were 132.67±19.53 and 80.69±11.28, respectively. The prevalence of AH was 35.5% based on the ESC guidelines; this rate was much higher based on the AHA thresholds, reaching 68%. This disparity in AH guidelines not only modifies the prevalence but also elicits changes in the therapeutic decisions, including treatment strategies and the management of AH, especially for the frail. *Keywords:* arterial hypertension, blood pressure, European Society of Cardiology, American Heart association, arterial hypertension prevalence

S 1.11

Title	**Shifting from one-size-fits-all to an individualised VO2 plateau attainment**
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Abstract	Introduction: The gold standard to assess maximal oxygen consumption (VO2max) is the observation of a plateau in oxygen consumption (VO2plat), first identified by Hill et al. (1923) and quantified by Taylor et al. (1955). However, fixed plateau criteria have been criticised for their lack of validity and data fidelity. This study compared the incidence of the VO2plat across two incremental step-test protocols using both Taylor et al. (1955) fixed criterion and an individualised alternative. Methods: 35 physically active men (26.69 ± 6.16 years) performed two maximal treadmill protocols on separate days: 1-minute (1-MIN) and 3-minute (3-MIN) stages, both increasing 1 km.h-1 per stage. VO2plat was accepted between the two consecutive highest 30 s sampling periods, using: 1) ΔVO2 = 150 ml.min-1 (FIXED); 2) ΔVO2 = 50% of the VO2/Speed individual slope (IND). Binomial analysis determined the significance of plateau response within a criterion. A Paired t-test estimated differences in the individual VO2/Speed slope between protocols. Results: VO2plat attainment differed significantly (ρ<0.001) from the hypothesised within criterion. FIXED-VO2plat was exhibited in more participants (97.1%: 1-MIN; 94.3%: 3-MIN) compared to the IND-VO2plat (85.7% and 91.4%, respectively). Differences were observed regarding the slope of VO2/Speed between the protocols (t=-3.56; ρ=0.01). Conclusion: A fixed criterion for the VO2plat assessment fails to account for individual physiological responses to the external load, which have been shown to be protocol-dependent. Therefore, to avoid misrepresentation of VO2max, an individualised criterion is recommended. *Keywords:* VO2max, VO2plateau, Maximal Treadmill Protocols, Stage Duration

S 1.12

Title	**Impact of Concurrent Training on Body Composition and Physical Fitness in Karate Practitioners: A Longitudinal Study with Training Load Monitoring**
Authors	João Mota Neves [1], João Paulo Brito [1,2], Rafael Oliveira [1,2]
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Abstract	This study aimed to analyze the effects of concurrent training — combining resistance exercises and short-duration interval training — on body composition and physical fitness in karate practitioners over a seven-week period. Twelve athletes participated (mean age: 14.6±1.5 years; training experience: 3.0±0.3 years; height: 159.5±4.5 cm; weight: 53.3±5.0 kg; 5 females and 7 males) in the study. They were assessed in strength, power, flexibility, and body composition variables. Training load was tracked using the acute:chronic workload ratio (ACWR). Weekly group averages ranged from 0.85 to 1.21, while individual ACWR values varied more widely (0.32 to 1.68). This variability underscores the importance of individualized monitoring and adjustment strategies to ensure safe and effective training progression. Significant improvements were found in lean mass percentage (from 38.1% to 40.1%; p=0.02) and a slight reduction in fat mass percentage (from 21.1% to 20.0%; p=0.05). Power assessed by countermovement jump (CMJ) showed a non-significant trend toward improvement (+2.7 cm; p=0.25). Flexibility (Sit and Reach), upper-body strength (medicine ball throw and handgrip), and muscular endurance (push-ups) did not exhibit significant changes, although handgrip showed borderline relevance (p=0.06). Despite limited statistical significance in strength and flexibility, the results suggest that a well-structured concurrent training program can maintain performance levels during a competitive phase. This study also reinforces the utility of ACWR as a practical tool to guide load adjustments and reduce injury risk. Future research should address sex-specific adaptations and further explore the link between load management, technical-tactical performance, and competitive outcomes in youth karate athletes. *Keywords:* concurrent training; body fat; strength; power; flexibility; acute:chronic workload ratio; martial art

S 1.13

Title	**Internal Load Characterization of a Surfing Session: A Case Study**
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Abstract	The activity profile in surfing has been studied by using time-motion analysis, which is a reliable method that uses detailed analysis of video recordings, along with the characterization of the internal load through heart rate (HR). The aim of this study is to characterize the activity profile of a surfing session. A surfing session, lasting 45 minutes, was filmed with a Portuguese athlete (73kg, 1.84m) who has competed at national level in which HR was recorded with a Polar optical HR sensor ("Polar Verity Sense"), placed around the arm on the exterior part, following manufacturer guidelines. Session HR, using the average, maximum and minimum values and percentages of time were used for analysis. Session HR values were: average 116bpm; maximum 138bpm and minimum 91bpm. During the session, the following HR values (average, maximum, minimum, respectively) were found for specific activities: "paddling to return to the lineup" – 116, 135, 91 bpm; "sprint paddle for the wave" – 118, 132, 106 bpm; "general paddle in the lineup" – 118, 138, 93 bpm; "stationary" – 136, 137, 91 bpm; "wave riding" – 115, 128, 106 bpm; "recovery of the surfboard" – 115, 122, 107 bpm. In conclusion, the top three activities in which the surfer spent more time were "paddling to return to the lineup" (19.53%), "general paddle in the lineup" (27,15%) and "stationary" (45,63%). For future studies, using a Global Positioning System and other physiological tests to determine HR intensity zones could provide a better understanding of the surfing modality and the training process to be adopted. *Keywords:* wave riding, shortboarding, activity profile, time-motion analysis, heart rate

S 1.14

Title	**Comparison of small-sided games in young football players**
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Abstract	*Abstract withheld at the authors' request*

S 1.15

Title	**Influence of variations in external and internal load and well being on the changes in body composition and anthropometrics of an elite women's professional soccer team**
Authors	Sara Branco [1,2,3], Renato Fernandes [3,4], Rafael Oliveira [1,3,4], João Paulo Brito [1,3,4], Luís Branquinho [3,5], Ricardo Ferraz [1,2]
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Abstract	Women's soccer has experienced exponential growth in recent years, almost tripling the number of players in the last decade, with more than 13 million women playing (at both amateur and elite levels) organized football worldwide. The aim of this study is to identify the influence of variations in external, internal load and well-being on the changes in body composition and anthropometrics of an elite women's professional soccer team. Twenty-five players participated in the study (age 25 ± 3.98 years, weight 59.27 ± 6.2 kg, height 1.62 ± 0.04 m) over a 16-week period. The participants completed ≥80% of 75 training sessions and 20 matches. Hooper Index questionnaire (HI, scale 1-7) was applied to collect the following measures of well-being: fatigue, sleep quality, muscle soreness and stress. External intensity was measured using high-speed running, sprinting, acceleration, and deceleration metrics, while internal load was assessed through the rating of perceived exertion (RPE) multiplied by session duration to generate session-RPE. Four body composition assessments carried out: at the start and end of the pre-season, mid-season and end of the season. Participants' weight and height measured was measured using a stadiometer with a built-in scale (Seca 220, Hamburg, Germany). In addition, body fat mass (BFM), lean body mass (LBM), body mass index (BMI), sum of folds and muscle mass (MMA). The results showed that body composition parameters improved over time and variations in external intensity measures seem to influence those variables. *Keywords:* women's soccer, external and internal load, wellness, body composition, anthropometrics

S 2.16

Title	**Phase angle characterization of a touch rugby athlete with total rupture of anterior cruciate ligament - A case study**
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Abstract	A total rupture of the anterior cruciate ligament (ACL) means the ligament is completely severed, leading to knee instability. For an athlete, it will mean surgery and a long period of recovery (~9 months). Considering phase angle (PhA) characterization in this type of condition, there is scarce information. Thus, this study aimed to characterize PhA of a touch rugby athlete with ACL total rupture of the left knee before and after surgery. A secondary aim was to analyse the variations induced by a physiotherapy session. A case study of one female athlete clinically diagnosed with ACL total rupture was conducted (34 years, 60.8 kg and 166 cm). Four days before the surgery, one week, two weeks and two weeks and a half after surgery, total body and segmental, for left and right legs, PhA (50 kHz) were collected by the InBody S10. The results revealed that before surgery, total body, right leg and left leg PhA was 7.1º, 7.5º, 7.6º, respectively. After one week, the values changed to 6.7º, 7.1º and 5.6º, while after two weeks, the values changed to 6.7º, 6.9º and 5.8º, respectively. When analysing PhA changes induced by the first physiotherapy session, PhA changed from 6.7º, 6.8º and 5.1, to 6.2º, 6.2º and 4.8º, respectively. This case study showed the PhA variations during the pre and post ACL surgery where the athlete remained with the leg still and when started the first physiotherapy session. More studies with larger sample sizes are needed to confirm the results. *Keywords:* ACL; Bioimpedance; Phase Angle

S 2.17

Title	**Psychological, physiological and motor competence metrics: what does drive injury in young footballers?**
Authors	Cristiana Mercê [1,2,3,4], Bárbara Tavares [1], Tiago Vasconcelos [5,6], Mafalda Bernardino [1,3], Fernando Santos [7,8,9], Rafael Oliveira [1,3,5]
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Abstract	Engaging in sports during youth plays a key role in shaping not only physical development but also psychological and social growth. However, the physical and psychological demands of these sports can increase the risks of injury. Understanding these risks is crucial to ensure safe and sustainable participation. The study aimed to compare young football and futsal players across several dimensions, i.e., body composition, motor competence, and psychological traits; and to explore how these factors might relate to injury risk. Motor competence (which includes basic movements such as running, jumping, throwing, catching, and balancing) was assessed using the Motor Competence Assessment, injuries were reported through the Referred Morbidity Survey, and psychological characteristics were evaluated using the Questionnaire on Psychological Characteristics Related to Sports Performance questionnaire. Basic anthropometric data, such as height, weight, and percentile of body mass index according to age and sex were also calculated. The study included 217 under-15 young athletes (55-futsal, 162-football) of both sexes. The results indicated that football players experienced more injuries than futsal players. In terms of motor competence, football athletes showed better results in lateral jumps, horizontal jumps, and shuttle runs. Both groups performed strongly in throwing and kicking tasks, likely due to the specific demands of each sport. Psychological traits showed limited correlation with motor competence, with some associations found mainly among female football players. These findings highlight the importance of sport-specific training strategies that consider the athlete, physically and mentally, to enhance performance and reduce injury risk. *Keywords:* Motor development, anthropometry, mental health, team sports

S 2.18

Title	**Musculoskeletal injuries in CrossFit: comparison of rates per 1000 hours of training and body region between Portuguese and International Practitioners - A Review**
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Abstract	CrossFit®, a high-intensity functional training program, has grown quickly around the world, raising concerns about the risk of musculoskeletal injuries. Some training sessions can achieve 98% of maximal heart rate, 15 mmol/L of blood lactate, 66% of maximal oxygen uptake, a rating of perceived exertion between 8 and 9 (out of 10), and rate pressure product around 12,000 mmHg. The aim of this study to compare the incidence rates of musculoskeletal injuries per 1 000 hours of training and the regional distribution of these injuries among Portuguese and international CrossFit practitioners. A systematic review was conducted according to PRISMA and PICO guidelines, including six studies that met strict eligibility criteria (samples ≥250 participants, both sexes, European or American origin, open access). 1 study on Portuguese data showed greater variability in injury rates (0.51–18.9 per 1000 hours), with a notably high prevalence in the shoulder (46.1%) and knee (11.3%). In contrast, 5 studies of international cohorts reported narrower ranges (0.39–1.30 per 1000 hours) and lower prevalence in these regions. These findings suggest that Portuguese athletes may be more exposed to risk factors, potential related to differences in training volume, intensity, or technical supervision. The results highlight the need for personalized injury prevention strategies, emphasising scapular stability, core strengthening and gradual load progression, along with better coaching training and load monitoring practices. Future studies using physiological variables for different level of athletes and non-athletes are crucial to better understand injury patterns and reducing risk within the CrossFit community. *Keywords:* Injury, physiology, high-intensity interval training, high-intensity functional training

S 2.19

Title	**Electroencephalographic and cognitive task analysis of working memory and attention in athletes: A systematic review**
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Abstract	*Abstract withheld at the authors' request*

U 3.20

Title	**Novel 2D Fast Fourier Transform-Based Vertical Artifact Filtering Method Applied to Lung Ultrasound Videos of COVID-19 Patients**
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Abstract	Point-of-care lung ultrasound (LUS) is a fast and portable imaging modality for monitoring respiratory diseases. The presence of vertical artifacts (VA) is considered a hallmark of disease severity. However, the physiological basis of VA remains unclear, and discrete VA counting may miss relevant information. As such, recent literature has shifted toward quantitative approaches. We extended our previously developed method based on the 2D Fast Fourier Transform (2D-FFT), originally applied to LUS images, to LUS videos. The method applies a horizontal zero-nulling vector in the Fourier-transformed space to filter vertical components. The mean squared error (MSE) between the original and filtered frames is computed frame by frame, resulting in a time series of MSE values per video. We analyzed 22 videos without VA and 27 with VA. For each time series, we computed the minimum, maximum, mean, amplitude, and variance of the MSE values. Significant differences ($p<0.001$) were found using the Mann–Whitney U test for all metrics (median values): maximum 0.0018 (no VA) vs. 0.0043 (with VA); minimum 0.0010 (no VA) vs. 0.0017 (with VA); amplitude 0.0008 (no VA) vs. 0.0023 (with VA); mean 0.0012 (no VA) vs. 0.0028 (with VA); and variance 3.0×10^{-8} (no VA) vs. 3.2×10^{-7} (with VA). These results indicate greater magnitude and variability for the group with VA, which reflects the dynamic appearance and disappearance of VA during respiration. This work shows that the lightweight 2D-FFT-based method enables dynamic quantification of VA in LUS videos and shows potential as a physiologically relevant parameter for respiratory assessment. *Keywords:* Point-of-care lung ultrasound; Vertical Artifacts; 2D Fast Fourier Transform

U 3.21

Title	**Blood Pressure Profile of Young Healthy Adults**
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Abstract	Arterial hypertension (AH) is the major risk factor for cardiovascular morbidity and mortality. Early detection is crucial, even among young adults, to prevent long-term complications. Ambulatory blood pressure monitoring (ABPM) is considered the gold standard for assessing blood pressure (BP). This study aims to analyze the BP profile of healthy young adults using two BP measurement methods, assess the prevalence of different BP profiles (normal BP, elevated BP, and hypertension), evaluate dipping status, and shed light on the impact of physical activity on BP. The study included 30 participants, of whom 53.3% were female, and 46.7% were male, with a mean age of 24 years. Clinic BP measurements showed a mean BP of 113.13 ± 10.95 mmHg (SBP) and 76.18 ± 6.66 mmHg (DBP), with 6.7% classified as hypertensive. ABPM revealed a 24-hour mean BP of 114.13 mmHg (SBP) and 69.40 ± 5.48 mmHg (DBP), with a hypertension prevalence of 13.3%, including masked hypertension. Regarding circadian profiles, 43.3% of participants were non-dippers, 53.3% were dippers, and 3.3% were reverse dippers. Regarding physical activity, 70% of participants with non-elevated blood pressure were physically active, and 87,5% with normal-dipping values were active. These results underscore the need to raise awareness about hypertension and its adverse outcomes and help young adults understand the long-term impacts of an unhealthy lifestyle on their cardiovascular health. Furthermore, it is essential to take proactive steps by promoting consistent physical activity to help reduce the risk of hypertension and its associated health problems. *Keywords:* Arterial hypertension, Blood pressure, Ambulatory Blood Pressure Monitoring, Blood pressure profile

U 3.22

Title

Unbalance between pro-fibrotic P2Y2 and P2Y4 and anti-fibrotic P2Y11 purinoceptors' tone underlying cardiac fibrosis in rats with pulmonary arterial hypertension

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Abstract

Right heart failure due to pressure overload and remodeling is the main cause of death in pulmonary arterial hypertension (PAH). Our group showed that "danger molecules", like adenine and uracil nucleotides, promote cardiac fibrosis through P2Y2 and P2Y6 purinoceptors activation without the P2Y11 protection. Hence, one may speculate that changes in the P2Y receptors' tone might contribute to right ventricle (RV) hypertrophy and fibrosis in PAH. In this study, male Wistar rats randomly received monocrotaline (MCT, 60 mg/kg SC) to induce PAH (ORBEA's approval No. 224/2017). 24-days after, isolated RV cardiac fibroblasts (CFs) were cultured to assess viability/proliferation (MTT assay), type I collagen production (Sirius Red assay) and intracellular $[Ca^{2+}]i$ oscillations using the Fluo-4NW calcium dye. UTP (100 μM)-induced $[Ca^{2+}]i$ rises were diminished in CFs of PAH (70-80%) compared to CTR (90-110%) animals, but no differences were observed with UDP (100 μM). The P2Y4 agonist, MRS 4062 (10 μM), mimicked the UTP-induced $[Ca^{2+}]i$ rise, while P2Y2R and P2Y11R agonists produced minimal effects. Blockage of the P2Y6R with MRS2578 had no effect on $[Ca^{2+}]i$ transients caused by UTP and UDP. UTP (100 μM) increased growth and type I collagen production by CFs from CTR, but not from PAH-rats. The anti-proliferative effect of the P2Y11 agonist, NF546 (10 μM), was significantly attenuated in CFs from PAH-rats. Data suggest the balance between pro-fibrotic P2Y2R/P2Y4R and anti-fibrotic P2Y11R is disrupted in PAH-rats, potentially contributing to myocardial fibrosis in PAH. Work supported by FCT/FEDER (UIDB/04308/2025 and UIDP/04308/2025). RN received a PhD fellowship from FCT (2021.08676.BD).

Keywords: cardiac fibroblasts, pulmonary arterial hypertension, adenine and uracil nucleotides, fibrosis, intracellular $[Ca^{2+}]i$ oscillations

U 3.23

Title	**Comparison of Two Laser Doppler Probes in Assessing Microcirculation in the Upper Limb**
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Abstract	Laser Doppler flowmetry (LDF) is a reference technology to assess microcirculatory physiology. However, LDF's non-linear, pulsatile, and highly susceptible (e.g., to motion) single-point signals present many difficulties regarding reproducibility, considering its site-to-site and day-to-day heterogeneity. Variations in probe configuration can influence signal acquisition, making it essential to understand the characteristics of each probe when selecting equipment for specific physiological assessments. In the present study, we compared two LDF probes from Moor Instruments - VP1T (single delivery/single collecting fibre) and VP1T/7 (single delivery/eight collecting fibres) - regarding their ability to measure microcirculatory responses after a Post-Occlusion Reactive Hyperaemia manoeuvre. Eight independent recordings were obtained from healthy volunteers. Probes were placed on the index finger (VP1T) and middle finger (VP1T/7) of both hands, respecting a 10-minute acclimatization period in a temperature- and humidity-controlled room. The protocol involved a baseline registration (10 minutes), followed by occlusion of the brachial artery (2 minutes under 200 mmHg), and recovery (10 minutes). Values were presented as mean ± standard deviation. Statistical analysis was performed using Student's t-test, with a p-value < 0.05 considered significant. In the ipsilateral arm, during baseline, the VP1T probe recorded a significantly lower mean perfusion value (232 ± 142 PU) than the VP1T/7 (301 ± 177 PU; $p = 0.017$). Upon cuff release, the VP1T detected a more pronounced hyperaemic peak in the first minute of reperfusion. Mean values during this phase were 300 ± 162 PU for the VP1T probe and 323 ± 168 PU for the VP1T/7. A significant increase in microvascular blood flow post-occlusion was observed only with the VP1T ($p = 0.037$ vs. baseline). The results suggest that these two probes are not equivalent. The VP1T/7 probe depicts more stable readings across a larger tissue volume. However, the VP1T may be more suitable for detecting rapid and localized changes. Understanding such differences is essential for accurate data interpretation and meaningful comparisons across LDF studies. Funding Disclosure: This research was financed by national funds through FCT—Foundation for Science and Technology, I.P. (Portugal), under the [UIDB/04567/2020] and [UIDP/04567/2020] programs. All imaging instrumentation was provided by ALIES-COFAC. *Keywords:* Microcirculation, Laser Doppler Flowmetry, Laser Doppler Probes

U 3.24

Title	**Reactive Hyperemia – looking for mechanistic reasonings in glabrous and non-glabrous skin**
Authors	Marisa Nicolai [1], Joana Caetano [1,2], Elisabete Silva [1], Clemente Rocha [1], José D Alves [2], Luís Monteiro Rodrigues [1]
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Abstract	Reactive Hyperemia (RH) has been attributed to transient ischemia and is considered independent of autonomic control, although recent research suggests a different reality. Our study aimed to approach the autonomic contribution to RH in glabrous and non-glabrous skin Healthy adult male participants (n=24, 32.4 ± 5.2 years old) were tested with a post-occlusive reactive hyperemia (PORH) applied to one randomly chosen arm. Skin perfusion was non-invasively monitored in both hands with laser Doppler flowmetry (LDF) in the ventral face and with polarized light spectroscopy (PLS) in the dorsal hand, and with photoacoustic tomography (PAT) in one of the forearms (contralateral to the occlusion arm). Other hemodynamic indicators were also measured. The experimental approach involved measurements during baseline (10 minutes, phase 1), during PORH (2 minutes, phase 2), and following cuff deflation for recovery (10 minutes, phase 3). All procedures observed all principles of good practice applied in human research. During occlusion (phase 2), significant vasoconstriction was observed (LDF) in both palmar surfaces and in the contralateral forearm (PAT), while vasodilation was observed in the dorsal skin (PLS) in both hands. Perfusion recovered with varying kinetics across regions after cuff release (phase 3). Results have shown that RH generates a biphasic process with (i) a sympathetic activation during occlusion, producing both vasoconstrictive and vasodilatory effects depending on the skin region, and (ii) a sympathetic withdrawal during reperfusion, enabling recovery. Perfusion never reached zero during occlusion, indicating that ischemia cannot be present. These results indicate that RH is linked to an autonomic adaptive response meant to reestablish circulatory homeostasis, thus redefining RH as an integrated autonomic reflex. *Keywords:* reactive hyperemia; autonomic control; glabrous and nonglabrous skin; perfusion; optical technologies

U 4.25

Title	**TALUS: A scalable PPG-based platform for cardiovascular tele-monitoring and AI-driven clinical insights**
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Abstract	The TALUS device represents a significant advancement in photoplethysmography (PPG)-based remote health monitoring. Building upon the foundation established by its predecessor, SALUS—presented at this congress in 2022—TALUS integrates cutting-edge PPG technology with a robust, cloud-native architecture designed for scalability and centralized data management. This platform supports the collection and analysis of medical data from millions of devices, enabling real-time insights into cardiovascular health across both clinical and household environments. TALUS is engineered to operate seamlessly in telemedicine workflows, offering compatibility with GenAI-driven diagnostic support and personalized medicine recommendations. Its stateless design ensures high availability and reliability, while its wireless configuration enhances patient comfort and accessibility. The device delivers unparalleled cardiovascular assessments within its category, leveraging advanced signal processing and contextual analytics to provide clinicians with actionable metrics. By combining scalable infrastructure, AI-enhanced decision support, and precision PPG sensing, TALUS sets a new benchmark for remote physiological monitoring. This innovation holds promise for expanding access to cardiovascular care and improving outcomes through early detection and continuous monitoring. *Keywords:* Photoplethysmography, Telemedicine, Cardiovascular Health, Cloud, AI

U 4.26

Title	**Exploring Non-Invasive Optical Technologies for Improved Circulatory Monitoring**
Authors	Clemente Rocha [1], Alexandre Miguel Cordeiro [1,2], Elisabete Silva [1], Marisa Nicolai [1], Luís Monteiro Rodrigues [1]
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Abstract	In vivo assessment of distal (foot) perfusion with non-invasive optical-based technologies seems to provide an accessible way to dynamically test the peripheral circulatory physiology in human. In that direction, in the present study we compared the applicability of Polarized light Spectroscopy (Psp) with the reference technology, laser Doppler flowmetry (LDF). A convenience sample of eleven healthy volunteers, both sexes, mean age 57.27 ± 11.20 years, was selected. The experimental protocol involved the continuous measurement of perfusion in both feet during rest (baseline for 5 min), after a series of programed light intensity activities involving walking (5 min), step in place (5 min), and plantar flexion (1 min), and after the activity set (recovery). Perfusion was measured with LDF (moorVMS, Moor Instruments) and with Psp (TiVi 700 - Tissue viability Imaging, WheelsBridge). LDF sensors were positioned between the second and third metatarsi on the dorsal foot skin. All procedures complied with all principles of good clinical practice. Both technologies have shown that perfusion in both feet during baseline was not identical in all participants (differences higher than 50% in a few cases). However, globally, these asymmetries were not statistically significant. The physical activity, even if light, introduced significant perfusion changes. LDF has shown that those asymmetry differences were attenuated immediately following the activity, increasing until the end of the recovery period. Psp has shown that physical activity slightly attenuated these differences during the entire recovery register. These seem to relate with the different depths of the light-tissue interactions provided by LDF and Psp. However, considering the significant differences in perfusion that are linked to this light physical activity, this mechanistic approach seems to be interesting for further investigation regarding its physiological significance. These findings also suggest that this protocol might be particularly suitable for studying the circulatory impact of physical activity in a home-health context. *Keywords:* distal perfusion, lower limb, perfusion asymmetries, laser Doppler flowmetry, Polarized light Spectroscopy, light physical activity

U 4.27

Title	**Differentiating VEDOSS and established Systemic Sclerosis – Insights from capillaroscopy and functional microcirculatory assessment**
Authors	Joana Caetano [1,2], Marisa Nicolai [1], Elisabete Silva [1], Clemente Rocha [1], Alexandre Cordeiro [1], José Delgado Alves [2], Luís Monteiro Rodrigues [1]
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Abstract	Systemic sclerosis (SSc) is an autoimmune disease where microvasculopathy plays a central role in its progression. Early detection is critical for the management of patients, where Raynaud's phenomenon (RP), abnormal finger capillaries, and puffy fingers are the earlier manifestations. Here we studied patients with Very Early Diagnosis of Systemic Sclerosis (VEDOSS) and established SSc to detect potential modifications on their microvascular adaptive capacity compared to healthy controls (HC). Thirty-one female participants, mean age 54.0±11.9years (10 HC, 11 VEDOSS, 11 SSc) were selected after nailfold videocapillaroscopy (NVC). All procedures respected Good Clinical Practices. The ice cooling exposure procedure (ICE) previously published was applied to one randomly chosen hand. Hemodynamics and local perfusion were measured in both hands by non-invasive optical-based technologies, during baseline (10minutes, phase 1), ICE (3minutes, phase 2), and recovery (10minutes, phase 3). NVC confirmed a similar pattern between VEDOSS and SSc patients. Significant differences in perfusion were detected between all groups in all phases ($p<0.0001$). In the early recovery phase (first minute), perfusion in the SSc was still significantly lower ($p=0.0013$), while it increased in VEDOSS ($p=0.0005$) and HC ($p=0.04$) participants. In the late phase 3 (last 3 minutes), perfusion increased significantly in all groups, more markedly in the VEDOSS group (percent variation from phase 2 of 50.2%) compared to the other groups (SSc 7.6%, HC 16.4%). Despite the similar NVC morphologic characterization of VEDOSS and SSc patients, there are clear differences between their peripheral adaptive capacities in response to ICE, which should be further investigated. *Keywords:* Systemic Sclerosis (SSc), Very Early Diagnosis of Systemic Sclerosis (VEDOSS), nailfold-videocapillaroscopy, ice cold exposure, vascular homeostasis

U 4.28

Title	**Cold-Induced microcirculatory adaptive changes in Raynaud's Phenomenon**
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Abstract	Raynaud's phenomenon (RP) is an exaggerated transient vasoconstriction of the extremities' microvasculature in response to cold or stress. This may be primary (idiopathic) (pRP) or secondary (sRP); its mechanisms are unknown, and treatment is often ineffective. This study utilized controlled cold exposure (ICE) to investigate the adaptation of glabrous skin perfusion in pRP and sRP, compared to healthy controls (HC). Thirty-one female participants, mean age 55±12 years, were selected (10 HC, 11 pRP, 10 sRP). All procedures respected Good Clinical Practices. The challenge involved ICE methodology previously published, applied to one randomly chosen hand. Hemodynamics and local perfusion were measured in both hands by non-invasive technologies, during baseline (10 min phase 1), ICE (3 min phase 2), and recovery (10 min phase 3). With ICE, significant differences in perfusion were detected between HC, pRP, and sRP in all experimental phases ($p<0.0001$). In the first minute of recovery, mean perfusion significantly increased in HC ($p=0.0003$), while it decreased in pRP (phase 2: 150BPU vs phase 3: 138BPU, $p=0.0005$), with no significant response in sRP (phase 2: 78BPU vs phase 3: 71BPU, $p=0.06$). In the late recovery, perfusion further increased in HC ($p=0.02$), as well as in sRP ($p<0.0001$), and continued to decrease in pRP ($p<0.0001$). These suggest that pRP and sRP react differently to ice exposure. sRP showed a slower perfusion recovery, while pRP did not fully recover during the evaluation period, suggesting that impairment of vascular adaptation might be a determinant of RP manifestations, justifying further investigations. *Keywords:* Raynaud's phenomenon, ice cooling exposure, vascular homeostasis, microcirculation, laser Doppler flowmetry

U 4.29

Title	**Smoke Signals - reactive hyperemia detects early homeostatic adaptive stress in young light smokers**
Authors	Marisa Nicolai [1], Elisabete Silva [1], Alexandre M. Cordeiro [1,2], Clemente Rocha [1], Luís Monteiro Rodrigues [1]
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Abstract	Post-occlusive reactive hyperaemia (PORH) has been used to explore cardiocirculatory function and has potential utility to test homeostatic responses in the absence of disease. In this direction, and recognising the importance of tabaco usage as a major risk factor in cardiovascular disease, we compared PORH responses obtained from young healthy smokers and non-smokers. Twenty-seven healthy participants (13 smokers, 14 non-smokers), matched for sex, BMI, and height, were included. Smokers reported regular cigarette consumption for at least one year. All smokers were regarded as light smokers based on the average Smoking Index accepted to characterise the overall burden of smoking on an individual. The PORH protocol included three phases - baseline, occlusion, and recovery (early and late). Occlusion was set with a suprasystolic pressure applied by an inflated cuff in a randomly selected arm (200 mmHg for two minutes). Peripheral skin perfusion was assessed in both hands using laser Doppler flowmetry (LDF) in the index fingertips and Tissue Viability Imaging (TiVi) at the dorsal faces. Key outcomes were perfusion drop and time to minimum during occlusion, and time to peak reperfusion and full recovery time after cuff release. All procedures observed Good Clinical Practice principles. Perfusion dropped to near zero during occlusion in all participants, with similar profiles. During early recovery, smokers exhibited a significantly longer time to peak perfusion compared to non-smokers ($p<0.01$ LDF). TiVi supported these findings showing slower and more dispersed red blood cell accumulation, especially in late recovery, where non-smokers reached higher perfusion faster than smokers ($p < 0.05$ TiVi). In conclusion, these results suggest that light smokers already show significant differences regarding their cardiovascular adaptive responses to stress, even in the absence of any clinical signs or symptoms. These also underscore the potential of this manoeuvre in the early detection of pathophysiological processes that should be further explored. Funding Disclosure: This research was financed by national funds through FCT—Foundation for Science and Technology, I.P. (Portugal), under the [UIDB/04567/2020] and [UIDP/04567/2020] programs. All imaging instrumentation was provided by ALIES-COFAC. *Keywords:* Post-occlusive reactive hyperaemia, microvascular dysfunction, smoking and vascular reactivity, non-invasive vascular assessment, perfusion kinetics

R 3.30

Title	**Beyond Body Condition Score: DEXA-Driven Insights into Feline Fat Distribution and Diabetes Risk**
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Abstract	Obesity in feline, as in human, is associated with several diseases. Feline obesity is expanding in our societies and already represents a consistent health threat to these companion animals. Several semi-quantitative methods are used to estimate the percentage of animal body fat, however, all raise accuracy questions, critically depending on the observer's experience. Thus, the present study was designed to produce science-based evidence about adipose tissue distribution in domestic cats using dual-energy X-ray absorptiometry (DEXA). To that purpose, we selected 17 healthy domestic cats, which were sedated with 100 µg of medetomidine hydrochloride/kg, IM, for body composition imaging analysis.. Body mass, lean body mass, adipose mass, bone mass, visceral adipose tissue, and subcutaneous adipose tissue were quantified. All procedures were conducted in accordance with current EU animal welfare legislation. Results have shown that in cats with lower (25%), the predominant body adipose tissue compartment was visceral. As the percentage of body fat grows, the visceral fat increases. Visceral fat is much more active than subcutaneous and is capable of releasing various pro-inflammatory mediators that will accelerate pathological processes, namely hyperglicemia, insulin resistance and diabetes risk, along with all related implications. Importantly, the precision of DEXA in quantifying adipose tissue compartments in cats enhances the understanding of feline diabetes risk and might contribute to improved prevention, diagnosis, and management strategies in veterinary care. *Keywords:* Domestic cat, obesity, body fat, visceral adipose tissue, subcutaneous adipose tissue, dual-energy X-ray absorptiometry

R 3.31

Title

Cinnamaldehyde, silibinin and sulforaphane potentiate the release of GLP-1 and PYY from gut cells

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Abstract

During the progression of metabolic imbalance, gut endocrine cell function is disrupted, leading to altered levels of hormones like GLP-1 and PYY, which are co-released by L-cells and play important roles in metabolic regulation. Several studies have reported that diet can influence gut hormone levels. In particular, individuals adhering to the Mediterranean diet (MeD) exhibit higher levels of GLP-1. This work intends to reveal compounds from MeD that can induce the release of GLP-1, PYY and other possible neuroendocrine factors such as NPY, α-MSH and dopamine from the gut. An in vitro model of L-cells (NCI-H716 cell line) was treated with several compounds present in the MeD (carvacrol, citral, silibinin, geraniol, sulforaphane, taxifolin, cinnamaldehyde, eucalyptol and hydroxytyrosol) to evaluate the effects on gene expression of proglucagon (GLP-1 precursor), PYY, POMC (α-MSH precursor), tyrosine hydroxylase (TH) - the enzyme involved in dopamine synthese - and DPP4 (enzyme known for degrading GLP-1). Despite NPY and POMC gene expressions not observed in NCI-H716 cells, TH is expressed in both undifferentiated and differentiated cells, suggesting that these cells may release dopamine. Cinnamaldehyde at a lower concentration (5 μM), as well as silibinin and sulforaphane at 5 μM and 50 μM, enhanced the expression of proglucagon after 4 hours of treatment. In contrast, the expression levels of TH and DPP4 were not affected by any of the compounds. In conclusion, these findings indicate that the Mediterranean diet may modulate GLP-1 levels, highlighting a potential approach of precision nutrition for metabolic disease therapy. This work was supported by "CHAngeing – Connected Hubs in Ageing: Healthy Living to Protect Cerebrovascular Function" funded by the European Union's Horizon Europe program (Excellence Hubs - HORIZON-WIDERA-2022-ACCESS-04-01) under grant agreement No. 101087071.

Keywords: Gut hormones, Mediterranean diet, type 2 diabetes

R 3.32

Title	**Acute and Chronic Multimodal Responses to Whole-Body Electromyostimulation (WB-EMS): Integrating Cardiovascular, Neurological and Metabolic Biomarker Dynamics**
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Abstract	*Abstract withheld at the authors' request*

R 3.33

Title

Exploring the Role of Dietary (Poly)phenols in Pancreatic Cell Transdifferentiation

Authors

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Abstract

Diabetes mellitus is characterized by the progressive loss of pancreatic β-cell mass and function, resulting in insufficient insulin secretion and poor glycemic control. Therapeutic approaches aimed at restoring β-cell function are key in diabetes management. One promising strategy involves the transdifferentiation of pancreatic α-cells into insulin-producing cells, a process modulated by various molecular and environmental factors, including dietary components. Plant-derived bioactive compounds, particularly (poly)phenols (PPs), have been shown to exert beneficial effects on metabolic regulation. These compounds influence diverse molecular pathways, including those involved in genome and epigenetic regulation, RNA processing, and protein expression. While their metabolic effects are well-documented, the specific molecular targets of PP metabolites in the context of cellular reprogramming remain underexplored. This study aimed to investigate the overlap between gene expression alterations associated with diabetes and the molecular targets modulated by PPs and their metabolites, focusing on mechanisms relevant to cellular transdifferentiation. In silico integrative analysis was performed using publicly available gene expression data from individuals with diabetes, alongside proteomic and transcriptomic data from human, animal, and in vitro models treated with PPs or PP-rich extracts. Functional enrichment and regulatory network analyses were conducted to identify differentially expressed genes (DEGs) and key regulators. A total of 94 DEGs were identified as common to both diabetes and PP-treated models. These genes are primarily associated with endocrine function, inflammation, metabolic processes, and cellular signaling. Notably, transcription factors such as PDX1 and PAX6, central to β-cell identity and differentiation, and E2F1 and ATF6, involved in cellular stress responses, were implicated as potential mediators of PP-induced effects. These findings suggest that (poly)phenols may modulate gene networks relevant to β-cell function and identity, supporting their potential in contributing to the development of therapeutic approaches for diabetes management.

Keywords: diabetes; polyphenols; multi-omics; transdifferentiation

R 4.34

Title	**Urolithin B Modulates IAPP Aggregation and Preserves β-cell Physiology via Mitochondrial and Calcium Signaling Pathways**
Authors	Regina Menezes [1] , Sofia Ferreira [1,2], Ana Filipa Raimundo [3], Mehmet Akdag [4], Maria Inês Farrim [1,2], Vânia Pobre [5], Mafalda Lopes-da-Silva [3], Marta Martins [1,2], José Brito [5], Márcia Garcez [3], Catarina Homem [3], Nuno Saraiva [1], Tessa Sinnige [4], Claudia Nunes dos Santos [3]
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Abstract	Type 2 diabetes mellitus is characterized not only by insulin resistance but also by progressive pancreatic β-cell dysfunction. One of the contributing factors to β-cell damage is the aggregation of Islet Amyloid Polypeptide (IAPP), a process that disrupts proteostasis and compromises cellular viability. A growing body of evidence highlights that natural compounds from dietary sources, particularly (poly)phenols, can interfere with amyloidogenesis. Despite their often-limited bioavailability, metabolites resulting from the extensive metabolism of these compounds in the human body have begun to be associated with health-promoting activities. In this context, we investigated the impact of Urolithin B (UroB) - a microbial metabolite of ellagitannin - on IAPP aggregation and β-cell physiology. Through a combination of molecular docking and cell-free assays, we demonstrated that UroB interferes with IAPP fibrillogenesis, altering the kinetics of amyloid formation and the morphology of resulting aggregates. In rat insulin-secreting INS-1 832/3 cells, UroB treatment alleviated the cytotoxicity induced by exposure to IAPP aggregates. Mechanistic experiments revealed that UroB enhances mitochondrial respiratory capacity and stabilizes intracellular redox balance, suggesting a restoration of cellular energy metabolism. Furthermore, UroB significantly improved calcium dynamics, a key regulator of insulin exocytosis, and enhanced glucose-stimulated insulin secretion (GSIS). In 3D β-cell spheroid cultures, UroB reduced central necrosis, indicating improved cell viability in a more physiologically relevant model. In Caenorhabditis elegans expressing human IAPP-GFP, UroB administration led to a marked reduction in total and aggregated IAPP load, supporting its in vivo relevance. Altogether, our findings underscore the ability of UroB to counteract amyloid-induced stress and sustain β-cell functional integrity through mechanisms involving mitochondrial support and calcium signaling. This work highlights a physiologically relevant route by which diet-derived metabolites may contribute to cellular resilience in the diabetic pancreas. *Keywords:* diabetes; IAPP; polyphenol metabolites

R 4.35

Title	**ProIAPP Accumulation as a Marker of β-Cell Dysfunction and Amyloid Risk in Type 2 Diabetes**
Authors	Regina Menezes [1], Andreia Gomes [1], Emília Borba [1], Rita Andrade [2], Maria Inês Farrim [1,3] , Paula Pinto [4,5,6], João Raposo [2], Rogério Ribeiro [2]
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Abstract	β-cell dysfunction is central to the pathogenesis of Type 2 Diabetes Mellitus (T2DM) and is exacerbated by islet amyloid polypeptide (IAPP) aggregation. This study aimed to investigate IAPP dysregulation, focusing on the accumulation of its unprocessed forms as potential triggers of oligomerization and amyloid deposition, and to explore their association with metabolic, cardiovascular, and lifestyle-related risk factors in T2DM. A cross-sectional observational study was conducted between March and June 2022, including 49 adults with T2DM and 51 controls. Data on sociodemographics, anthropometrics, biochemistry, and lifestyle were collected. Cardiovascular risk was assessed using the Atherogenic Plasma Index (AIP) and Castelli Index. Blood samples were analyzed for glucose, HbA1c, insulin, proinsulin, IAPP, pro-IAPP, C-peptide, and other metabolic markers. HOMA-IR and HOMA-β were used to assess insulin resistance and β-cell function, respectively. Group comparisons were made using ANOVA with post hoc testing; correlations were analyzed using Pearson and Spearman methods. T2DM individuals showed higher BMI, fasting glucose, HbA1c, proinsulin, proinsulin-related ratios, and insulin resistance ($p<0.001$), with reduced β-cell function. Cardiovascular risk markers such as triglycerides, VLDL cholesterol, waist circumference, and AIP were also elevated. ProIAPP levels and the proIAPP/IAPP ratio were significantly higher in T2DM and correlated with disease duration, fasting glucose, and inversely with C-peptide and HOMA-β. IAPP dysregulation, marked by increased pro-IAPP, is linked to β-cell dysfunction, impaired glucose regulation, insulin resistance, and higher cardiovascular risk, reinforcing its role in T2DM pathophysiology. *Keywords:* diabetes; IAPP; β-cell dysfunction

R 4.36

Title

Associations Between Body Composition and Physical Fitness in Women Diagnosed with Fibromyalgia

Authors

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Abstract

Fibromyalgia is a chronic condition characterized by widespread musculoskeletal pain, fatigue, and reduced physical capacity. Alterations in body composition and physical fitness parameters are commonly observed in this population. However, the relationship between those parameters remains poorly explored. This study aimed to evaluate the associations between body composition and physical fitness parameters in women diagnosed with fibromyalgia. Twenty-two women diagnosed with fibromyalgia (mean age: 52.3 ± 6.6 years) participated in the study. Body composition assessments included body fat mass (BFM), foft lean mass (SLM), fat free mass (FFM), intracellular water (ICW), extracellular water (ECW), total body water (TBW), phase angle (PhA, 50 kHz), ECW/TBW ratio and TBW/FFM ratio) while physical fitness included the Rikkli & Jones tests plus the Handgrip Strength test. Handgrip strength of the right hand correlated positively with ECW/TBW ratio (r=0.481; p=0.027), and sit-to-stand performance was associated with TBW/FFM ratio (r=0.460; p=0.031). Upper limb flexibility showed significant negative correlations with multiple body composition parameters, including ICW (r=-0.534; p=0.013), SLM (r=-0.541; p=0.011), and FFM (r=-0.536; p=0.012). No significant correlations were observed with PhA, despite its role as a marker of cellular health. In women with FM, physical fitness improvements appear to be related to specific body compositions parameters. Although PhA did not correlate with fitness outcomes, it remains a relevant marker of cellular health.

Keywords: Fibromyalgia; Body Composition; Physical Fitness; Phase Angle; Strength, Flexibility.

R 4.37

Title	**Body composition and physical fitness characterization in a patient with cerebellar ataxia and multiple sclerosis. A case study**
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Abstract	Multiple sclerosis is a chronic disease of the central nervous system which affects myelin sheaths. Additionally, cerebellar ataxia is a neurological condition that affects muscle coordination, resulting in uncoordinated movements and instability. However, body composition and physical fitness are poorly characterized in patients with both conditions. Thus, this study aimed to characterize body composition and physical fitness of a patient with both cerebellar ataxia and multiple sclerosis. A case study of one male patient (63 years, 55.9 kg and 163 cm), clinically diagnosed with cerebellar ataxia and multiple sclerosis, was conducted. Body Composition assessment included body fat mass (BFM), fat free mass (FFM), intracellular water (ICW), extracellular water (ECW), total body water (TBW), phase angle (PhA, 50 kHz), while physical fitness included the chair stand and the 8 foot up-and-go (UG) of Rikli and Jones tests, plus the standing on one leg and tandem walk of Rose, Lucchese and Wiersma. Body composition revealed that FFM (21.8 kg), TBW, ECW, ICW (29.8, 18.2, 11.6 l, respectively) and PhA (4.5º) were considered low while BFM was considered higher (15.2 kg) according to InBody S10 manual instructions. Physical fitness showed to be compromised in chair stand (11 repetitions), UG (8.58''), standing on one leg (1.68'' and 1.70'' for right and left legs) and tandem walk (unable to complete 10 steps independently) according to the reference values. This case study showed that the patient needs improving physical fitness and nutritional behavior habits to reduce the symptoms of his disease. *Keywords:* Balance; Bioimpedance; Body water; Phase Angle; Strength

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