



XVII Simposio Internacional de Actualizaciones en Entrenamiento de la Fuerza

23 - 24 de octubre de 2026

Madrid, España

UNIVERSIDAD POLITÉCNICA DE MADRID

Facultad de Ciencias de la Actividad Física y del Deporte (INEF)

Departamento de Salud y Rendimiento Humano

Editores: Pedro J. Benito, Ana B. Peinado,
Miguel A. Rojo-Tirado, Lara Pablos.

PROGRAMA
Y
LIBRO DE
RESÚMENES





XVII International Symposium in Strength Training

October 23 - 24, 2026

Madrid, Spain

UNIVERSIDAD POLITÉCNICA DE MADRID

Faculty of Physical Activity and Sport Sciences (INEF)

Department of Health and Human Performance

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PROGRAM
&
BOOK OF
ABSTRACTS



POLITÉCNICA



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BIENVENIDOS

BIENVENIDOS AL XVII SIMPOSIO DE FUERZA

Es para nosotros una gran satisfacción presentar el Libro de Resúmenes del XVII Simposio Internacional de Actualizaciones en Entrenamiento de la Fuerza, una publicación que reúne las contribuciones científicas presentadas en esta nueva edición de un encuentro que, tras años de crecimiento continuo, se ha consolidado como la principal referencia nacional y una de las citas más relevantes en el estudio, la aplicación y la transferencia del entrenamiento de la fuerza.

La fuerza constituye actualmente una capacidad física fundamental no solo para el rendimiento deportivo, sino también para la salud, la prevención de lesiones, la rehabilitación, el envejecimiento saludable y la mejora de la calidad de vida. La creciente producción científica en este ámbito exige foros de encuentro que permitan intercambiar conocimientos, debatir nuevas evidencias y fortalecer la colaboración entre investigadores, profesionales y estudiantes de las ciencias del deporte y la salud. El Simposio de Fuerza nació precisamente con esta vocación y, una edición más, mantiene su compromiso con la excelencia científica y la transferencia del conocimiento a la práctica profesional.

La edición de 2026 reúne en Madrid a destacados investigadores y profesionales de reconocido prestigio internacional, entre los que se encuentran David Bishop, Vanesa España-Romero, Mikel Zabala, María Belén Feriche, Henning Wackerhage y Alejandro Muñoz, entre otros muchos, quienes compartirán los avances más recientes en áreas relacionadas con el entrenamiento, la fisiología, la adaptación al ejercicio, el rendimiento deportivo y la salud.

Este libro de resúmenes refleja la diversidad y calidad de las investigaciones presentadas en el simposio. Los trabajos recogidos abarcan diferentes perspectivas metodológicas y temáticas, evidenciando el dinamismo de una disciplina en constante evolución. Además de ofrecer una visión actualizada del conocimiento científico disponible, estas contribuciones representan la inquietud investigadora de estudiantes, jóvenes investigadores y grupos consolidados que contribuyen al avance de nuestro campo.

Desde el Comité Científico y Organizador queremos expresar nuestro agradecimiento a todos los autores por su participación y confianza, a los revisores por su labor rigurosa y generosa, a los ponentes invitados por compartir su experiencia y conocimiento, y a las instituciones y entidades colaboradoras que hacen posible la celebración de este encuentro.

Confiamos en que los trabajos presentados en este volumen sirvan de inspiración para nuevas investigaciones, promuevan el pensamiento crítico y contribuyan a seguir fortaleciendo la conexión entre la evidencia científica y la práctica profesional.

Os damos la bienvenida al XVII Simposio Internacional de Actualizaciones en Entrenamiento de la Fuerza y os deseamos que estas jornadas resulten tan enriquecedoras desde el punto de vista científico como estimulantes desde el punto de vista personal y profesional.

Ana Belén Peinado Lozano y Pedro José Benito Peinado
Presidentes del XVII Simposio de Actualizaciones en Entrenamiento de la Fuerza

WELCOME

WELCOME TO THE XVII INTERNATIONAL SYMPOSIUM IN STRENGTH TRAINING

It is our great pleasure to present the Book of Abstracts of the XVII International Symposium in Strength Training, a publication that brings together the scientific contributions presented in this new edition of a meeting that, after years of continuous growth, has established itself as the leading national reference and one of the most important events for the study, application, and translation of strength training.

Strength is currently recognized as a fundamental physical capacity, not only for sports performance but also for health, injury prevention, rehabilitation, healthy aging, and the improvement of quality of life. The growing body of scientific research in this field demands forums that facilitate the exchange of knowledge, the discussion of emerging evidence, and the strengthening of collaboration among researchers, practitioners, and students in the fields of sport and health sciences. The Strength Symposium was founded precisely with this mission in mind and, once again, reaffirms its commitment to scientific excellence and the translation of knowledge into professional practice. The 2026 edition brings together in Madrid distinguished researchers and professionals of internationally recognized prestige, including David Bishop, Vanesa España-Romero, Mikel Zabala, María Belén Feriche, Henning Wackerhage, and Alejandro Muñoz, among many others, who will share the latest advances in areas related to training, physiology, exercise adaptation, sports performance, and health.

This book of abstracts reflects the diversity and quality of the research presented at the symposium. The contributions included cover a wide range of methodological and thematic perspectives, highlighting the dynamism of a discipline that continues to evolve. In addition to providing an up-to-date overview of the available scientific knowledge, these works represent the research commitment of students, early-career researchers, and established research groups who contribute to the advancement of our field.

On behalf of the Scientific and Organizing Committee, we would like to express our gratitude to all authors for their participation and trust, to the reviewers for their rigorous and generous work, to the invited speakers for sharing their expertise and knowledge, and to the institutions and partner organizations whose support makes this event possible.

We trust that the work presented in this volume will inspire new research, foster critical thinking, and contribute to further strengthening the connection between scientific evidence and professional practice.

We warmly welcome you to the XVII International Symposium in Strength Training and hope that these days will be as enriching from a scientific perspective as they are stimulating from a personal and professional standpoint.

Ana Belén Peinado Lozano y Pedro José Benito Peinado
Presidents of the XVII International Symposium in Strength Training

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PROGRAMA CIENTÍFICO / SCIENTIFIC PROGRAM

DÍA 1/ DAY 1

Horario/Time	DÍA 1 / DAY 1
	23/10/2026
8:30 - 9:00 h	Acreditación / Registration
9:00 - 10:30 h	Comunicaciones orales 1 / Oral presentation 1
10:30 - 11:30 h	FUERZA Y RENDIMIENTO EN ESCALADA: UN ENFOQUE INTEGRADO VANESA ESPAÑA ROMERO
11:30 - 12:00 h	DESCANSO / BREAK PRESENTACIÓN PÓSTERES / POSTER PRESENTATION
12:00 - 13:00 h	PREDICTORES DE RENDIMIENTO EN LAS CARRERAS DE LARGA DISTANCIA: CÓMO ENTRENARLOS Y CÓMO MONITORIZARLOS JUAN MANUEL DEL CAMPO VECINO
13:00 - 14:00 h	ESTRATEGIAS DIETÉTICO-NUTRICIONALES EN DEPORTES DE FUERZA Y CONTROL DE PESO ALEJANDRO MARTÍNEZ RODRÍGUEZ
14:00 - 15:30 h	WORKSHOP 1: LACTATO: ¿QUÉ ES Y PARA QUÉ SIRVE? ROCÍO CUPEIRO COTO COMIDA / LUNCH
15:30 - 16:00 h	MICROCONCIERTO DE PIANO DE MIGUEL GARRIDO ROMANOS
16:00 - 18:00 h	ACTO DE APERTURA / OPEN CEREMONY TRAINING STRATEGIES TO IMPROVE ENDURANCE PERFORMANCE: PRACTICAL APPLICATIONS FROM LABORATORY RESEARCH DAVID BISHOP
18:00 - 18:30 h	Comunicaciones orales 2 / Oral presentation 2
18:30 - 19:00 h	DESCANSO / BREAK PRESENTACIÓN PÓSTERES / POSTER PRESENTATION
19:00 - 20:00 h	HIPOXIA APLICADA AL ENTRENAMIENTO DE LA FUERZA: EVIDENCIA Y TECNOLOGÍA MARÍA BELÉN FERICHE FERNÁNDEZ-CASTANYS
20:00 - 21:00 h	TRATAMIENTO COMBINADO DE LA OBESIDAD: EJERCICIO Y FÁRMACOS, ¿1 + 1 = 3? ANTELM PUJOL CALAFAT

PROGRAMA CIENTÍFICO / SCIENTIFIC PROGRAM

DÍA 2/ DAY 2

Horario/Time	DÍA 2 / DAY 2	
	24/10/2026	
8:30 - 9:00 h	Acreditación / Registration	
9:00 - 10:15 h	Comunicaciones orales 3 / Oral presentation 3	
10:15 - 11:30 h	ESCUCHAR AL CUERPO: SALUD MENSTRUAL APLICADA AL ENTRENAMIENTO	
	EVA FERRER VIDAL-BARRAQUER	
11:30 - 12:00 h	DESCANSO / BREAK PRESENTACIÓN PÓSTERES / POSTER PRESENTATION	
12:00 - 13:00 h	USO DE LA INTELIGENCIA ARTIFICIAL GENERATIVA DE FORMA INTELIGENTE EN EL ENTRENAMIENTO DEPORTIVO	
	ALEJANDRO MUÑOZ LÓPEZ	
13:00 - 14:00 h	ÚLTIMAS TENDENCIAS DEL ENTRENAMIENTO DE FUERZA EN CICLISMO	
	MIKEL ZABALA DÍAZ	
14:00 - 16:00 h	WORKSHOP 2: PRUEBA DE ESFUERZO MARÍA ALCOCER AYUGA	COMIDA / LUNCH
16:00 - 17:30 h	ANTI-OBESITY EFFECTS OF MUSCLE HYPERTROPHY	
	HENNING WACKERHAGE	
17:30 - 18:30 h	FUERZA, TÉCNICA Y EFICIENCIA: EL MODELO APLICADO A CAMPEONES INTERNACIONALES DE MARCHA ATLÉTICA	
	DANIEL JACINTO GARZÓN JIMÉNEZ	
18:30 - 19:30 h	Conclusiones, entrega de premios y clausura del Simposio Conclusions, awards and closing ceremony	

PROGRAMA DE COMUNICACIONES Y POSTERES/ ORAL AND POSTER PRESENTATION PROGRAMME

Horario/Time		DÍA 1 / DAY 1
		23/10/2026
9:00 - 10:30 h		Comunicaciones orales 1 / Oral presentation 1
1	9:00 h	Lower limb strength matters: the FIQMODE study in Cystic Fibrosis ANTONIO RELAÑOS MANCHEÑO
2	9:15 h	Resistance training as supportive oncology care in metastatic cancer: effects on muscle quality and mass FRANSCISCA REYES MERINO
3	9:30 h	Design of a CERT-based training program for functional recovery in liver transplant recipients JULIA VADILLO ROMERO
4	9:45 h	Association between static and dynamic inspiratory muscle strength and functional performance in older adults ÓSCAR FABREGAT ELIPE
5	10:00 h	Maximal intended velocity power training improves multiscale walking speed in postmenopausal women JHONATTAN OVIEDO
6	10:15 h	Comparison of menstrual distress between recreational and competitive female athletes PALOMA GARCÍA-MARTÍNEZ
18:00 - 18:30 h		Comunicaciones orales 2 / Oral presentation 2
7	18:00 h	Adiposity markers and cardiorespiratory fitness: comparing associations with absolute and relative VO ₂ max ALBERTO ARMERO SOTILLO
8	18:15 h	Acute caffeine ingestion improves simulated competition performance in high-level weightlifters ARTURO FRANCO ANDRÉS
Horario/Time		DÍA 2 / DAY 2
		24/10/2026
09:00 - 10:00 h		Comunicaciones orales 3 / Oral presentation 3
9	9:00 h	Sex differences in muscular adaptations to resistance training under normobaric hypoxia CRISTINA BENAVENTE BARDERA

PONENTES / KEYNOTE SPEAKERS

FRIDAY, OCTOBER 23, 2026

16:00 - 18:00 H



DAVID BISHOP

VICTORIA UNIVERSITY, INSTITUTE OF HEALTH
AND SPORT (IHES) - MELBOURNE, AUSTRALIA

Ejercicio y señalización muscular: Implicaciones en el envejecimiento muscular

David Bishop es un investigador de referencia mundial en fisiología del ejercicio muscular, con más de 350 publicaciones científicas y un índice h de 107. Dirige el Exercise Prescription Lab, donde estudia principalmente cómo el ejercicio, la alimentación y la genética influyen en las adaptaciones del músculo, especialmente en las mitocondrias, con el objetivo de desarrollar programas de ejercicio más personalizados para mejorar la salud y el rendimiento humano. A lo largo de su carrera, ha obtenido financiación de organismos como el ARC, el NHMRC y las Fuerzas de Defensa Australianas, y ha participado como ponente en más de 100 conferencias internacionales. Además, ha ocupado importantes cargos de liderazgo en el ámbito de las ciencias del deporte, entre ellos la presidencia de Exercise & Sport Science Australia (ESSA). Ha recibido numerosos premios y reconocimientos por su trayectoria y es miembro de organizaciones como ESSA, ACSM y ECSS. Actualmente, es el primer editor jefe de npj Exercise Medicine and Health. Su trabajo también ha tenido un impacto significativo fuera del ámbito académico. Sus investigaciones han aparecido en más de 250 medios de comunicación, incluyendo prensa, radio y televisión. Además, sus estudios sobre las adaptaciones mitocondriales al entrenamiento físico han sido presentados en dos ocasiones en el programa australiano ABC Catalyst.

David Bishop is a world-leading researcher in muscle exercise physiology, with more than 350 scientific publications and an h-index of 107. He leads the Exercise Prescription Lab, where he primarily investigates how exercise, nutrition, and genetics influence muscle adaptations, particularly mitochondrial adaptations, with the aim of developing more personalised exercise programmes to improve health and human performance. Throughout his career, he has received funding from organisations such as the ARC, the NHMRC, and the Australian Defence Force, and has been invited to speak at more than 100 international conferences. He has also held important leadership positions in the field of exercise and sport science, including the presidency of Exercise & Sport Science

Australia (ESSA). He has received numerous awards and recognitions throughout his career and is a fellow of organisations such as ESSA, the ACSM, and the ECSS. He is currently the inaugural Editor-in-Chief of *npj Exercise Medicine and Health*. His work has also had a significant impact beyond academia. His research has been featured in more than 250 media outlets, including newspapers, radio, and television. In addition, his studies on mitochondrial adaptations to exercise training have been featured twice on the Australian television programme *ABC Catalyst*.



HENNING WACKERHAGE
TECHNICAL UNIVERSITY OF MUNICH – ALEMANIA

Anti-obesity effects of muscle hypertrophy

Henning Wackerhage es un investigador y profesor especializado en fisiología y biología molecular del ejercicio, actualmente vinculado a la Technical University of Munich (TUM). Su investigación se centra principalmente en cómo el ejercicio influye en el organismo a nivel molecular, con especial interés en el músculo esquelético, la hipertrofia muscular, el metabolismo y la interacción entre genética y ejercicio. Cuenta con más de 170 publicaciones científicas y miles de citas a sus trabajos. A lo largo de su carrera, ha desarrollado investigaciones relacionadas con la adaptación muscular al entrenamiento, la regulación molecular de la hipertrofia y la influencia de factores genéticos en el rendimiento y las respuestas al ejercicio. Además, ha participado en numerosos estudios y colaboraciones internacionales dentro del ámbito de las ciencias del deporte y la fisiología del ejercicio. Entre sus principales aportaciones destaca su trabajo sobre la hipertrofia muscular y los mecanismos moleculares que regulan la adaptación al entrenamiento de fuerza, así como sus investigaciones sobre la prescripción individualizada del ejercicio. También es autor y coautor de publicaciones científicas centradas en el diseño de programas de entrenamiento basados en la evidencia para mejorar el rendimiento, la condición física y la salud. Su producción científica ha tenido una importante repercusión en el ámbito académico y deportivo. Entre sus trabajos destaca el artículo *Personalized, Evidence-Informed Training Plans and Exercise Prescriptions for Performance, Fitness and Health*, en el que aborda la importancia de adaptar el entrenamiento a las características individuales de cada persona. Su investigación contribuye así a conectar los avances de la biología molecular y la genética con la aplicación práctica del ejercicio y el entrenamiento.

Henning Wackerhage is a researcher and professor specialising in exercise physiology and molecular exercise biology, currently affiliated with the Technical University of Munich (TUM). His research focuses primarily on how exercise affects the body at a molecular level, with particular interest in skeletal muscle, muscle hypertrophy, metabolism, and the interaction between genetics and exercise. He has more than 170 scientific publications and thousands of citations of his work. Throughout his career, he has conducted research related to muscle adaptation to training, the molecular regulation of hypertrophy, and the influence of genetic factors on performance and responses to exercise. He has more than 170 scientific publications and thousands of citations of his work.

Among his main contributions is his work on muscle hypertrophy and the molecular mechanisms that regulate adaptation to resistance training, as well as his research on individualised exercise prescription. He is also the author and co-author of scientific publications focusing on the design of evidence-based training programmes to improve performance, fitness, and health. His scientific work has had a significant impact in both academic and sports-related fields. Among his notable publications is the article Personalized, Evidence-Informed Training Plans and Exercise Prescriptions for Performance, Fitness and Health, in which he addresses the importance of adapting training to the individual characteristics of each person. His research therefore helps to connect advances in molecular biology and genetics with the practical application of exercise and training.

**VANESA ESPAÑA ROMERO****UNIVERSIDAD DE CÁDIZ, ESPAÑA- N° COL. 58354***Fuerza y Rendimiento en Escalada: Un Enfoque Integrado*

Vanesa España Romero es profesora titular de la Universidad de Cádiz, donde desarrolla su actividad docente e investigadora en el área de Educación Física y Deporte. Forma parte del grupo de investigación MOVE-IT y del Instituto de Investigación e Innovación en Ciencias Biomédicas (INiBICA). Es doctora por la Universidad de Granada, con una tesis centrada en los determinantes fisiológicos de la escalada deportiva. Su investigación se centra en la fisiología y el rendimiento deportivo, especialmente en la escalada, disciplina que estudia desde 2005 y en la que ha desarrollado una destacada trayectoria científica. También ha investigado la relación entre actividad física, salud, envejecimiento y depresión, participando en proyectos como C-HIPPER y SONRÍE. Cuenta con numerosas publicaciones y experiencia en proyectos y congresos nacionales e internacionales. Su trabajo conecta la investigación sobre fisiología y rendimiento con aplicaciones prácticas orientadas tanto a la mejora del rendimiento en escalada como a la promoción de la salud mediante el ejercicio físico.

Vanesa España Romero is an Associate Professor at the University of Cádiz, where she conducts her teaching and research activities in the field of Physical Education and Sport. She is a member of the MOVE-IT research group and the Institute for Biomedical Research and Innovation (INiBICA). She holds a PhD from the University of Granada, with a doctoral thesis focused on the physiological determinants of sport climbing. Her research focuses on exercise physiology and sports performance, particularly in climbing, a discipline she has studied since 2005 and in which she has developed a strong scientific career. She has also conducted research on the relationship between physical activity, health, ageing, and depression, participating in projects such as C-HIPPER and SONRÍE. She has numerous scientific publications and extensive experience in national and international research projects and conferences. Her work connects research on physiology and performance with practical applications aimed at improving climbing performance and promoting health through physical exercise.

**MIKEL ZABALA DÍAZ****UNIVERSIDAD DE GRANADA, ESPAÑA – Nº COL. 9503**

Últimas tendencias del entrenamiento de fuerza en ciclismo

Mikel Zabala Díaz es catedrático de la Universidad de Granada, donde desarrolla su actividad docente e investigadora en la Facultad de Ciencias del Deporte. Es doctor por esta universidad desde 2004 y actualmente dirige el Centro de Estudios e Investigación Olímpicos de la UGR. Su trayectoria está estrechamente vinculada al ciclismo, tanto desde el ámbito académico como desde el alto rendimiento deportivo. Sus principales líneas de investigación se centran en el rendimiento deportivo y el ciclismo, abordando aspectos relacionados con la fisiología del ejercicio, la preparación física y las variables que influyen en el rendimiento de los ciclistas. Cuenta con más de 200 publicaciones científicas y ha participado en numerosos proyectos nacionales e internacionales. En el ámbito profesional, fue director de rendimiento del equipo ciclista Movistar durante ocho años y ha trabajado como preparador físico, técnico y asesor de la Real Federación Española de Ciclismo y de la Federación Andaluza de Ciclismo. Actualmente, ejerce como seleccionador nacional de BTT y de la categoría sub-23 masculina de carretera. Además, ha dirigido 11 tesis doctorales y ha sido investigador principal en 21 proyectos o contratos, destacando por conectar la investigación científica con su aplicación práctica al ciclismo de alto rendimiento.

Mikel Zabala Díaz is a Full Professor at the University of Granada, where he conducts his teaching and research activities at the Faculty of Sport Sciences. He earned his PhD from the same university in 2004 and currently directs the Olympic Studies and Research Centre at the University of Granada. His professional career is closely linked to cycling, both in academia and in high-performance sport. His main research interests focus on sports performance and cycling, addressing areas such as exercise physiology, physical preparation, and the factors that influence cyclists' performance. He has more than 200 scientific publications and has participated in numerous national and international research projects. In the professional field, he served as Performance Director of the Movistar professional cycling team for eight years and has worked as a physical trainer, coach, and technical advisor for the Royal Spanish Cycling Federation and the Andalusian Cycling Federation. He currently works as the national coach for mountain biking and the men's U23 road cycling team. He has also supervised 11 PhD theses and served as principal investigator on 21 research projects or contracts, with his work standing out for connecting scientific research with its practical application in high-performance cycling.



MARÍA BELÉN FERICHE FERNÁNDEZ-CASTANY
UNIVERSIDAD DE GRANADA, ESPAÑA - N° COL. 6860

Hipoxia aplicada al entrenamiento de la Fuerza: evidencia y tecnología

María Belén Feriche Fernández-Castany es catedrática y actual decana de la Facultad de Ciencias del Deporte de la Universidad de Granada, donde desarrolla su actividad docente e investigadora en el Departamento de Educación Física y Deportiva. Se doctoró por la Universidad de Granada en 1998 con una tesis centrada en los efectos del citrato sódico sobre el rendimiento y la tolerancia al esfuerzo en condiciones de normoxia e hipoxia. Su trayectoria investigadora se ha centrado principalmente en la fisiología del ejercicio, el rendimiento deportivo y la hipoxia, con especial interés en los efectos de la altitud y diferentes condiciones de hipoxia sobre la fuerza, la potencia muscular, la hipertrofia y las respuestas fisiológicas al entrenamiento. A lo largo de su carrera ha dirigido proyectos relacionados con el entrenamiento en hipoxia, la adaptación muscular y los mecanismos neuromusculares y metabólicos. Cuenta con más de 100 publicaciones científicas y una amplia participación en congresos y proyectos nacionales e internacionales. Su trabajo combina la investigación básica y aplicada, buscando comprender las adaptaciones del organismo al ejercicio en diferentes condiciones ambientales y contribuir a la mejora del rendimiento deportivo.

María Belén Feriche Fernández-Castany is a Full Professor and the current Dean of the Faculty of Sport Sciences at the University of Granada, where she conducts her teaching and research activities in the Department of Physical Education and Sport. She earned her PhD from the University of Granada in 1998 with a thesis focused on the effects of sodium citrate on performance and exercise tolerance under normoxic and hypoxic conditions. Her research career has focused primarily on exercise physiology, sports performance, and hypoxia, with particular interest in the effects of altitude and different hypoxic conditions on strength, muscle power, hypertrophy, and physiological responses to training. Throughout her career, she has led research projects on hypoxic training, muscular adaptation, and neuromuscular and metabolic mechanisms. She has more than 100 scientific publications and extensive experience participating in national and international conferences and research projects. Her work combines basic and applied research, aiming to understand how the body adapts to exercise under different environmental conditions and to contribute to improving sports performance.



DANIEL JACINTO GARZÓN JIMÉNEZ

GDO. EF, ENTRENADOR OLÍMPICO DE MARCHA

Fuerza, técnica y eficiencia: El modelo aplicado a campeones internacionales de marcha atlética

Daniel Jacinto Garzón Jiménez es entrenador olímpico de atletismo y marcha atlética de la Selección Española. Graduado en Educación Física por la Universidad de Granada, cuenta con un Máster en Alto Rendimiento Deportivo por la Universidad de Murcia y desarrolla su trayectoria como entrenador desde 2007. Su carrera está especialmente vinculada a la marcha atlética y al entrenamiento de atletas de alto nivel. Ha sido entrenador de María Pérez desde sus inicios, acompañándola hasta convertirse en una de las grandes figuras mundiales de la disciplina. Bajo su dirección, María Pérez logró una medalla de oro y otra de plata en los Juegos Olímpicos de París 2024. Además, ha trabajado con atletas como Alberto Amezcua, José Manuel Pérez y Robyn Stevens, y ha recibido reconocimientos como el premio al Mejor Entrenador de la RFEA. También participa como formador en la Escuela Nacional de Entrenadores de la RFEA y recibió en 2026 la Insignia de Oro de la Facultad de Ciencias del Deporte de la Universidad de Granada.

Daniel Jacinto Garzón Jiménez is an Olympic athletics and race walking coach for the Spanish National Team. He holds a degree in Physical Education from the University of Granada, as well as a Master's degree in High-Performance Sport from the University of Murcia, and has been working as a coach since 2007. His career is particularly linked to race walking and the training of elite athletes. He has been María Pérez's coach since the beginning of her career, supporting her development into one of the world's leading race walkers. Under his guidance, María Pérez won one gold and one silver medal at the Paris 2024 Olympic Games. He has also worked with athletes such as Alberto Amezcua, José Manuel Pérez, and Robyn Stevens, and has received recognition including the RFEA Best Coach Award. He also works as a coach educator at the RFEA National Coaching School and, in 2026, received the Gold Insignia of the Faculty of Sport Sciences of the University of Granada.

**EVA FERRER VIDAL-BARRAQUER**

UNIDAD DE MEDICINA DEL DEPORTE DEL HOSPITAL
SANT JOAN DE DÉU, ESPAÑA - N° COL. 80833413

Escuchar al cuerpo: Salud menstrual aplicada al entrenamiento

Eva Ferrer Vidal-Barraquer es médica especialista en Medicina de la Educación Física y el Deporte, formada en la Universitat de Barcelona y vinculada al Hospital Sant Joan de Déu Barcelona. Su trayectoria se centra en la medicina deportiva y, especialmente, en la salud de la mujer y el deporte femenino. Entre 2018 y 2022 fue responsable médica del fútbol femenino del FC Barcelona y desde 2022 forma parte del comité de expertos en salud femenina de la UEFA. En 2013 fundó la iniciativa El Deporte en Femenino, dedicada a divulgar información sobre deporte y salud de la mujer. Su trabajo combina medicina deportiva, investigación, docencia y divulgación, abordando cuestiones como la menstruación, el embarazo, la menopausia, la fertilidad y la prevención de lesiones en mujeres deportistas. Actualmente, realiza un doctorado centrado en fútbol y salud femenina.

Eva Ferrer Vidal-Barraquer is a medical doctor specialising in Sports and Exercise Medicine, trained at the University of Barcelona and currently affiliated with Sant Joan de Déu Barcelona Hospital. Her career focuses on sports medicine and, particularly, women's health and women's sport. Between 2018 and 2022, she was the medical officer responsible for FC Barcelona Women's Football, and since 2022 she has been a member of the UEFA Women's Health Expert Group. In 2013, she founded the initiative El Deporte en Femenino, dedicated to raising awareness and providing information about women's health and sport. Her work combines sports medicine, research, teaching, and science communication, addressing topics such as menstruation, pregnancy, menopause, fertility, and injury prevention in female athletes. She is currently pursuing a PhD focused on football and women's health.



ALEJANDRO MARTÍNEZ RODRÍGUEZ
UNIVERSIDAD DE ALICANTE, ESPAÑA - N° COL. 55089

Estrategias dietético-nutricionales en deportes de fuerza y control de peso

Catedrático en Nutrición y Bromatología desde junio de 2025 en la Universidad de Alicante. Licenciado en Ciencias de la Actividad Física y del Deporte, Graduado en Nutrición Humana y Dietética, y Doctor en Psicología de la Salud, Máster en Alto Rendimiento Deportivo, Máster U. en Formación del Profesorado, y Máster U. en Rendimiento Deportivo y Salud, y Máster U. en Dirección y Gestión de Entidades Deportivas.

Imparte docencia en grado y posgrado en asignaturas relacionadas con nutrición deportiva, composición corporal, gastronomía científica y tecnologías aplicadas al rendimiento. Cuenta con un sexenio de investigación (2013-2019), 125 publicaciones científicas (más de 100 publicaciones en JCR, 70 en Q1), 1.877 citas y un índice H de 23 (Scopus). Ha dirigido 5 tesis doctorales con indicios de calidad y ha participado en 14 proyectos competitivos, siendo investigador principal (IP) en uno de ellos. Además, ha coordinado 13 proyectos de innovación docente. Ha sido ponente en más de 150 congresos, destacando su participación en 97 internacionales. Miembro del comité científico en 5 congresos y presidente en 3 congresos internacionales. En 2019 recibió el premio a la mejor investigación por la Sociedad Española de Medicina del Deporte. Y en 2018 dos premios de la ISAK (Sociedad Internacional para el Avance de la Cineantropometría). Director del European Institute of Exercise and Health, spin-off de la Universidad de Alicante. Responsable Área de Nutrición & Rendimiento Deportivo Elche C.F.

Full Professor of Nutrition and Food Science at the University of Alicante since June 2025. He holds a degree in Physical Activity and Sport Sciences, a degree in Human Nutrition and Dietetics, and a PhD in Health Psychology, as well as a Master's Degree in High Performance Sport, a University Master's Degree in Teacher Training, a University Master's Degree in Sports Performance and Health, and a University Master's Degree in Management and Administration of Sports Organizations.

He teaches undergraduate and postgraduate courses in subjects related to sports nutrition, body composition, scientific gastronomy, and technologies applied to performance. He has one six-year research period (2013–2019), 125 scientific publications (more than 100 publications in JCR journals, 70 in Q1), 1,877 citations, and an H-index of 23 (Scopus). He has supervised 5 doctoral theses with quality indicators and has participated in 14 competitive research projects, serving as principal investigator (PI) in one of them.

In addition, he has coordinated 13 teaching innovation projects. He has been a speaker at more than 150 conferences, including 97 international conferences. He has been a member of the scientific committee at 5 conferences and president of 3 international conferences. In 2019, he received the award for best research from the Spanish Society of Sports Medicine. In 2018, he received two awards from ISAK (International Society for the Advancement of Kinanthropometry). He is Director of the European Institute of Exercise and Health, a spin-off of the University of Alicante. He is also Head of the Nutrition & Sports Performance Area at Elche C.F.

**ALEJANDRO MUÑOZ LÓPEZ****UNIVERSIDAD DE SEVILLA, ESPAÑA – N° COL. 54722**

Uso de la Inteligencia Artificial Generativa de forma inteligente en el entrenamiento Deportivo

El Dr. Alejandro Muñoz es Profesor Titular en la Universidad de Sevilla. Su principal línea de investigación se centra en la aplicación de tecnología para el seguimiento y la gestión de la carga de entrenamiento, especialmente en el ámbito del entrenamiento de fuerza y sus efectos sobre la fatiga. Es autor de 35 artículos científicos relacionados con el rendimiento deportivo, de los cuales 12 han sido publicados en revistas del primer cuartil (Q1) del Journal Citation Reports y 14 en revistas situadas entre el Q2 y el Q3. Posee un índice h de 13 en Web of Science, con un total de 400 citas. En 14 de estos artículos figura como autor principal o de correspondencia, y 11 proceden de colaboraciones internacionales. Como resultado de estas colaboraciones, editó con Springer el libro *Resistance Training Methods: From Theory to Practice*, publicado en 2021 y elaborado con la participación de 34 autores de reconocido prestigio nacional e internacional.

Varios de sus artículos han sido financiados mediante proyectos de transferencia de conocimiento con empresas privadas, y sus resultados han dado lugar a múltiples actividades de transferencia. Esta línea de investigación está estrechamente vinculada a su experiencia profesional previa como preparador físico en fútbol profesional y como consultor para empresas de equipamiento deportivo. A partir de esa experiencia, el Dr. Muñoz ha asesorado a empresas tecnológicas líderes en la medición del entrenamiento de fuerza a nivel internacional.

Previo a su inicio como profesor de universidad desarrolló su trayectoria profesional como preparador físico de fútbol profesional, y entrenador personal de deportistas de alto rendimiento en varias disciplinas deportivas. Destaca la dirección del departamento de ciencias del deporte de la Federación Letona de Fútbol, así como preparador físico principal del equipo nacional del país, en varias fases clasificatorias para Eurocopa y Mundial, así como otros clubes de fútbol profesionales nacionales e internacionales.

Dr. Alejandro Muñoz is an Associate Professor at the University of Seville. His main line of research focuses on the application of technology for monitoring and managing training load, particularly in the field of resistance training and its effects on fatigue. He is the author of 35 scientific articles related to sports performance, 12 of which have been published in first-quartile (Q1) journals in the Journal Citation Reports and 14 in journals ranked between Q2 and Q3.

He has an h-index of 13 in Web of Science, with a total of 400 citations. In 14 of these articles, he is listed as first or corresponding author, and 11 resulted from international collaborations. As a result of these collaborations, he edited the book *Resistance Training Methods: From Theory to Practice* with Springer, published in 2021 and produced with the participation of 34 nationally and internationally renowned authors.

Several of his articles have been funded through knowledge transfer projects with private companies, and their findings have led to multiple knowledge transfer activities. This line of research is closely linked to his previous professional experience as a strength and conditioning coach in professional football and as a consultant for sports equipment companies. Based on this experience, Dr. Muñoz has advised leading international technology companies specialising in the measurement of resistance training.

Before beginning his career as a university professor, he developed his professional career as a strength and conditioning coach in professional football and as a personal trainer for high-performance athletes in several sports disciplines. Of particular note are his role as Director of the Sports Science Department of the Latvian Football Federation and his position as head strength and conditioning coach of the Latvian national team during several UEFA European Championship and FIFA World Cup qualifying campaigns, as well as his work with other professional football clubs at national and international level.



JUAN MANUEL DEL CAMPO VECINO
*UNIVERSIDAD AUTÓNOMA DE
MADRID, ESPAÑA – N° COL. 6151*

Optimización de la distribución del volumen y la intensidad de la carga en la preparación de un maratoniano de alto nivel: una propuesta personal

El Dr. Juan del Campo Vecino es Profesor Titular de Universidad en la Universidad Autónoma de Madrid, donde desarrolla su actividad docente e investigadora en el ámbito de las Ciencias de la Actividad Física y del Deporte. Es Doctor en Ciencias de la Actividad Física y del Deporte por la Universidad Politécnica de Madrid, donde defendió en 2005 su tesis doctoral, centrada en la intensidad del entrenamiento en jugadores de baloncesto mediante la percepción del esfuerzo y la fatiga. Su actividad académica e investigadora se ha desarrollado principalmente en el ámbito del entrenamiento y el rendimiento deportivo, con trabajos relacionados con el atletismo, el baloncesto, el entrenamiento de resistencia y la valoración del rendimiento. Su producción académica incluye 33 artículos en revistas, 13 colaboraciones en obras colectivas y 4 libros, además de la dirección de 7 tesis doctorales.

Paralelamente, cuenta con una amplia trayectoria como entrenador de atletismo, especialmente en pruebas de fondo y maratón. Es entrenador colaborador de la Real Federación Española de Atletismo y ha trabajado con atletas de alto nivel. En los Juegos Olímpicos de París 2024 formó parte del equipo técnico de la Federación Española de Atletismo como entrenador de los maratonianos Yago Rojo y Tariku Novalés. Su trayectoria profesional también incluye experiencia en la preparación física en baloncesto de formación, habiendo trabajado en categorías inferiores de clubes como Estudiantes y Real Madrid. Su perfil combina así la docencia universitaria, la investigación aplicada y una extensa experiencia práctica en el entrenamiento deportivo.

Dr. Juan del Campo Vecino is an Associate Professor at the Universidad Autónoma de Madrid, where he carries out his teaching and research activities in the field of Physical Activity and Sport Sciences. He holds a PhD in Physical Activity and Sport Sciences from the Universidad Politécnica de Madrid, where he defended his doctoral thesis in 2005, focusing on training intensity in basketball players through perceived exertion and fatigue. His academic and research activity has mainly focused on training and sports performance, with work related to athletics, basketball, endurance training, and performance assessment. According to Dialnet, his academic output includes 33 journal articles, 13 contributions to collective works, and 4 books, in addition to having supervised 7 doctoral theses.

Alongside his academic career, he has extensive experience as an athletics coach, particularly in long-distance running and the marathon. He is a collaborating coach with the Royal Spanish Athletics Federation and has worked with high-level athletes. At the Paris 2024 Olympic Games, he was part of the technical staff of the Spanish Athletics Federation as coach to marathon runners Yago Rojo and Tariku Novales. His professional career also includes experience in strength and conditioning within youth basketball, having worked in the development programmes of clubs such as Estudiantes and Real Madrid. His profile therefore combines university teaching, applied research, and extensive practical experience in sports training.

**ANTELM PUJOL CALAFAT****MÉDICO ESPECIALISTA EN ENDOCRINOLOGÍA Y NUTRICIÓN**

Tratamiento combinado de la obesidad: Ejercicio y fármacos, ¿1+1=3?

El Dr. Antelm Pujol Calafat, nacido en 1994 en Mallorca, es médico especialista en Endocrinología y Nutrición, investigador y divulgador científico. Su trayectoria profesional se ha desarrollado especialmente en los ámbitos de la salud hormonal, el metabolismo, la nutrición y el rendimiento deportivo, combinando la práctica clínica con la investigación y la divulgación basada en la evidencia científica.

Se graduó en Medicina y Cirugía por la Universitat de Barcelona y posteriormente realizó la especialidad vía MIR en Endocrinología y Nutrición en el Hospital Son Llàtzer de Mallorca. Es doctor en Medicina, con distinción Cum Laude, gracias a sus trabajos vinculados a la investigación y la salud pública. Además, ha ampliado su formación mediante diferentes posgrados y másteres, entre ellos un posgrado de Harvard en Endocrinología Clínica y un Máster en Medicina Clínica. También cuenta con formación específica en nutrición deportiva y como entrenador personal certificado por ANEF.

En el ámbito profesional, ejerce como médico especialista en Endocrinología y Nutrición en Palma de Mallorca, donde desarrolla actividad asistencial en centros como Salud 10. Paralelamente, ha desarrollado una trayectoria como investigador clínico, vinculado al Instituto de Investigación Sanitaria de las Islas Baleares (IdISBa) y a proyectos relacionados con el Instituto de Salud Carlos III. Su actividad también incluye la docencia y la participación como profesor y ponente en diferentes másteres universitarios y programas de formación especializada relacionados con las ciencias del deporte y la salud, entre ellos los vinculados a ANEF, ENFAF y Audiofit.

Sus principales áreas de interés y especialización comprenden la salud hormonal, la optimización del metabolismo, la pérdida de grasa, la ganancia de masa muscular, la diabetes y el envejecimiento saludable y la longevidad. Su enfoque busca integrar los conocimientos de la medicina y la fisiología con la nutrición y el ejercicio físico, especialmente desde una perspectiva basada en la evidencia científica. Además de su actividad clínica e investigadora, el Dr. Pujol ha adquirido notoriedad por su labor de divulgación científica en redes sociales y plataformas digitales.

A través de proyectos como TheFitMedStudent y de perfiles como @thefitmedstudent y @AntelmPujol, divulga contenidos relacionados con medicina, fisiología, entrenamiento y nutrición, con el objetivo de acercar conceptos científicos y médicos al público general y al ámbito del deporte.

Dr. Antelm Pujol Calafat, born in 1994 in Mallorca, is a physician specializing in Endocrinology and Nutrition, as well as a researcher and science communicator. His professional career has focused particularly on hormonal health, metabolism, nutrition, and sports performance, combining clinical practice with research and science-based communication.

He earned his degree in Medicine and Surgery from the University of Barcelona and subsequently completed his specialist medical training in Endocrinology and Nutrition through the Spanish MIR residency system at Son Llàtzer Hospital in Mallorca. He holds a PhD in Medicine, awarded Cum Laude, for his research work in the fields of research and public health. He has also furthered his education through various postgraduate programs and master's degrees, including a postgraduate qualification from Harvard in Clinical Endocrinology and a Master's degree in Clinical Medicine. In addition, he has specialized training in sports nutrition and is a certified personal trainer through ANEF.

Professionally, he works as a specialist in Endocrinology and Nutrition in Palma de Mallorca, where he provides clinical care at centers such as Salud 10. At the same time, he has developed a career as a clinical researcher, working in connection with the Health Research Institute of the Balearic Islands (IdISBa) and projects associated with the Carlos III Health Institute. His professional activities also include teaching and speaking at various university master's programs and specialized training courses related to sports science and health, including programs associated with ANEF, ENFAF, and Audiofit.

His main areas of interest and expertise include hormonal health, metabolic optimization, fat loss, muscle gain, diabetes, healthy aging, and longevity. His approach aims to integrate knowledge from medicine and physiology with nutrition and physical exercise, particularly from an evidence-based perspective.

In addition to his clinical and research work, Dr. Pujol has gained recognition for his science communication activities on social media and digital platforms. Through projects such as TheFitMedStudent and profiles including @thefitmedstudent and @AntelmPujol, he shares content related to medicine, physiology, training, and nutrition, with the aim of making scientific and medical concepts accessible to the general public and the sports community.

**ROCÍO CUPEIRO COTO****UNIVERSIDAD POLITÉCNICA DE MADRID - N° COL. 5246***Lactato: ¿Qué es y para qué sirve?*

La doctora Rocío Cupeiro Coto es Profesora Titular del Departamento de Salud y Rendimiento Humano de la Facultad de Ciencias de la Actividad Física y del Deporte (INEF) de la UPM. Es Doctora en Ciencias de la Actividad Física y del Deporte por la UPM y Premio Extraordinario de Doctorado. Cuenta con más de 15 años de experiencia docente y desarrolla también una consolidada trayectoria investigadora vinculada al Laboratorio de Fisiología del Esfuerzo, del que forma parte desde el inicio de su carrera científica. Ha participado en más de 20 proyectos de investigación, siendo investigadora principal en tres de ellos. Su producción científica incluye numerosas publicaciones, más del 90 % en revistas JCR, y cuenta con tres sexenios de investigación reconocidos. Además, ha realizado estancias en centros de prestigio internacional como el Instituto Karolinska, la Clínica Mayo y la Universidad Federal de Viçosa, con publicaciones derivadas de estas experiencias. Sus principales líneas de investigación se centran en el metabolismo energético durante el ejercicio, la influencia de las hormonas sexuales en la salud y el rendimiento de la mujer y la influencia de la genética en la adaptación al entrenamiento.

Dr. Rocío Cupeiro Coto is an Associate Professor in the Department of Health and Human Performance at the Faculty of Physical Activity and Sport Sciences (INEF) of the Polytechnic University of Madrid (UPM). She holds a PhD in Physical Activity and Sport Sciences from UPM and received the Extraordinary Doctorate Award. She has more than 15 years of teaching experience and has also developed an established research career linked to the Exercise Physiology Laboratory, of which she has been a member since the beginning of her scientific career. She has participated in more than 20 research projects, serving as principal investigator in three of them. Her scientific output includes numerous publications, more than 90% of which have been published in JCR-indexed journals, and she has been awarded three recognized six-year research periods (sexenios). She has also completed research stays at prestigious international institutions such as the Karolinska Institute, Mayo Clinic, and the Federal University of Viçosa, resulting in scientific publications. Her main research areas focus on energy metabolism during exercise, the influence of sex hormones on women's health and performance, and the influence of genetics on adaptation to training.

**MARÍA ALCOCER AYUGA**

CENTRO MÉDICO-QUIRÚRGICO OLYMPIA, GRUPO QUIRÓNSALUD, MADRID - N° COL. 282870599

Prueba de esfuerzo

La Dra. María Alcocer Ayuga es especialista en Cardiología y Cardiología Deportiva, con experiencia en el ámbito de la prevención y rehabilitación cardiovascular. Es licenciada en Medicina por la Universidad Complutense de Madrid y realizó su especialización en Cardiología en el Hospital Universitario de Getafe (2014-2019). Actualmente ejerce como facultativa especialista en Cardiología en Olympia, Grupo Quirónsalud, así como en otros centros hospitalarios del grupo. Su trayectoria profesional también incluye experiencia en la Agencia Española para la Protección de la Salud en el Deporte, rehabilitación cardíaca y soporte vital avanzado.

Cuenta con formación complementaria en cardiología clínica, rehabilitación cardíaca, psicología del deporte y fisiología del ejercicio. En el ámbito científico, ha participado en publicaciones y proyectos relacionados con la fisiología y adaptación cardiovascular al ejercicio, incluyendo investigaciones sobre el corazón del deportista y la respuesta cardiovascular al ejercicio. Asimismo, forma parte del Laboratorio de Fisiología del Esfuerzo de la Universidad Politécnica de Madrid, donde participa en actividades de investigación relacionadas con el ejercicio y la salud cardiovascular. Su perfil combina así la práctica clínica, la cardiología deportiva y la investigación en fisiología del ejercicio, con especial interés en la prevención y promoción de la salud cardiovascular.

Dr. María Alcocer Ayuga is a specialist in Cardiology and Sports Cardiology, with experience in the field of cardiovascular prevention and rehabilitation. She holds a degree in Medicine from the Complutense University of Madrid and completed her specialization in Cardiology at Getafe University Hospital (2014-2019). She currently works as a specialist physician in Cardiology at Olympia, Quirónsalud Group, as well as at other hospitals within the group. Her professional career also includes experience at the Spanish Agency for Health Protection in Sport, in cardiac rehabilitation, and in advanced life support.

She has additional training in clinical cardiology, cardiac rehabilitation, sports psychology, and exercise physiology. In the scientific field, she has participated in publications and projects related to cardiovascular physiology and adaptation to exercise, including research on the athlete's heart and the cardiovascular response to exercise.

She is also a member of the Exercise Physiology Laboratory at the Universidad Politécnica de Madrid, where she participates in research activities related to exercise and cardiovascular health. Her profile therefore combines clinical practice, sports cardiology, and research in exercise physiology, with a particular interest in the prevention and promotion of cardiovascular health.

COMUNICACIONES ORALES / ORAL PRESENTATION

FRIDAY, OCTOBER 23, 2026

9:00 - 10:30 H

Comunicaciones orales 1 / Oral presentation 1

09:00 - 09:30 h

LOWER LIMB STRENGTH MATTERS: THE FIQMODE STUDY IN CYSTIC FIBROSIS

RELANOS A.1, NUEVO-NUEVO I.1, OJEDA-VAN GEETERUYEN C.2, GALERA-BIBIAN M.2, PANTOJA-ARÉVALO L.1, ITURRIAGA T.2, PÉREZ-RUIZ M.1, YVERT T.1

1 IMFINE RESEARCH GROUP, DEPARTMENT OF HEALTH AND HUMAN PERFORMANCE, UNIVERSIDAD POLITÉCNICA DE MADRID, MADRID, SPAIN.

2 ESBIDA RESEARCH GROUP, DEPARTMENT OF SPORTS SCIENCES, FACULTY OF MEDICINE, HEALTH AND SPORTS, UNIVERSIDAD EUROPEA DE MADRID, VILLAVICIOSA DE ODÓN, MADRID, SPAIN.

OBJECTIVE: The introduction of highly effective CFTR modulators elexacaftor/tezacaftor/ivacaftor (ETI), has transformed the clinical landscape of cystic fibrosis (CF) with children now showing markedly improved life expectancy, many expected to reach well into adulthood (1,2). In this context, physical fitness, particularly lower-limb strength and exercise tolerance, is an independent predictor of morbidity and mortality. Early development of a robust “muscle reserve” may support healthier aging, autonomy, and improved metabolic outcomes. Consequently, optimizing neuromuscular performance during childhood represents an investment in lifelong health. The aim of this study was to evaluate the effects of a 16-week virtual strength-oriented training intervention on lower-limb strength in children and adolescents with CF receiving ETI.

METHODS: A randomized controlled trial was conducted in patients with CF aged 6-18 years receiving ETI. Lower-limb strength was assessed using an isometric belt-squat test performed with a portable dynamometer (Takei, Japan). Participants were randomly assigned to an intervention group, or a usual care control group (4).

RESULTS: Intervention group (n=20) showed significant increase in squat strength compared with controls (n=22) (2.12 ± 0.71 to 2.74 ± 0.90 kg/kgbodyweight vs. 1.89 ± 0.58 to 1.94 ± 0.71 kg/kgbodyweight; $\eta^2 p = 0.124$ [medium-large effect]; ANOVAtimexgroup: $p = 0.022$).

CONCLUSION: A 16-week strength training program improved lower-limb strength in children and adolescents with CF receiving ETI. Strength training may act synergistically with CFTR modulator therapy.

PRACTICAL APPLICATION: Nowadays, simple functional assessments are essential for routine monitoring. The belt-squat test represents a practical, reliable, and functionally meaningful tool to assess lower-limb strength in children and adolescents with CF.

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RESISTANCE TRAINING AS SUPPORTIVE ONCOLOGY CARE IN METASTATIC CANCER: EFFECTS ON MUSCLE QUALITY AND MASS

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OBJECTIVE: In metastatic cancer (MC), prolonged systemic treatments and chronic inflammation promote the loss of muscle mass (MM), impair functionality, quality of life, and therapeutic response, while also increasing treatment toxicity and side effects (1). Muscle quality (MQ), defined as the ratio between manifested strength and activated muscle mass, is a variable used as a marker of muscle health (2). Resistance training (RT) is a strategy to counteract MM loss in these patients; however, concerns remain regarding potential skeletal complications that may occur in metastatic patients, especially in those with bone metastases (3). Prescription and supervision by a specialized multidisciplinary team constitute a crucial element for the implementation of RT in individuals with MC (3). The aim of the present study was to evaluate the effects of an 8-week RT program on MM and MQ in patients with breast or colorectal MC.

METHODS: Twenty-seven patients (61.5 ± 7 years) with breast (N=23) or colorectal MC, undergoing various systemic treatments, completed two weekly sessions. Pre- and post-intervention variables were assessed under identical evaluation conditions: maximal strength through one-repetition maximum (1RM) testing in knee extensors, and estimated MM through dual-energy X-ray absorptiometry of the thighs and thigh-pelvic region.

RESULTS: Significant increases with moderate effect sizes were observed in total muscle mass ($p=0.001$; $d=0.693$) and leg muscle mass ($p=0.01$; $d=0.536$). Variables related to 1RM and MQ showed improvements with $p<0.001$, as well as large and very large effect sizes, respectively ($d=1.088$ and $d=1.619$). **CONCLUSIONS:** An eight-week RT program in patients with MC produces increases in MM and MQ, with improvements of 20.4% and 17.9%, respectively.

PRACTICAL APPLICATIONS: The results of this pilot project reinforce the safety and effectiveness of RT as part of the comprehensive oncological treatment of patients with MC.

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DESIGN OF A CERT-BASED TRAINING PROGRAM FOR FUNCTIONAL RECOVERY IN LIVER TRANSPLANT RECIPIENTS

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OBJECTIVE: The aim of this study was to design a structured and safe physical training program for liver transplant recipients, based on scientific evidence and Consensus on Exercise Reporting Template (CERT) guidelines, to improve functional recovery.

METHODS: A structured literature review was conducted following PRISMA guidelines using PubMed, Scopus, Web of Science, Cochrane, and Dialnet databases (2006-2026). Nineteen studies met the inclusion criteria. Based on the evidence, a 12-week supervised training program (three weekly sessions, 60 minutes each) was developed, complemented by a 4-week home-based program. The intervention included strength, aerobic endurance, core stability, and balance exercises. Training intensity was progressively adjusted (60-80% HRmax; moderate RPE). Initial assessment included the 6-minute walk test, dynamometry, submaximal strength testing, and RPE. The program was designed for multidisciplinary team supervision and developed according to CERT criteria.

RESULTS: This program prioritizes progressive resistance training for major muscle groups, particularly the lower limbs, due to their importance for autonomy and daily functional tasks. Based on evidence, the intervention is expected to improve muscle strength, walking capacity, cardiorespiratory fitness, fatigue, and health-related quality of life. CERT criteria enable detailed reporting of exercise components, progression rules, safety monitoring, adherence strategies, and fidelity procedures, facilitating replication in clinical and research settings.

CONCLUSIONS: A CERT-based exercise program for patients undergoing liver transplantation is presented, grounded in scientific evidence. This protocol may represent a feasible, clinically relevant, and reproducible strategy to support functional recovery after transplantation. Although empirical validation is still required, this proposal provides a standardized and reproducible framework for exercise professionals working with clinical populations with muscle weakness, fatigue, and reduced functional capacity.

PRACTICAL APPLICATIONS: This protocol provides personal trainers and clinical exercise professionals with a reproducible, evidence-based framework for prescribing exercise in liver transplant recipients. Its combination of supervised sessions, individualized progression, simple equipment, and home-based continuity may facilitate implementation in hospital, rehabilitation, and real-world exercise settings.

This is the first application known of the CERT framework to this condition.

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ASSOCIATION BETWEEN STATIC AND DYNAMIC INSPIRATORY MUSCLE STRENGTH AND FUNCTIONAL PERFORMANCE IN OLDER ADULTS

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OBJECTIVE: Maximal inspiratory pressure (MIP) and S-Index evaluate inspiratory muscle strength (IMS) statically and dynamically, respectively; the S-Index is flow-dependent and mimics the inspiratory muscle training (IMT) maneuver (1). Since whether both measures show equivalent associations with functional performance in older adults (OA) remains unknown, this study analyzed their associations with gait speed (GS) and balance in active OA.

METHODS: Twenty OA (69.52±5.59y; 8 men/12 women) were assessed for MIP (MicroRPM; device) and S-Index with POWERbreathe K5® following Kowalski et al. (2). GS (200m walk test) and balance (Mini-BESTest) were assessed. Balance recording total and domain scores: anticipatory (ANT), reactive postural control (RPC), sensory orientation (SO), and dynamic gait (DG). Sex-stratified analyses were performed (Mann-Whitney U test) given the known influence of sex on IMS. Pearson or Spearman correlations were applied according to normality, in the total sample and by sex. Effect sizes were reported.

RESULTS: No significant sex differences were observed, though higher values in men supported exploratory sex-stratified analyses. MIP showed large associations with GS ($r=0.640$; $p=0.004$), balance ($r=0.531$; $p=0.019$), and ANT ($r=0.468$; $p=0.043$). S-Index was associated only with GS ($r=0.716$; $p<0.001$). In men, S-Index showed a large association with GS ($r=0.821$; $p=0.012$), while MIP showed no significant associations. In women, MIP was associated with GS ($r=0.934$; $p<0.001$), balance ($r=0.809$; $p=0.003$), and RPC ($r=0.630$; $p=0.038$); S-Index with GS ($r=0.677$; $p=0.022$) and RPC ($r=0.588$; $p=0.044$).

CONCLUSIONS: MIP showed a broader association profile than S-Index, extending to balance and postural control, possibly reflecting the diaphragm's dual role (3). These findings suggest MIP and S-Index may capture partially different functional capacities in OA. Sex-stratified findings should be interpreted with caution given the small subgroup sizes.

PRACTICAL APPLICATIONS: MIP and S-Index should not be used interchangeably in functional screening of OA. MIP may better identify fall risk, particularly in older women. IMT targeting isometric inspiratory force may complement fall prevention programs given the diaphragm's postural stabilizing role.

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MAXIMAL INTENDED VELOCITY POWER TRAINING IMPROVES MULTISCALE WALKING SPEED IN POSTMENOPAUSAL WOMEN

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OBJECTIVE: Walking speed has been established as a functional health marker and a powerful survival predictor in the elderly. Since age-related decline in muscle power is strongly associated with reductions in walking speed in older adults (2), interventions targeting muscle power become especially relevant in postmenopausal women (PW). Power-oriented resistance training has demonstrated better functional transfer compared with traditional strength training (1), while performing the concentric phase with maximal intended velocity (MIV) has been shown to enhance neuromuscular activation and improve muscle function in older adults (3). Therefore, the aim of this study was to determine the effects of a MIV power training protocol on self-selected walking speed (SWS), maximal walking speed (MWS), and sustained maximal walking speed (SMWS) in PW.

METHODS: Using a quasi-experimental design, forty-four PW (66.8 ± 10.6 years; 63.9 ± 10.6 kg; 159.9 ± 6.9 cm) who had not participated in resistance training during the previous six months completed a 12-week circuit-based cluster-set power-training program for a total of 24 training sessions. Pre- and post-intervention assessments of SWS, MWS, and SMWS were conducted on a 50-m flat indoor corridor using a stopwatch. SWS and MWS were assessed using the 10-m walk test, while SMWS was evaluated using a 200-m fast walk test performed at the highest sustainable walking speed.

RESULTS: significant statistical differences were observed between pre-post measures in SWS (0.07 ± 0.13 m/s, $p=0.001$, $g=0.533$), MWS (0.05 ± 0.13 m/s, $p=0.019$, $g=0.361$) and SMWS (0.05 ± 0.09 m/s, $p=0.001$, $g=0.513$).

CONCLUSIONS: Circuit-based cluster-set power-training protocols with MIV seem to elicit multiscale walking speed adaptations in PW in a feasible and safe manner.

PRACTICAL APPLICATIONS: Circuit-based cluster-set power training with MIV should be considered within macrocycle planning when walking speed is a primary goal in programs for special populations such as PW. Although power-training protocols are safe we recommend at least six familiarization sessions prior to MIV power-training with PW.

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COMPARISON OF MENSTRUAL DISTRESS BETWEEN RECREATIONAL AND COMPETITIVE FEMALE ATHLETES

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OBJECTIVE: Women are often underrepresented in sports science, yet menstrual cycle-related symptoms may impact their training and competition decisions (1). The purpose of this study was to compare global menstrual distress between recreational and competitive female athletes using the specialized MEDI-Q questionnaire.

METHODS: This is a preliminary descriptive cross-sectional analysis of a subsample from the PERCIVIR project (2) with 46 physically active natural menstruating females. Participants were categorized following a tiered classification framework (3) in: recreational (tiers 1-2) and competitive (tiers 3-4-5). Symptomatic burden was assessed via the MEDI-Q total score (range 0–125) (4). Statistical comparison used the Mann-Whitney U test ($\alpha=0.05$).

RESULTS: seventeen recreational (age: 30.4 ± 7.8 years; height: 164.0 ± 10.1 cm; weight: 61.2 ± 13.6 kg) and 29 competitive (age: 28.2 ± 7.26 years; height: 163.0 ± 5.65 cm; weight: 58.2 ± 6.5 kg) participants were included. Statistical analysis revealed no significant differences in menstrual symptom burden between groups ($U=230$, $p=0.715$), with a trivial effect size ($d=0.179$). The mean total MEDI-Q score for the recreational group was 14.1 ± 10.5 , while the competitive group reported 12.4 ± 8.68 .

CONCLUSIONS: Our results indicate that regardless of the level, athletes experience similar menstrual-related symptoms. The total scores are similar to those reported previously (4). Performance level does not seem to be a determining factor for the global menstrual distress, and female athletes may experience a similar symptom burden to the one reported in the general population.

PRACTICAL APPLICATIONS: The lack of differences between groups suggests that coaches should implement individual monitoring of menstrual cycle symptoms, regardless of the level. Training planning should remain sensitive to individual symptom to optimize well-being and performance throughout the cycle, despite competitive rank.

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FRIDAY, OCTOBER 23, 2026

18:00 - 18:30 H

Comunicaciones orales 2 / Oral presentation 2

18:00 - 18:15 h

ADIPOSIITY MARKERS AND CARDIORESPIRATORY FITNESS: COMPARING ASSOCIATIONS WITH ABSOLUTE AND RELATIVE VO₂ MAX

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OBJECTIVES: Cardiorespiratory fitness, assessed through maximal oxygen uptake (VO₂max), is a strong health marker (1). However, its interpretation differs when VO₂max is expressed in absolute terms or relative to body mass, since normalization can affect associations with body composition (2). Although body mass index (BMI) is widely used, it does not distinguish between fat mass (FM) and fat-free mass, whereas fat mass index (FMI) better estimates adiposity (4). We compared associations of BMI, FMI, and total FM with absolute and relative VO₂max.

METHODS: A cross-sectional analysis included 728 participants (387 men, 341 women) who completed a maximal exercise test and whole-body DXA scan. Men were 43.63 ± 11.58 years, 84.78 ± 13.94 kg, and 175.93 ± 6.57 cm; women were 40.57 ± 11.91 years, 72.59 ± 14.00 kg, and 163.26 ± 6.42 cm. Associations between absolute and relative VO₂max and BMI, FMI, and FM were assessed using partial Pearson correlations adjusted for age and height.

RESULTS: BMI was not significantly associated with absolute VO₂max ($r = -0.017$, $p = 0.660$). In contrast, FMI and total FM showed significant negative associations with absolute VO₂max ($r = -0.271$, $p < 0.001$ and $r = -0.275$, $p < 0.001$, respectively). For relative VO₂max, all associations were negative and significant, with stronger correlations for FMI ($r = -0.748$, $p < 0.001$) and total FM ($r = -0.747$, $p < 0.001$) than for BMI ($r = -0.641$, $p < 0.001$). FMI and total FM were very strongly correlated ($r = 0.988$, $p < 0.001$).

CONCLUSION: After controlling age and height adiposity-specific indicators were more strongly associated with cardiorespiratory fitness than BMI, particularly when VO₂max was expressed as relative to bodyweight. However, associations with relative VO₂max should be interpreted cautiously because shared mathematical relationships with body mass may contribute to their magnitude. Theoretically, adiposity itself (expressed as FMI and total FM) appears more consistently related to cardiorespiratory fitness than just the relationship between height and weight (expressed as BMI).

PRACTICAL APPLICATION: These findings support the use of FMI or total FM rather than BMI when examining the relationship between body composition and cardiorespiratory fitness. They also indicate that absolute VO₂max and relative VO₂max should not be interpreted as interchangeable outcomes.

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ACUTE CAFFEINE INGESTION IMPROVES SIMULATED COMPETITION PERFORMANCE IN HIGH-LEVEL WEIGHTLIFTERS

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OBJECTIVE: Caffeine is a widely used ergogenic aid and has reported benefits on maximal strength (1,2) and power (3), however, evidence in elite weightlifters remains scarce. Thus, the aim of this study was to examine the effects of caffeine ingestion $3 \text{ mg}\cdot\text{kg}^{-1}$ on physical performance in elite weightlifters.

METHODS: A double-blind, randomized, counterbalanced, placebo-controlled design was employed. Fourteen elite Spanish weightlifters (men: 9; women: 5) completed two testing sessions separated by seven days. In each session, a physical performance test battery composed by countermovement jump, deep squat jump, isometric start position pull and isometric handgrip. Subsequently, a simulated weightlifting competition, consisting of the snatch and the clean and jerk exercises, was performed.

RESULTS: Deep squat jump performance improved across all variables compared with placebo ($p < 0.05$), while handgrip strength increased only in the non-dominant hand ($p = 0.021$; $d = 0.02$). However, caffeine did not improve countermovement jump variables or isometric start position pull peak force (all $p > 0.05$). In the simulated competition, caffeine enhanced snatch, clean and jerk, and Olympic total results ($p = 0.006$ – 0.037 ; $d = 0.69$ – 1.03), and increased the number of valid attempts in both lifts ($p = 0.048$ – 0.013 ; $d = 0.55$ – 0.79). No differences were found in competition strategy ($p = 0.111$ – 0.780 ; $d = 0.07$ – 0.44). Caffeine increased sensations of energy and irritability and reduced perceived sleep quality ($p = 0.002$ – 0.030 ; $d = 0.88$ – 1.00).

CONCLUSIONS: The ingestion of $3 \text{ mg}\cdot\text{kg}^{-1}$ of caffeine 45 minutes before exercise improved various physical performance aspects such vertical jumping capacity performance or non-isometric handgrip strength as well as simulated competition performance in Olympic weightlifting high-level weightlifters.

PRACTICAL APPLICATIONS: An acute dose of $3 \text{ mg}\cdot\text{kg}^{-1}$ body mass of caffeine may be considered a useful strategy to enhance weightlifting performance in high-level weightlifters during simulated competition. However, caffeine intake should be implemented on an individual basis, after carefully evaluating possible side effects.

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SATURDAY, OCTOBER 24, 2026

09:00 - 10:15 H

Comunicaciones orales 3 / Oral presentation 3

09:00 - 09:15 h

SEX DIFFERENCES IN MUSCULAR ADAPTATIONS TO RESISTANCE TRAINING UNDER NORMOBARIC HYPOXIA

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OBJECTIVE: Resistance training (RT) under hypoxic conditions is proposed as a strategy to enhance muscle strength and hypertrophy, potentially mediated by increased exercise-induced metabolic stress, metabolite accumulation and greater motor unit recruitment (3). Despite the extensive literature regarding the specific responses to hypoxia, most studies have been conducted in men, limiting the availability of sex-specific references (1). Moreover, physiological responses to a fixed inspired fraction of oxygen (FiO₂) may be linked to the underlying mechanisms of sex specific differences (2). This study aimed to compare functional and structural adaptations between males and females following a RT program performed under normobaric hypoxia (NH) vs. normoxia (N).

METHODS: Forty-four strength-trained volunteers were assigned to N (males: n=10, females: n=11) or NH (FiO₂=15.9%; males: n=11; females: n=12). Participants completed an 8-week RT program (3 sessions/week) of a full-body routine. One-repetition maximum (1RM) in back squat and muscle thickness of the lower limb (vastus lateralis and rectus femoris) were assessed before and after the training program.

RESULTS: Findings displayed improvements in 1RM back squat across all groups (>16%; p<0.05), with no significant differences between environmental conditions or sex. Muscle thickness only increased following RT under N in both males (8.0%) and females (7.3%). An attenuated hypertrophic adaptation in NH was observed just in males (p<0.001), without reaching statistical significance in females.

CONCLUSIONS: Similar improvements in maximal strength between males and females across conditions suggest that neuromuscular adaptations to RT are similarly preserved under intermittent moderate NH. However, the sex-related differences observed in muscle hypertrophy suggest that hypoxia may interact differently with hormonal and/or local physiological mechanisms involved in muscle growth.

PRACTICAL APPLICATIONS: These findings suggest that RT combined with intermittent moderate NH does not seem to compromise maximal strength gains. However, when muscle hypertrophy is the goal, potential sex-specific sensitivity to hypoxic RT should be considered, as muscle growth responses may differ between sexes. Finally, the hypoxic dose (severity and duration of exposure) and the air quality within the hypoxic environment require careful selection to ensure an adequate hypoxic physiological stimulus.

Abstracts were prepared by the authors and printed as submitted.

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FUNDING: This work was supported by the Spanish Ministry of Science, Innovation and Universities under grant [PGC2018-097388-B-I00 -MINECO/FEDER] and by the Andalusian FEDER Operational Program [B-CTS-374-UGR20 and C-SEJ-015-UGR23].

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EXERCISE INCREASES GRO- α /CXCL1 IN CHILDREN AND ADOLESCENTS WITH CYSTIC FIBROSIS RECEIVING CFTR MODULATORS (FIQMODE STUDY)

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INTRODUCTION: CXCL1, also known as GRO α , is a chemokine involved in neutrophil recruitment, inflammatory signaling, angiogenesis, and tissue remodeling (1, 2). In patients with cystic fibrosis (CF), CFTR modulator therapy has been associated with reduced circulating levels of pro-inflammatory mediators, including GRO α , reflecting partial restoration of immune homeostasis (3). Exercise training is also known to modulate inflammatory pathways and immune responses in other chronic inflammatory diseases (4). However, the behavior of GRO α following a structured exercise intervention in children and adolescents with CF remains unknown.

OBJECTIVE: To evaluate the effects of a 16-week exercise intervention on circulating GRO- α /CXCL1 levels in children and adolescents with CF receiving elexacaftor/tezacaftor/ivacaftor (ETI).

METHODS: 45 children and adolescents with CF treated with ETI were randomized to an exercise group (n=20) or a to control group (n=25). Plasma GRO- α /CXCL1 concentrations were measured at baseline and after 16 weeks. Data are presented as median and quartiles (Q1-Q3). Group $\times$ time interactions were analyzed using repeated-measures models.

RESULTS: A significant group $\times$ time interaction was observed for GRO- α /CXCL1 ($p=0.016$). The exercise group showed an increase from 31.20(31.20-64.91) pg/mL to 78.59(31.20-163.07) pg/mL, whereas the control group remained stable from 31.20(31.20-33.88) pg/mL to 31.20(31.20-31.20) pg/mL.

CONCLUSION: A 16-week exercise intervention increased circulating GRO- α /CXCL1 levels in children and adolescents with CF receiving ETI. While GRO- α is traditionally considered a pro-inflammatory chemokine, its increase after chronic exercise may also reflect tissue remodeling, immune regulation, angiogenic signaling, and skeletal muscle adaptation.

PRACTICAL APPLICATIONS: These findings suggest that exercise-induced immune responses in CF should not necessarily be interpreted as deleterious inflammation but may represent part of a complex adaptive response to training in the era of CFTR modulators.

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FUNDING: Carlos III Health Institute (PI23/00299).

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OPTIMIZING SET TERMINATION CRITERIA BASED ON VELOCITY LOSS IN INSTITUTIONALIZED OLDER ADULTS DURING RESISTANCE TRAINING: A STUDY PROTOCOL

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OBJECTIVE: Velocity loss (VL) has been proposed as an effective approach to prescribe resistance training volume in older adults (1). Despite the strong relationship reported between VL and the percentage of completed repetitions in healthy populations, the possible rep-to-rep velocity fluctuations in older adults may affect the accuracy of VL thresholds (%VL) to estimate intra-set fatigue (2,3). This study protocol aims to compare different set termination criteria for resistance training using %VL in institutionalized older adults.

METHODS: Nursing home residents aged 65 years or more, will participate in this study. Participants will complete two sets to either muscle failure or 40% VL on the bilateral leg press exercise at 45% of the estimated maximal isometric force. Seven termination criteria (TC) were analyzed with the velocity of the fastest repetition as the reference for different VL (10, 20, 30 and 35%): threshold reached for the first (C1), second (C2), or third time (C4); second (C3) or third time (C5) resetting upon a new fastest repetition; and second (C6) or third consecutive time (C7). The number of completed repetitions (R_{total}) and the omitted target-velocity repetitions (R_{omitted}; i.e., number of additional repetitions that would still meet the target velocity if the set had not been terminated) will be calculated for each termination criteria. Linear mixed-models will evaluate TC effects and %VL×TC interactions on both variables.

RESULTS: It is expected that the selected TC will influence R_{total} and R_{omitted}. Specifically, more conservative approaches (i.e., consecutive threshold detection) should minimize the loss of effective repetitions. Furthermore, the optimal TC is expected to be VL dependent.

CONCLUSIONS: Refining TC will improve resistance training prescription in institutionalized older adults, enabling more precise and context-specific decision-making.

PRACTICAL APPLICATIONS: These findings will guide TC selection according to the selected %VL, which will optimize individualized prescription in institutionalized older adults.

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YEARS OF LOW/NON IMPACT SPORT PRACTICE ARE NEGATIVELY ASSOCIATED WITH BONE MINERAL DENSITY IN EXERCISING FEMALES

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OBJECTIVE: It is well known that mechanical loading plays an important role not only in the process of bone remodelling but also in the formation of a bone structure capable of efficiently supporting loads; similarly, it is also known that the physical demands of each sport are associated with these two variables (1). Therefore, the objective of this study is to analyse the association between bone mineral density (BMD), years of exposure to sports with varying levels of impact, menarche, and the number of sports practiced by the participants.

METHODS: Fifteen women (23±3yrs; 57,3±5 kg) with natural menstrual cycles and physically active, The participants reported details about their history of sports participation throughout their lives, and underwent DXA scans of the whole body, lumbar spine, and femoral neck (GE Healthcare) (3). The sports were classified based on their impact level as high/odd and low/non-impact according to Nikander et al., (1) criteria.

RESULTS: The number of years practicing low/non-impact sports was negatively associated with whole-body BMD Z-score ($r = -0.599$, $p = 0.043$), femoral neck BMD Z-score ($r = -0.634$, $p = 0.027$), and femoral neck BMD ($r = -0.610$, $p = 0.035$).

CONCLUSIONS: Prolonged participation in low/non-impact sports does not appear to provide sufficient osteogenic stimulation, despite the physical activity involved, particularly in the femoral neck and the whole body. This suggests that the type of impact the bone is subjected to over the years is determining factor in BMD, thereby reinforcing the importance of weight-bearing exercises for maintaining bone health.

PRACTICAL APPLICATIONS: Participation in low- or non-impact sports during childhood, adolescence, and early adulthood may provide insufficient osteogenic stimulation to optimize bone mineral density in adulthood.

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ONSET AND RATE OF DECLINE OF KNEE EXTENSOR SKELETAL MUSCLE SIZE DURING AGING: A SYSTEMATIC REVIEW, META-ANALYSIS AND AGE- TRAJECTORY META-REGRESSION

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OBJECTIVE: Sarcopenia, including the loss of skeletal muscle size, is considered an important determinant of healthy aging in older adults (1). We aimed to investigate the rate, potential onset, and age-related trajectory of knee extensor muscle size decline during aging using longitudinal imaging data.

METHODS: This systematic review and meta-analysis followed PRISMA 2020 (2) (PROSPERO: CRD420250597171). PubMed/Web of Science were searched for longitudinal studies (≥ 18 years) reporting knee extensor muscle size (cross-sectional area, thickness, or volume), with follow-up ≥ 1 year and no exercise intervention. The primary outcome was Hedges-corrected annualised standardised mean change (SMC/year), assuming $r=0.5$ (sensitivity: $r=0.3$, $r=0.7$); random-effects meta-analysis used restricted maximum likelihood. Risk of bias and certainty were assessed using Newcastle-Ottawa Scale and GRADE.

RESULTS: Eleven studies ($n=1,361$; 58.8% female; age range: 51.6–84.8 years; follow-up: 1–12 years) were included. Pooled SMC/year was -0.156 (95%CI: -0.261 to -0.051 ; 95% prediction interval: -0.49 to 0.17 ; $p=0.004$; $I^2=96.1\%$), indicating significant average muscle size loss with substantial heterogeneity. The onset age of measurable loss could not be robustly estimated, as only one study included adults <65 years. Exploratory piecewise meta-regression ($AIC=-0.95$; $R^2=84.2\%$) suggested a relatively stable decline of ~ 1.2 – 2.1% per year before the age of 77 years, followed by larger declines of ~ 5.3 – 7.8% /year thereafter. Sex-specific subgroup analysis was precluded by limited sex-stratified data and age confounding. Publication-bias analyses did not materially alter the pooled estimate.

CONCLUSIONS: Longitudinal imaging shows a significant average decline in knee extensor muscle size during aging. Available data were insufficient to determine onset age for this decline. Exploratory trajectory modelling suggested late-life acceleration after ~ 77 years of age. Future studies should include adults <65 years and report sex-disaggregated imaging outcomes.

PRACTICAL APPLICATIONS: Because knee extensor muscle size contributes to chair-rising and stair-climbing, these findings tentatively support progressive resistance training targeting the knee extensors from midlife onwards, before clinically meaningful muscle loss occurs (3).

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PRESENTACIÓN DE PÓSTERES / POSTER PRESENTATION

FRIDAY, OCTOBER 23, 2026

11:30 - 12:30 H

Presentación de pósteres 1 / Poster presentation 1 - PP01

PP01 - OPTIMIZACIÓN DEL ENTRENAMIENTO I / TRAINING OPTIMIZATION I 11:30 - 12:00 h

EFFECTS OF FRUIT-DERIVED SUPPLEMENTATION ON MUSCULAR PERFORMANCE: A SYSTEMATIC REVIEW AND META-ANALYSIS

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OBJETIVES: Considering that fruit-derived bioactive compounds may mitigate oxidative stress and improve muscle contractile function (1), we examine the effects of fruit-derived supplementation on muscular performance.

METHODS: Sub-analysis of a broader systematic review (PROSPERO: CRD420261288919) of randomized controlled trials assessing the effects of fruit-based supplementation on physical performance. Risk of bias was evaluated using RoB2 (2). Muscular performance outcomes were categorized into: (A) power performance (maximal strength, mechanical power, and work output), (B) sprint performance (sprint times and Wingate indices), (C) muscular endurance (total repetitions and volume load), and (D) jump performance (vertical and horizontal jump height). Random-effects models were applied, and effect sizes were calculated as Hedges'g with 95%CI.

RESULTS: From 7.802 records, 36 were included in the overall review, and among those, 17 reported muscular outcomes (n=380; 81.8% men). Since some studies reported multiple outcomes, 34 effect sizes were analyzed. For (A; 21 comparisons), a small effect favoring supplementation was observed ($g=0.14$; 95%CI=-0.00 to 0.29; $I^2=0.0\%$; $p=0.053$). Individual analyses indicated that *Opuntia ficus*, tart cherry and coffeeberry show more consistent positive effects compared to banana and citrus. In (B; 4 comparisons), a small-to-moderate effect was found ($g=0.43$; 95%CI=-0.90 to 1.77; $I^2=75.1\%$; $p=0.38$) with considerable heterogeneity. While *Opuntia ficus* demonstrated large effects in favor of supplementation, citrus displayed negligible or even negative effects, contributing to the wide confidence intervals. For (C; 4 comparisons), a moderate effect size was observed ($g=0.49$; 95%CI=-0.70 to 1.68; $I^2=76.9\%$; $p=0.282$). Notably, grape supplementation showed large positive effects, whereas watermelon presented mostly trivial changes. In (D; 5 comparisons) a small-to-moderate effect was found ($g=0.39$; 95%CI=-0.33 to 1.11; $I^2=45.2\%$; $p=0.206$). Positive effects were mainly associated with *Opuntia ficus* and grapes, while blueberry showed minimal impact.

CONCLUSIONS: This sub-analysis suggests that fruit-derived supplementation may exert small-to-moderate ergogenic effects on muscular performance. However, these findings warrant cautious interpretation due to moderate-to-high heterogeneity and not consistently statistical significance of pooled estimates. Specific fruits like *Opuntia ficus*, tart cherry, and grapes show the most promise, though further high-quality trials are needed to confirm these results.

PRACTICAL APPLICATIONS: Fruit-based supplements may serve as a complementary strategy to support muscular performance. Practitioners should consider the variability in current evidence and tailor recommendations to specific performance goals.

Abstracts were prepared by the authors and printed as submitted.

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2. Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 366: l4898, 2019.

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PP01 - Optimización del entrenamiento I / Training Optimization I

FAILURE INCREASES VELOCITY LOSS VERSUS REPETITIONS IN RESERVE IN THE LOWER LIMB

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OBJECTIVES: Velocity loss is commonly used as an objective indicator of neuromuscular fatigue during resistance training (1). Although velocity loss-RIR relationships are exercise- and individual-dependent, whether the additional velocity-loss cost of failure differs by exercise segment or sex remains unclear (2,3). This study aimed to examine whether segment and sex modify the effect of proximity-to-failure on absolute velocity loss.

METHODS: Nineteen resistance-trained adults, 11 males and 8 females, completed an 8-week unilateral intervention in preacher curl and leg extension exercises: one limb trained to failure and the contralateral limb trained with RIR. Set-level velocity was recorded using a Beast Sensor accelerometer.

RESULTS: Failure produced greater velocity loss than RIR (0.019 m.s⁻¹; 95% CrI 0.005 to 0.033; posterior Pr(>0)=0.997), with greater loss in the lower than upper limb (0.028 m.s⁻¹; 95% CrI 0.022 to 0.033). The failure-versus-RIR difference was larger in the lower than upper limb (interaction=0.037 m.s⁻¹; 95% CrI 0.025 to 0.049), being evident in the lower limb (0.037 m.s⁻¹; 95% CrI 0.022 to 0.052) but negligible in the upper limb (0.001 m.s⁻¹; 95% CrI -0.014 to 0.016). Sex did not clearly modify velocity loss (female - male=-0.011 m.s⁻¹; 95% CrI -0.047 to 0.025). Robustness analyses were consistent.

CONCLUSIONS: The additional velocity-loss cost of training to failure was segment-dependent. Failure increased fatigue-related velocity loss mainly in lower-limb exercise, whereas sex did not clearly modify the response.

PRACTICAL APPLICATIONS: Failure may be used in lower-limb exercise when greater velocity-loss exposure is desired. However, coaches and practitioners should consider its potential recovery cost. In upper-limb exercise, failure offered limited additional velocity-loss stimulus over RIR, suggesting that the need to train to failure should be judged by exercise segment, training goal and the desired fatigue stimulus. These data do not support sex-specific adjustments based solely on velocity loss.

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PP02 - Optimización del entrenamiento II / Training Optimization II

IS CMJ SENSITIVE ENOUGH IN ELITE FEMALE FOOTBALL PLAYERS?

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OBJECTIVE: Countermovement jump (CMJ) is widely used to assess explosive strength and monitor neuromuscular status in football players due to its practicality and time efficiency. Although CMJ performance has shown high reliability and sensitivity to training-induced adaptations (1,2), recent recommendations suggest that practitioners should interpret CMJ using multiple force-time variables rather than jump height alone (4,5). However, evidence regarding its usefulness for discriminating competitive level in elite female football players remains limited (3). The aim of this study was to analyze differences in CMJ performance across competitive categories in elite female football players.

METHODS: A total of 117 elite female football players from the Spanish women's national teams participated in the study: ABS (n=27), U19 (n=24), U17 (n=40), and U16 (n=26). CMJ performance was assessed using a dual force-platform system following a standardized protocol. Jump height was calculated using force-time integration methods. Linear mixed-effects models were used to examine differences across competitive categories, including category as a fixed effect and player identity as a random intercept.

RESULTS: CMJ demonstrated a significant main effect of competitive category ($p < 0.001$). ABS players achieved significantly greater CMJ height than U16 ($d = 1.36$), U17 ($d = 1.04$), and U19 players ($d = 0.91$). No significant differences were observed between U16 and U17 ($d = 0.41$), U16 and U19 ($d = 0.55$), or U17 and U19 players ($d = 0.19$). These findings suggest a limited progression in CMJ height during later developmental stages despite the increasing competitive level.

CONCLUSIONS: CMJ height appeared to show limited sensitivity to performance changes across competitive categories in elite female football players, presenting an apparent stabilization pattern during later developmental stages. Therefore, CMJ height alone may not be sufficient to comprehensively describe neuromuscular performance in elite female football players. Future research should investigate additional force-platform-derived variables and anthropometric factors that may influence jump performance in female athletes.

PRACTICAL APPLICATIONS: CMJ height may still represent a practical tool for monitoring fatigue and neuromuscular status in elite female football players. However, practitioners should complement CMJ assessment with additional jump-related metrics when evaluating neuromuscular performance.

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SEDENTARY TIME, SLEEP QUALITY, AND ANXIETY: THE ROLE OF FITNESS

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OBJECTIVES: To examine whether subjective sleep quality mediates the association between sedentary time and anxiety symptoms, and whether functional fitness and cardiorespiratory fitness (CRF) moderate this association in middle-aged and older adults.

METHODS: This cross-sectional analysis included 83 middle-aged and older adults from the MINA-CM-Sport sub-study (43 women; age, mean (SD): 55.0 (9.0) years). Anxiety symptoms were assessed with the Hospital Anxiety and Depression Scale, and sleep quality with the Pittsburgh Sleep Quality Index (PSQI). Sedentary time was assessed with the International Physical Activity Questionnaire and scaled to 100 min/day increments. A functional fitness index was calculated as an age- and sex-adjusted composite z-score including strength, mobility, sit-to-stand speed, and balance, with higher values indicating better functional performance. CRF was assessed in a subsample (n=74) using a maximal treadmill exercise test. Models were adjusted for age and sex.

RESULTS: In an age- and sex-adjusted mediation model, higher sedentary time was associated with poorer sleep quality, reflected by higher PSQI total score ($B=0.525$, $p=0.006$), which was associated with higher anxiety symptoms ($B=0.260$, $p=0.024$). The indirect association between sedentary time and anxiety through PSQI was significant (effect=0.137, 95% bootstrap CI: 0.005 to 0.333), whereas the direct association was not significant. Functional fitness moderated the sedentary time-anxiety association ($B=-0.437$, $p=0.020$), with sedentary time associated with anxiety only in participants with low functional fitness ($B=0.551$, $p=0.030$). CRF showed a consistent moderating pattern ($B=-0.064$, $p=0.001$).

CONCLUSIONS: Sedentary time was indirectly associated with anxiety through poorer subjective sleep quality. Higher functional fitness, and secondarily higher CRF, appeared to buffer the sedentary time-anxiety association.

PRACTICAL APPLICATIONS: Exercise professionals should combine sitting-reduction strategies with training aimed at improving functional fitness, including strength, mobility, balance, and sit-to-stand speed. Sleep quality should also be monitored when high sedentary time and anxiety symptoms coexist.

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PHYSICAL FITNESS TRENDS AMONG CHILDREN AND ADOLESCENTS FROM SLOVENIA AND ARAGON, SPAIN: AN INTERNATIONAL COMPARISON

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OBJETIVES: This study aims to compare trends of three fitness components in children and adolescents from Slovenia and Aragon (Spain) between 1995-2005 and 2020-2025.

METHODS: The sample comprised 6-to-16-year-old participants in 1995-2005 and 2020-2025, respectively: 4,737 and 3,341 from Slovenia (2), and 2,569 (1) and 2,321 from Aragon, Spain (47.3-48.4% females). Assessments included body height, body mass, body mass index (BMI), sit-and-reach, standing broad jump (SBJ) and the 20m shuttle run test (20mSRT). ANCOVA with Bonferroni adjustment examined within- and between-population differences.

RESULTS: Body height increased in both populations, whereas body mass increased in Slovenia, while BMI decreased in Aragon ($p < 0.05$). In 2020-2025, Slovenians were taller, heavier and had higher BMI ($d = 0.1$ - 0.3 ; $p < 0.05$), whereas only height ($d = 0.1$ - 0.3 ; $p < 0.001$) and female body mass differed ($d = 0.1$; $p < 0.001$) in 1995-2005. Sit-and-reach decreased in males of both populations and Aragonese females, resulting in higher Slovenian values in both sexes in 2020-2025 ($d = 0.1$; $p < 0.05$). SBJ decreased in Slovenia ($p < 0.001$), reducing between-population differences from $d = 0.8$ - 1.0 to $d = 0.6$ in 2020-2025 ($p < 0.001$). The 20mSRT decreased in Aragon but increased in Slovenia (both $p < 0.001$), reversing higher Spanish values in 1995-2005 ($d = 0.3$ - 0.5) towards higher Slovenian values in 2020-2025, especially in females ($d = 0.2$; $p < 0.001$).

CONCLUSION: Body height, BMI, and body mass showed minimal between-population changes, whereas physical fitness trends were more pronounced. Both populations should reverse declining flexibility trends. Slovenia should address its drop in explosive power, while Aragon needs to improve this still-lagging component. Positive aerobic endurance trends in Slovenia should be maintained, whereas the Spanish decline should be addressed.

PRACTICAL APPLICATIONS: Higher physical fitness in Slovenia may reflect robust conditions for fitness development within the educational system, supported by continuous population-level surveillance. Aragon and Spain could draw valuable lessons from Slovenia's physical fitness surveillance system (3) to implement evidence-based policies. Both countries must address sedentariness, which hinder healthy development.

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RELATIVE AND ALLOMETRIC POWER IN THE SJ AND 5STS IN HEALTHY VS ANXIOUS/DEPRESSED UNIVERSITY STUDENTS

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OBJECTIVES: Higher power in vertical jump correlates with reduced depression in university students, with no anxiety correlation (1). Alternatively, the 5-times sit-to-stand test (5STS) measures relative and allometric power (2), being both tests associated in young adults (3). We aimed to analyze 5STS and SJ in university students looking for differences and associations in health vs mental disorders (MD).

METHODS: 113 first-year students (19.47 ± 0.22 & 19.32 ± 0.13 age, male & female) were allocated to 4 groups upon scores in Depression (PHQ-9) and Anxiety (GAD-7): Depressed, $n=10$; Anxious, $n=12$; both MD, $n=61$; and Healthy, $n=30$. Females*group were 6, 7, 44, and 17 respectively. After body composition (Tanita_DC-430) and a standardized warm-up, students performed twice 5STS and 3*SJ/1min_rec (4). PowerFrail App®, Optojump (MicroGate) and Kinovea_2025.1.0 allowed power calculations. Sex was considered separately, limiting mean comparisons (T-student / Mann-Witney U) to healthy vs MD groups. Violin plots considering pathology by sex, scatter plots, and Pearson partial correlations, or Spearman, were included.

RESULTS: Overall, males displayed higher relative and allometric power ($p < 0.001$; SJ: $d=1.85$ & 1.75 ; 5STS: $d=1.08$ & 1.00). Healthy vs MD females ($n=16, 42$) showed no differences either in both powers (SJ: 16.23 ± 0.82 vs 14.72 ± 0.47 w/kg, $d=0.48$; 357.02 ± 24.86 vs 317.09 ± 9.42 w/m², $d=0.48$; 5STS: 4.78 ± 0.30 vs 4.61 ± 0.14 w/kg, $d=0.16$; 104.38 ± 7.08 vs 99.64 ± 3.38 w/m², $d=0.18$). Male followed similar patterns. SJ ($n=10, 13$): 22.18 ± 1.27 vs 21.40 ± 1.07 w/kg, $d=0.20$; 492.62 ± 31.52 vs 468.48 ± 23.93 w/m², $d=0.26$; 5STS SJ ($n=13, 17$): 6.03 ± 0.30 vs 5.63 ± 0.26 w/kg, $d=0.38$; 132.44 ± 6.48 vs 127.57 ± 8.25 w/m², $d=0.17$). Violin and scatter plots suggested slightly affected power in depression. No power output correlated with mental variables. Anxiety and depression correlated ($r=0.645$, $p < 0.001$), together with w/kg and w/m² intra-test ($r > 0.9$, $p < 0.001$). SJw/m² vs 5STS w/m² decreased but were still associated ($r=0.275$, $p=0.005$) whilst SJw/kg vs 5STS w/kg, no.

CONCLUSIONS: Despite higher means in health, both tests failed to reflect significant reduced muscle power in MD. A small sample size considering sex, lower-to-moderate level of pathology, similarity in body composition (matched in UNILIFE-M case-control study), and low physical fitness in healthy women, likely matter.

PRACTICAL APPLICATIONS: Larger studies with higher MD scores will confirm if this easy-to-use 5STS adds valuable information in young pathological populations' fitness testing

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EFFECTS OF STRENGTH TRAINING ON ACHONDROPLASIA: A CASE REPORT

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OBJECTIVES: To evaluate the impact of a 6-week adapted strength training program on the health-related quality of life of a youth with achondroplasia (1).

METHODS: A 22-year-old male diagnosed with achondroplasia, who is a member of the Spanish Paralympic Badminton Team, participated in the study. Following an initial assessment consisting of (i) safety and exercise clearance screening, (ii) a functional capacity evaluation, and (iii) strength and maximal strength testing, a 6-week progressive strength training program was implemented at a frequency of 2 days per week. The training intensity was structured as follows: Weeks 1–2 (65–73% 1RM); Weeks 3–4 (72–80%1RM); Week 5 (60–65% 1RM); and Week 6 (78–83% 1RM). Session 1 focused on maximal strength (6–8 repetitions), with exercises structured into tri-sets comprising the leg press, bench press, Romanian deadlift, Bulgarian split squat, dumbbell row, and frontal plank. Session 2 centered on hypertrophy (10–12 repetitions), including the goblet squat, seated military press, lat pulldown, alternating step-ups, bicep curl with tricep extension, and the bird-dog exercise.

RESULTS: Muscle strength increased in the deadlift, from a pre-training (Pre) value of 64 kg to a post-training (Post) value of 79 kg (23.4%); Squat, Pre 86-Post 106 kg (23.3%); Hip Thrust, Pre 54-Post 65 kg (20.4%); Hex bar squat, Pre 57-Post 67 kg (17.5%); Bench press, Pre 63-Post 93kg (47.6%). The 6 minutes walk test increased by 5.6% (PRE360-Post380 meters) and 30 seconds sit to stand test by 41.7% (Pre24-Post34 repetitions).

CONCLUSIONS: Following a progressive strength training program, neuromuscular and functional improvements were observed in an individual with achondroplasia.

PRACTICAL APPLICATIONS: These results confirm the feasibility and efficacy of progressive strength training, adapted to specific morphological and clinical characteristics, as an intervention for individuals with achondroplasia. Furthermore, they support the hypothesis that neuromuscular adaptation in this population follows similar patterns to those of the general population when the program is properly structured.

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BASELINE LEISURE-TIME PHYSICAL ACTIVITY AND LONG-TERM RISK OF TYPE-2-DIABETES: EVIDENCE FROM THE TWO-DECADE SEGOVIA COHORT

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OBJECTIVES: Physical activity is a key modifiable behaviour in cardiometabolic prevention, although its independent contribution to long-term type 2 diabetes mellitus (T2DM) risk may be attenuated after accounting for baseline metabolic risk [1–3]. This study examined whether baseline physical activity was associated with incident T2DM in a rural/urban cohort followed for 22 years, and whether this differed by metabolic risk.

METHODS: The SEGOVIA cohort included 900 participants recruited in 2000. After excluding individuals with incomplete data and prevalent diabetes at baseline (n=89), participants free of diabetes were followed to 2023 through clinical assessments and electronic health record monitoring. For this analysis, 387 participants with complete follow-up clinical data were included. Baseline leisure-time physical activity was self-reported and categorized as light, moderate, or intense. Incident T2DM was defined according to fasting plasma glucose criteria and/or medical diagnosis during follow-up. Logistic regression models estimated the association between baseline physical activity and T2DM, adjusting for age, sex, residence, sedentary time, body mass index, and fasting glucose. Physical activity was also modelled as moderate/intense versus light. Baseline metabolic risk was defined using waist circumference, triglycerides, HDL cholesterol, blood pressure, and fasting glucose.

RESULTS: The final sample included 387 participants (49.5±9.6 years; 46.9% men; 60.8% rural). Over more than two decades, 16% developed T2DM. Higher baseline physical activity showed a consistent inverse, non-significant association with T2DM risk (OR per category=0.61; p=0.10). After adjustment for fasting glucose, the estimate was attenuated but remained inverse (OR=0.75; 95% CI: 0.37–1.52). Similar patterns were observed for moderate/intense versus light activity (OR=0.71; 95% CI: 0.27–1.86). Adjusted T2DM probabilities decreased across activity levels: 9.8% for light, 7.5% for moderate, and 5.8% for intense activity. Baseline metabolic risk strongly stratified T2DM prevalence, from 6.8% in low-risk to 48.7% in high-risk participants. Stratified analyses showed inverse estimates in both low-risk (OR=0.77) and high-risk groups (OR=0.47), although the interaction was not significant.

CONCLUSIONS: Baseline physical activity showed a consistent but non-significant inverse association with incident T2DM. Baseline cardiometabolic risk remained the dominant predictor.

PRACTICAL APPLICATIONS: Exercise programmes for diabetes prevention should integrate physical activity with early cardiometabolic risk screening, prioritising individuals with metabolic alterations.

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CONTROL OF MUSCLE ENERGETICS BY CFTR: IN-VITRO SIMULATION OF DYSFUNCTION AND AGING (FIQMODE STUDY)

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OBJECTIVES: Cystic fibrosis is a disease caused by mutations in the CFTR gene, associated with accelerated aging in the muscle tissue of patients (1). CFTR expression in muscle decreases with age in humans and animal models, blocking muscle regeneration. Although CFTR has been primarily studied in lung tissue, there is growing evidence of skeletal muscle involvement (2). Muscle impairment in patients declines functional capacity and life quality, but the underlying cellular mechanisms remain unclear (3). Therefore, it is necessary to analyze the role of the CFTR channel in mitochondrial dysfunction within cultured muscle fibers. Our objective was to analyze mitochondrial bioenergetics in control muscle fibers without CFTR inhibition compared to chemically inhibited fibers, establishing a cellular-disease model.

METHODS: We used an in-vitro model of the human skeletal muscle myoblast cell line differentiated into myocytes to evaluate mitochondrial function using the Seahorse XF-Cell-Mito-Stress-Test. To simulate disease-associated CFTR dysfunction, cells were treated with a chemical inhibitor at different concentrations (5-10-20 μ M).

RESULTS: CFTR inhibition in myocytes induced dose-dependent alterations in mitochondrial respiration when comparing each condition to the control. Basal OCR in control condition was 98.9 $\pm$ 25.9 pmol/min. At each inhibition condition results obtained where: 5 μ M (162.8 $\pm$ 27.5 pmol/min; p=0.0012); 10 μ M (129.6 $\pm$ 13.5 pmol/min; p=0.147); and 20 μ M (62.8 $\pm$ 14.7 pmol/min; p=0.072). This indicates a transition from a compensatory hypermetabolic state at low inhibitor doses toward an impairment of basal respiratory capacity at higher doses. The fold change in the control condition was 1.7 $\pm$ 0.1, whereas for each inhibition condition: 5 μ M (1.3 $\pm$ 0.1; p=0.0006); 10 μ M (1.5 $\pm$ 0.04; p=0.353) and 20 μ M (1.4 $\pm$ 0.2; p=0.014), reflecting a loss of bioenergetic flexibility and mitochondrial responsiveness.

CONCLUSIONS: These findings suggest that the loss of CFTR function directly compromises mitochondrial energy metabolism in skeletal muscle. CFTR dysfunction could act as a regulator of muscle regeneration and be linked to myocyte aging.

PRACTICAL APPLICATIONS: To uncover novel preclinical mechanisms related to CFTR dysfunction and mitochondrial bioenergetics that could be involved in muscle regeneration.

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ASSOCIATIONS OF DIETARY PROTEIN SOURCE AND FAT QUALITY WITH MUSCLE AND PHYSICAL FUNCTION IN ADULTS

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BACKGROUND: Plant protein intake (PPI) and a higher monounsaturated-to-saturated fatty acid (MUFA/SFA) ratio may represent complementary dietary factors potentially relevant to muscle-related outcomes and healthier aging (1-3).

OBJECTIVE: To examine the associations of body weight-adjusted total, plant and animal protein intake (API), and MUFA/SFA ratio, with muscle and physical function in middle-aged adults.

METHODS: Linear regression models from 263 adults (age:54.8±1.5 years) of whom 153 were women were performed. Muscle function was assessed using relative Sit-to-Stand (STS) power (W/kg) derived from the 30-s STS test, whereas physical function was assessed using 4-meters (4m) habitual gait speed (HGS, m/s). Main dietary exposures were derived from a Food Frequency Questionnaire (4) for total protein intake, PPI and API (g/kg) and dietary MUFA/SFA ratio. Linear regression analyses adjusted for age, sex, physical activity, total energy intake, total lean mass (only for HGS models) and total energy intake were performed.

RESULTS: In Adjusted models higher PPI was associated with faster 4m HGS ($\beta=0.284, p=0.005$) and relative STS power ($\beta=1.824, p<0.001$). API was negatively associated with 4m HGS ($\beta=-0.082, p=0.040$). Total protein intake was only significantly associated with relative STS power ($\beta=0.426, p=0.024$). The MUFA/SFA ratio was positively associated with relative STS power ($\beta=0.395, p=0.027$) and with 4m HGS ($\beta=0.086, p=0.016$) in adjusted models.

CONCLUSIONS: Higher PPI and MUFA/SFA ratio may be associated with both faster HGS and higher relative STS power, suggesting that protein source and dietary fat quality may be relevant markers of muscle and physical function in middle-aged adults.

PRACTICAL APPLICATIONS: These findings support plant-forward dietary strategies to promote healthier aging.

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EFFECTS OF AGONIST AND ANTAGONIST INTER-SET STATIC STRETCHING ON PERFORMANCE, STRENGTH, AND HYPERTROPHY: SYSTEMATIC REVIEW

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OBJECTIVE: To systematically analyze the acute and chronic effects of inter-set static stretching on neuromuscular performance, strength gains, and hypertrophic adaptations during isotonic resistance training.

METHODS: A systematic review was conducted according to PRISMA guidelines. Searches were performed in PubMed, MEDLINE, Scopus, and SPORTDiscus up to January 2026. Studies involving healthy adults (≥ 18 years) performing static stretching during inter-set rest periods in isotonic resistance training programs were included. Methodological quality was assessed using the PEDro scale, and risk of bias was evaluated using the Cochrane RoB 2.0 tool.

RESULTS: Twelve studies were included (8 acute and 4 chronic). Methodological quality was moderate (PEDro = 5–8 points), and no study presented a high risk of bias. In acute studies, agonist muscle stretching reduced movement velocity, training volume, or the number of repetitions in most investigations, whereas others reported no differences compared with passive rest. In contrast, studies evaluating antagonist muscle stretching reported significant increases in repetitions performed, total training volume, and electromyographic activity. In chronic studies, all groups improved maximal strength after 8 weeks of training, with no significant differences between inter-set stretching and passive rest. One study conducted in untrained individuals reported greater hypertrophic adaptations with inter-set stretching, whereas studies involving trained participants found no additional benefits. Movement velocity was monitored in only one study, and stretching intensity showed substantial heterogeneity across protocols.

CONCLUSIONS: Inter-set static stretching applied to the agonist musculature may impair acute performance, whereas antagonist stretching appears to facilitate the maintenance or enhancement of performance. Current evidence does not support a superior effect of inter-set stretching over passive rest for improving strength.

PRACTICAL APPLICATIONS: When the goal is to maximize performance or training volume, coaches should avoid static stretching of the agonist musculature during inter-set recovery periods. Antagonist stretching may represent a practical strategy to maintain performance without increasing session duration. Future studies should monitor movement velocity and standardize stretching intensity to optimize its application within resistance training programs.

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EFFECTOS DE LA LESIÓN DE CUÁDRICEPS EN LA CINEMÁTICA DEL RSA EN JUGADORAS DE FÚTBOL

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OBJETIVOS: El presente estudio tiene como objetivo analizar la cinemática del RSA en jugadoras de fútbol de élite y examinar cómo una lesión previa en el cuádriceps puede afectar a la longitud de paso la frecuencia de paso y el rendimiento general.

MÉTODOS: Cinco jugadoras de fútbol de élite ($21,33 \pm 2,7$ años, $166,33 \pm 4$ cm y $60,5 \pm 3,45$ kg respectivamente) realizaron 6 sprints máximos de 40 m con 30 s de descanso pasivo entre sprints. La prueba se registró mediante una cámara en seguimiento con paneo a 100 FPS. Para todas las repeticiones se analizó la frecuencia de paso, longitud de paso, y tiempo de sprint, incluyendo variables por tramos. Los tiempos de sprint se registraron mediante células fotoeléctricas. El análisis se centró en comparaciones intra-sujeto a lo largo de las repeticiones y los tramos del sprint.

RESULTADOS: A lo largo de la prueba, ambos grupos mostraron disminuciones significativas tanto para la frecuencia de paso (control $x_2=16,8$ $p=0,005$; lesión cuádriceps $x_2=19,4$ $p=0,002$) como para la longitud de paso (control $x_2=12,8$ $p=0,026$; lesión cuádriceps $x_2=11,9$ $p=0,037$), y por consecuencia, el tiempo total del sprint aumentó de manera significativa (control $x_2=16,0$ $p=0,007$; lesión cuádriceps $x_2=24,1$ $p<0,001$). Asimismo, entre tramos, todas las variables mostraron diferencias estadísticamente significativas para ambos grupos ($p<0,05$).

CONCLUSIONES: Los resultados indicaron que, si bien ambos grupos experimentaron una evolución similar en el rendimiento de la prueba, la frecuencia de paso fue la variable más sensible a la fatiga y por tanto, la más relacionada con el rendimiento en acciones repetidas a máxima intensidad en futbolistas. Además, el grupo con lesión de cuádriceps sufrió una disminución inmediata del rendimiento desde el principio de la prueba, mientras que el grupo control logró retrasar la caída del rendimiento hasta los últimos sprints.

APLICACIONES PRÁCTICAS: Los resultados sugieren que para aumentar el rendimiento en este tipo de situaciones claves para el rendimiento, se debería incidir en mejorar la proyección de fuerza horizontal, para optimizar la aceleración inicial y la aplicación de fuerza útil, incluir trabajo de fuerza y tareas mecánicas, para mejorar el ciclo y la eficiencia de carrera, y por último, incidir en el trabajo de tolerancia a la fatiga a través de tareas de alta intensidad con recuperaciones incompletas y asegurando el mantenimiento de la frecuencia de paso.

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PP02 - Optimización del entrenamiento II / Training Optimization II

INDIVIDUALIZED STRENGTH TRAINING REDUCES INJURY INCIDENCE AND IMPROVES PERFORMANCE IN FEMALE VOLLEYBALL PLAYERS

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OBJECTIVES: Strength and conditioning programs in volleyball are commonly implemented using generalized approaches that may not account for individual neuromuscular characteristics or injury history (1). Therefore, this study aimed to examine whether an individualized strength and conditioning program integrated within a periodized team-based physical preparation could reduce injury incidence and improve neuromuscular performance in female volleyball players competing in the Spanish First National Division.

METHODS: Nine female volleyball players completed an individualized strength and conditioning program during the 2025/2026 competitive season. Training was tailored based on neuromuscular assessments, asymmetries, force deficits, previous injury history, and competitive calendar demands. Assessments were performed pre-, mid-, and post-season using K-Deltas force platforms (Kinvent, France) (2). Only pre- and post-season data were included in the final analysis. The testing battery included SJ, IMTP, ISO Squat, and ISO McCall tests; variables analyzed included jump height and maximal force production. Mid-season assessments individualized training adjustments throughout the season. Injury incidence was monitored using a researcher-designed questionnaire and compared with data from the 2024/2025 season.

RESULTS: Neuromuscular performance improved following the intervention. SJ increased from 35.84 ± 9.56 to 42.46 ± 12.42 cm (+18.45%), IMTP maximal force from 97.07 ± 38.68 to 114.53 ± 24.31 kg (+17.99%), ISO Squat from 140.69 ± 39.43 to 181.17 ± 38.60 kg (+28.78%), and ISO McCall from 36.27 ± 11.19 to 43.73 ± 7.61 kg (+20.57%). Injury incidence decreased by 33.3% during the 2025/2026 season compared with the previous season (8 vs. 12 injuries). Injury severity was also reduced, with fewer severe injuries reported and 22.2% of players remaining injury-free throughout the intervention season.

CONCLUSIONS: An individualized strength and conditioning program combined with periodized team-based physical preparation reduced injury incidence and severity while improving neuromuscular performance in female volleyball players.

PRACTICAL APPLICATIONS: Regular neuromuscular assessments and individualized strength training may help practitioners improve performance, optimize load management, and reduce injury incidence and severity, increasing player availability throughout the competitive season.

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POSITIONAL DIFFERENCES IN COUNTERMOVEMENT JUMP FORCE TIME CHARACTERISTICS IN EUROPEAN PROFESSIONAL AMERICAN FOOTBALL PLAYERS

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OBJECTIVES: To characterize neuromuscular profiles of professional European League of Football (ELF) male players using a concise countermovement jump (CMJ) force time panel and to compare positional groups (linemen vs skill players).

METHODS: Cross sectional analysis of best of 3 CMJ tests collected from Madrid Bravos team's PRO homegrown players. Strength and jump assessments were performed using the ForceDecks dual-plate force platform system (VALD Performance, Brisbane, Australia). Data were recorded at a sampling frequency of 1000 Hz and analyzed using ForceDecks software. After quality control and computing subject means of valid trials, three primary variables were selected: RSI_{mod}, peak power normalized to body mass ($W \cdot kg^{-1}$), and eccentric peak force normalized to body mass ($N \cdot kg^{-1}$). Positions were grouped as Linemen (OL, DL) and Skill (WR, RB, DB, TE, QB). Descriptive statistics are reported as mean $\pm$ SD. Between group comparisons used two sided Welch's t tests (normality checked with Shapiro-Wilk; Levene's test for variance); Cohen's d (unequal variances) with 95% CI quantified effect sizes; $\alpha = 0.05$.

RESULTS: The final sample included 28 male PRO players ($n = 12$ linemen and $n = 16$ skill players). RSI_{mod} was 0.47 ± 0.12 in linemen and 0.59 ± 0.14 in skill players (Cohen's $d = -0.780$ (95% CI -1.350 – -0.210)). PeakPower/BM was $49.20 \pm 7.80 W \cdot kg^{-1}$ in linemen and $58.90 \pm 8.60 W \cdot kg^{-1}$ in skill players (Cohen's $d = -0.950$ (95% CI -1.550 – -0.350)). EccPeakForce/BM was $28.30 \pm 3.60 N \cdot kg^{-1}$ in linemen and $23.40 \pm 3.80 N \cdot kg^{-1}$ in skill players (Cohen's $d = 1.020$ (95% CI 0.450 – 1.590)).

CONCLUSIONS: A minimal CMJ force time panel (RSI_{mod}, PeakPower/BM, EccPeakForce/BM) discriminates positional neuromuscular profiles in professional ELF athletes. Skill players demonstrate greater reactive and relative concentric power (medium to medium-large effects), while linemen show substantially greater eccentric force capacity (large effect). These distinctions align with positional demands and provide actionable targets for training.

PRACTICAL APPLICATIONS: Implement a 3 metric CMJ panel for routine monitoring: emphasize reactive and concentric power development for skill players (RSI_{mod}, PeakPower/BM) and prioritize eccentric strength and force absorption training for linemen (EccPeakForce/BM). This approach is time efficient and directly informs individualized programming.

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CÁNCER DE MAMA: INFLUENCIA DEL PLANO PROTÉSICO EN FUNCIONALIDAD, CALIDAD DE VIDA Y EJERCICIO FÍSICO

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OBJETIVOS: Analizar la evidencia científica disponible sobre la influencia del plano de reconstrucción mamaria (prepectoral o subpectoral) en la funcionalidad del hombro y calidad de vida de las pacientes con cáncer de mama, así como evaluar dichas variables mediante una encuesta realizada a pacientes sometidas a reconstrucción con prótesis y desarrollar una propuesta de ejercicio físico específica según el plano.

MÉTODOS: Se realizó una revisión narrativa mediante búsqueda en PubMed, Scopus y Web of Science. Se incluyeron estudios sobre reconstrucción mamaria prepectoral y/o subpectoral que evaluaran funcionalidad del hombro, biomecánica, dolor, calidad de vida o ejercicio físico. Adicionalmente, se desarrolló un estudio observacional transversal mediante un cuestionario online cumplimentado por 47 mujeres. Finalmente, se elaboró una propuesta de ejercicio físico orientada a la restauración funcional del miembro superior, diferenciada para ambos planos.

RESULTADOS: La reconstrucción subpectoral se asocia con mayor frecuencia a alteraciones funcionales relacionadas con la afectación del pectoral mayor, incluyendo dolor y deformidad dinámica. Por el contrario, la reconstrucción prepectoral preserva la función muscular y presenta mejor recuperación funcional. Los datos de la encuesta no mostraron diferencias significativas entre planos. La propuesta de ejercicio priorizó en reconstrucción subpectoral restaurar la función del pectoral mayor, el control escapular y la movilidad glenohumeral; la prepectoral se centró en la progresión funcional global del miembro superior.

CONCLUSIONES: El plano protésico utilizado en la reconstrucción puede influir en la funcionalidad del hombro y la calidad de vida en mujeres con cáncer de mama. El ejercicio físico personalizado según el tipo de reconstrucción podría desempeñar un papel fundamental en la recuperación en fases iniciales.

APLICACIÓN PRÁCTICA: Un programa de ejercicio específico según el plano de reconstrucción podría contribuir a optimizar la recuperación funcional y mejorar la calidad de vida.

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SIX-MINUTE SKIERG TEST: REFERENCE VALUES IN MEN WITH SPINAL CORD INJURY ABOVE T10

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1 FUNDACIÓN ISIDRE ESTEVE.

OBJECTIVES: To provide preliminary reference values for a 6-minute SkiErg test in men with spinal cord injury (SCI) above T10, as a field-based indicator of upper-body endurance.

METHODS: A retrospective cross-sectional observational study was conducted using functional assessment records from Fundacio Isidre Esteve. Thirty-two men with a neurological level of injury above T10 were included. Participants were instructed to cover the maximum possible distance during 6 minutes on a SkiErg. Total distance and mean power output were recorded from the ergometer monitor. Descriptive statistics and reference percentiles for distance were calculated. Procedures followed the Declaration of Helsinki, and informed consent was obtained.

RESULTS: Mean distance was 916 +/- 160 m, median 949 m, and range 615-1138 m. Reference distance percentiles were: P10 = 685 m, P25 = 751 m, P50 = 949 m, P75 = 1067 m, and P90 = 1081 m.

CONCLUSIONS: The 6-minute SkiErg test may provide a feasible field-based measure of upper-body endurance in men with SCI above T10. These values are preliminary and should not be interpreted as direct VO₂peak/VO₂max estimates without criterion validity studies.

PRACTICAL APPLICATIONS: These reference percentiles may help classify endurance, set training goals, and monitor changes when laboratory testing is unavailable.

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PERFILES FENOTÍPICOS DE FUERZA MUSCULAR, COMPOSICIÓN CORPORAL Y ACTIVIDAD FÍSICA EN MUJERES GESTANTES

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OBJETIVO: Identificar perfiles fenotípicos basados en la fuerza muscular, composición corporal y niveles de actividad física en mujeres gestantes mediante análisis de conglomerados, y explorar sus implicaciones para la prescripción de ejercicio.

MÉTODOS: Estudio transversal en 59 gestantes evaluadas entre semanas 12-16. Todas firmaron consentimiento informado y el estudio siguió los principios de la Declaración de Helsinki. Se aplicó un análisis de clustering K-means utilizando variables de fuerza muscular (remo, extensión, pectoral y leg press en Z-score), handgrip, índice de masa corporal (IMC), porcentaje de grasa corporal, masa magra total, edad, semanas de gestación y niveles de actividad física. Las variables fueron estandarizadas mediante Z-score. Se seleccionó la solución de tres conglomerados mediante índices de Silhouette y Davies-Bouldin. Las diferencias entre perfiles se analizaron mediante Kruskal-Wallis y post-hoc de Dunn con corrección Bonferroni ($p < 0.05$).

RESULTADOS: Se identificaron tres perfiles: F-1 (baja fuerza y sedentario; $n=24$, 40.7%), F-2 (alta fuerza y actividad física; $n=15$, 25.4%) y F-3 (alta fuerza y sobrepeso; $n=20$, 33.9%). F-1 presentó los valores más bajos de fuerza muscular y actividad física. F-2 mostró mayor actividad vigorosa (22.1 ± 14.2 min/día), mejores valores relativos de fuerza y menos porcentaje de grasa ($32.3 \pm 5.3\%$). F-3 presentó los mayores valores de handgrip (27.3 ± 3.9 kg), IMC (28.9 ± 2.9 kg/m²), porcentaje de grasa ($41.7 \pm 5.4\%$) y masa magra total (43322 ± 5197 g), pese a bajos niveles de actividad física. Se observaron diferencias significativas entre perfiles de fuerza y composición corporal ($p < 0.001$), sin diferencias en edad o gestación.

CONCLUSIONES: La condición física en el embarazo es heterogénea. Un IMC elevado no implica necesariamente baja fuerza muscular, ya que se asocia a una mayor masa magra.

APLICACIONES PRÁCTICAS: Se debe individualizar el ejercicio según el perfil. F-1, inicio en el entrenamiento de fuerza. F-3, aprovechar base muscular, y F-2 mantenimiento de condición física.

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MENSTRUAL CYCLE PHASES AND LOWER-LIMB NEUROMUSCULAR ACTIVATION: IMPLICATIONS FOR INJURY PREVENTION IN EUMENORRHEIC WOMEN

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OBJECTIVES: Hormonal fluctuations across the menstrual cycle (MC) may influence neuromuscular function in women during dynamic actions, although current evidence remains controversial. Given that women present a 2-8 times greater risk of knee injuries, compared with men, the purpose was examine cycle-related variations in lower-limb muscle activation for injury prevention and training individualization.

METHODS: A systematic review was conducted following PRISMA guidelines. Electronic databases (PubMed, Web of Science, and SPORTDiscus) were searched using terms related to the MC, neuromuscular activation, and electromyography (EMG). Studies were included if they involved eumenorrheic women with regular cycles confirmed through hormonal or physiological assessments, not using hormonal contraceptives, and evaluated lower-limb muscle activation via EMG.

RESULTS: Seven studies met the inclusion criteria, comprising 116 participants. Overall, most investigations did not identify statistically significant differences in muscle activation patterns between MC phases.

CONCLUSION: Although the current evidence does not conclusively demonstrate consistent phase-dependent alterations in muscle activation, hormonal variations may modulate neuromuscular control under specific conditions depending on task characteristics (e.g., dynamic vs. static or fatiguing vs. non-fatiguing conditions).

PRACTICAL APPLICATIONS: Considering the elevated incidence of knee injuries in women, individualized training strategies that account for MC phases could be beneficial. Incorporating dynamic neuromuscular training that replicates sport-specific demands may enhance anticipatory and reactive muscle activation patterns, contributing to improved knee joint protection.

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LOW ENERGY AVAILABILITY ELEVATES PERCEIVED EXERTION WITHOUT ALTERING HEART RATE IN FEMALE ATHLETES

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OBJECTIVE: Energy availability is essential for regulating physiological function and athletic performance (1), long-term low energy availability (LEA) is linked to low performance outcomes (2). Less is understood about how acute LEA affect perceived and physiological exercise intensity. Therefore, this study examined whether short-term LEA modify objective and subjective exercise-intensity responses in exercising females under controlled nutritional conditions.

METHODS: Nine naturally menstruating females (23 ± 3 yrs; 57.3 ± 5 kg) with confirmed luteinizing hormone peak completed two treadmill protocols, consisting of 8x3-min at 95% of the ventilatory threshold 2 (VT2) interspersed with 90 s of active recovery. One after six days of LEA [$35 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{fat-free mass (FFM)}^{-1}$] and another under high energy availability (HEA) ($60 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{FFM}^{-1}$). Heart rate (HR) was continuously measured using Polar H10, while rate of perceived exertion (RPE; Borg 0-10) was recorded immediately at the end of each exercise bout.

RESULTS: with higher values in LEA (5 ± 3) than in HEA (4 ± 2 ; $p=0.001$). In contrast, HR did not differ between conditions (LEA 174 ± 17 bpm; HEA 172 ± 19 bpm; $p=0.097$). No condition $\times$ time interactions were found for either variable.

CONCLUSIONS: Short-term LEA appears to increase the subjective perception of exercise intensity in physically active females, even when objective responses remain unchanged. The higher RPE values under LEI suggest that perceptual markers may be more sensitive to acute changes than objective physiological indicators (3), as RPE integrates both physiological strain and cognitive and psychological influences (4). Whereas physiological measures like HR may require longer or more severe LEI exposure to show measurable alterations.

PRACTICAL APPLICATIONS: Monitoring both HR and RPE may help coaches and athletes determine whether changes in exercise intensity responses arise from physiological or psychological factors, supporting early identifications and management of factors that increase physiological strain.

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BONE HEALTH, STRENGTH-POWER AND FUNCTIONAL PERCEPTION IN POSTMENOPAUSAL WOMEN: STUDY OF BASELINE ASSOCIATIONS

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OBJECTIVES: Menopause marks a biological inflection point impacting bone mineral density (BMD), muscle function and quality of life (1). Aging-related functional decline impairs mobility, adaptability, and independence (2). To analyze BMD associations with muscle strength and physical/perceptual variables in postmenopausal women (PW).

METHODS: After 3 weeks of familiarization with strength training, sixteen PW (66.56 ± 4.86 y; 62.30 ± 7.48 Kg) were assessed of T-score at total hip (H) and lumbar spine (LS, L1-L4) (DXA; Hologic Inc., USA), handgrip strength [both sides: HGR, HGL] and fear of falling (FES-I questionnaire). Lower-limb and muscle trunk strength (n=11) were assessed by an adapted progressive resistance force-velocity test, considering the maximal load (ML) and its maximal mean propulsive velocity (MPV) in the concentric contraction of a squat smith (SS) and deadlift with the Hex-Bar (DL) exercises (T-Force Dynamic Measurement System™; Spain). Pearson or Spearman correlations were applied according to normality.

RESULTS: T-scores at LS (-2.29 ± 0.99) and H (-2.19 ± 0.97) showed significant, large associations with FES-I (rLS=-0.49; p=0.04; rH: -0.57; p=0.01). No significant associations were found between T-scores and HG (H vs HGR: r=0.42; p=0.11; H vs HGL: r=0.46; p=0.07; LS vs HGR: r=-0.01; p=0.95; LS vs HGL: r=-0.04; p=0.85). Neither with MPV (H vs MPVSS: r=-0.19; p=0.56; LS vs MPVSS: r=-0.02; p=0.94; H vs MPVDL: r=-0.25; p=0.45; LS vs MPVDL: r=0.09; p=0.79) or ML (H vs MLSS: r=0.3; p=0.36; LS vs MLSS: r=-0.14; p=0.66; H vs MLDL: r=0.47; p=0.14; LS vs MLDL: r=0.02; p=0.93).

CONCLUSIONS: PW exhibited advanced osteopenia. Despite the small sample size, the inverse relationship between BMD and FES-I suggests a link between fracture risk and its perception (3). Compound exercise' performance likely depends more on technique and confidence than on current BMD.

PRACTICAL APPLICATION: The FES-I may provide complementary information for bone health screening. Exercise prescription requires cautious load selection, prioritizing neuromuscular control, movement quality, and patient perception.

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BEYOND TRAINING: HEAT DRIVES STRENGTH ADAPTATION IN POSTMENOPAUSAL WOMEN

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OBJECTIVES: Menopause is a physiological process inherent to female ageing and is associated with alterations that may include accelerated loss of muscle mass and strength. Evidence suggests that hyperthermia and physical exercise may represent non-pharmacological strategies to modulate these alterations and improve quality of life during this stage (1,2). The aim of this study was to analyse and compare the effects of an intermittent sauna bathing protocol and a multicomponent exercise training programme on physical fitness in menopausal women.

METHODS: The study was conducted in accordance with the Declaration of Helsinki of the World Medical Association regarding the use of human participants. After providing written informed consent, 44 women participated in the study (57.6±3.6 years; 161.5±5 cm; 26.6±3.9 kg/m²). Participants were randomly allocated to multicomponent exercise training (MET) or intermittent hyperthermia (IH). Both groups completed a 12-week intervention, with three sessions per week. MET performed a progressive programme based on RPE, RIR and %HR. IH progressed from 3 sets of 5 min at 60°C to 3 sets of 10 min at 75°C in a sauna, with a 2:1 work-to-recovery ratio. Trunk flexibility (TF), handgrip strength (HGS; T.K.K. 5001A GRIP-A), lower-limb strength during isometric squat (SQ-ISO; T.K.K. 5402) and countermovement jump (CMJ; K-Deltas, Kinvent) were assessed. Pre-post differences and between-group differences were calculated.

RESULTS: After the experimental period, IH significantly improved right HGS (+1.23±2.64kg; p = 0.030), left HGS (+1.15±3.03kg; p=0.014) and SQ-ISO (+10.83±23.92kg; p=0.009). MET showed significant improvements in left HGS (+1.78±2.46kg; p=0.007), SQ-ISO (+17.92±21.23kg; p=0.002) and TF (+4.78±4.57cm; p<0.001). Regarding CMJ, both protocols improved jump height, absolute and relative peak power, absolute and relative impulse, and relative peak force (IH: p≤0.013; ME: p≤0.011). TF was the only variable showing a differential response between protocols, favouring MET (p=0.007; d=0.77).

CONCLUSIONS: Overall, both protocols induced neuromuscular adaptations, with no significant differences between them in most variables.

PRACTICAL APPLICATIONS: Hyperthermia and multicomponent exercise training may represent promising strategies to improve physical fitness in postmenopausal women.

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DIETARY PATTERNS AND CARDIOPULMONARY PARAMETERS IN MIDDLE-AGED ADULTS

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OBJECTIVES: Dietary patterns represent complex interactions among foods and nutrients that may influence functional capacity through metabolic, inflammatory, and musculoskeletal pathways (1). Although previous studies have primarily focused on individual nutrients, evidence regarding the association between overall dietary patterns and cardiopulmonary exercise testing (CPET)-derived cardiorespiratory fitness parameters in middle-aged adults remains limited (2). Therefore, this study aimed to evaluate the association between dietary patterns and cardiorespiratory fitness parameters in middle-aged adults, since age-related declines in physical and cardiovascular function may begin before older adulthood (3).

METHODS: A total of 258 participants aged 50–55 years from the Toledo Study for Healthy Aging Study in Middle Age (ETES-me) cohort were included in this study. Dietary intake was assessed using a validated food frequency questionnaire (4). Food consumption frequencies were converted into daily gram intakes and energy-adjusted prior to dietary pattern derivation using k-means analysis. Three dietary patterns were identified: Healthy Plant-Based (C1), Animal Protein and Vegetable (C2), and Western (C3). Cardiorespiratory fitness was assessed using CPET, including peak oxygen uptake (VO_2peak), metabolic equivalents (MET), relative workload (W/kg), peak power output, heart rate (HR), and heart rate recovery (HRR). Group differences were adjusted for sex and physical activity level and analyzed using General Linear Models.

RESULTS: Only HRR differed significantly across dietary pattern clusters ($p=0.045$). Participants in C1 demonstrated higher cardiorespiratory fitness indicators, including VO_2peak and MET, although these differences did not reach statistical significance (both $p=0.056$). Relative workload demonstrated the largest effect size among fitness outcomes ($\eta^2=0.070$), despite non-significant between-cluster differences.

CONCLUSION: Dietary patterns were not significantly associated with most CPET-derived cardiorespiratory fitness parameters in middle-aged adults.

PRACTICAL IMPLICATIONS: These findings suggest that dietary patterns may have a limited association with cardiorespiratory fitness in middle-aged adults. Further research is needed to clarify these relationships.

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EFFECTS OF HYPOXIC RESISTANCE TRAINING ON INTERNAL AND EXTERNAL LOAD RESPONSES IN TRAINED WOMEN

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OBJECTIVES: Resistance training (RT) under hypoxic conditions is considered a valuable strategy for enhancing muscle strength and hypertrophy (1). However, hypoxia may affect training intensity adjustment, as it imposes greater physiological demands than normoxia (N) (3), potentially altering internal and external load (2). While external load measures the work performed, the internal load provides a more accurate and individualized assessment of the real response to training stress (2). This study aimed to investigate the external and internal load responses over an 8-week RT program between hypoxia (H) and N conditions in trained women.

METHODS: Twenty-two strength-trained women completed an 8-week RT program in N (n=11) or normobaric H (NH; FiO₂=15.9%; n=11). External load was assessed by the total volume load (VL) (reps x sets x load) in bench press, back squat and pull-down exercises. Internal load was assessed by the mean heart rate (HR) during the session.

RESULTS: Both groups showed similar total VL across the program (p=0.909). Throughout the training, significant increases (p<0.007) were observed in the squat (15% NH and 10% N), pulldown (14% NH and 18% N), and bench press (21% NH and 21% N). Although HR tended to be higher in NH, it did not reach statistical significance (p=0.099). HR declined over time (p=0.001), while higher values were observed during the last three weeks (p<0.022).

CONCLUSIONS: Comparable external loads were sustained in both study conditions over the 8-week program. However, moderate NH elicited greater cardiovascular stress, highlighting the additional physiological stress of the hypoxic stimulus.

PRACTICAL APPLICATIONS: External load metrics alone may underestimate the physiological demands of RT in NH; internal load markers must be monitored throughout the full program, as HR may diverge between conditions despite equivalent volume load.

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FUNDING: This work was supported by the Spanish Ministry of Science, Innovation and Universities under grant [PGC2018-097388-B-I00 -MINECO/FEDER] and by the Andalusian FEDER Operational Program [B-CTS-374-UGR20 and C-SEJ-015-UGR23].

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SATURDAY, OCTOBER 24, 2026

11:30 - 12:00 H

Presentaciones de pósteres 2 / Poster presentation 2

PP02 - OPTIMIZACIÓN DEL ENTRENAMIENTO III/TRAINING OPTIMIZATION III 11:30 - 12:30 h

VELOCITY OF THE LAST REPETITION TO FAILURE BASED ON TRAINING EXPERIENCE: A PILOT STUDY

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OBJECTIVES: The main purpose of this study was to compare the mean propulsive velocity (MPV) of the last completed repetition during a set performed to momentary muscular failure in the Smith machine bench press between subjects with different levels of resistance training (RT) experience.

METHODS: Six adult males (22.8 ± 1.17 years; 1.76 ± 0.08 m; 74.2 ± 11.7 kg) were divided into two groups: untrained in RT ($n=3$; <6 months experience; 22.67 ± 0.58 years; 65.67 ± 10.21 kg) and trained in RT ($n=3$; >2 years experience; 23.00 ± 1.73 years; 82.67 ± 4.51 kg). Following an initial session to estimate 1RM using a three-point (40%, 60%, 80%) protocol (1), participants performed a single set to failure at 80% 1RM. MPV was recorded using a linear position transducer, focusing on the final completed repetition as the minimum velocity threshold (MVT).

RESULTS: Statistical analysis showed no significant differences between groups for the MVT variable ($p=0.250$, Untrained= 0.12 ± 0.03 m/s; Trained= 0.18 ± 0.07 m/s)). However, a large effect size was found (Cohen's $d=1.10$), indicating a substantial practical difference despite the limited sample size.

CONCLUSIONS: In this pilot, MVT was not significantly associated with RT experience. However, the lower values observed in the untrained group, along with the effect sizes, suggest a possible experience-related effect requiring confirmation in larger and more heterogeneous samples, including females and more age diversity. Furthermore, the MVT recorded in the untrained group (0.12 m/s) appears to differ from the theoretical values (approx. 0.17 m/s) commonly reported in the literature (3).

PRACTICAL APPLICATIONS: Monitoring MVT is a valuable tool for velocity-based training (2). These preliminary results suggest that resistance training experience may influence this variable; therefore, coaches should consider individualizing MVT instead of relying solely on generic theoretical values.

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TIME OF DAY INFLUENCES PHYSICAL, COGNITIVE AND TECHNICAL PERFORMANCE IN ELITE MALE TABLE TENNIS ATHLETES

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OBJECTIVES: Table tennis is an intermittent racket sport that relies on the integration of physical, cognitive, and technical abilities (1). Previous research has demonstrated that athletic performance may vary throughout the day due to circadian fluctuations in physiological and psychological functions, affecting physical performance, cognitive processes, and sport-specific technical skills (2). Thus, the aim of this study was to investigate the influence of time of day on physical, cognitive, and technical performance in elite table tennis players.

METHODS: Twenty-two international-level male table tennis players (20.1 ± 4.4 years) participated in this study. Using a randomized, counterbalanced design, participants completed a battery of physical, cognitive, and technical performance tests at three different times of day: morning (09:00 h), midday (14:00 h), and evening (19:00 h). Physical performance was assessed through vertical jump (i.e., countermovement jump height), isometric mid-thigh pull strength, isometric handgrip strength and modified 5-0-5 agility test. Cognitive performance was evaluated using reaction time, motor performance and divided attention, whereas technical performance was assessed through a sport-specific table tennis hitting test, (which measured ball speed and overall performance score).

RESULTS: Regarding physical performance, table tennis players exhibited greater countermovement jump height, isometric mid-thigh pull performance, isometric dominant handgrip strength, and ankle dorsiflexion at midday and/or in the evening compared with the morning ($p < 0.001$ – 0.016 ; $\eta^2 = 0.19$ – 0.47). In contrast, no differences were observed in non-dominant isometric handgrip strength or modified 5-0-5 agility performance ($p > 0.05$). Regarding cognitive performance, motor performance and divided attention improved in the evening compared with morning and midday ($p = 0.007$ – 0.039 ; $\eta^2 = 0.19$ – 0.25), whereas reaction time remained unchanged throughout the day ($p > 0.05$). Concerning technical performance, ball speed was higher at midday and in the evening than in the morning ($p < 0.001$; $\eta^2 = 0.41$), while performance score did not differ across the day ($p > 0.05$).

CONCLUSION: Time of day influences physical, cognitive, and technical performance in elite table tennis players, with significant differences observed at midday and in the evening compared with the morning.

PRACTICAL APPLICATIONS: The findings of this study suggest that the time of day training sessions and competitions should be considered for optimizing performance in elite table tennis players.

FUNDING: This work is part of the research project entitled "Effects of Circadian rhythms, sleep, and PER3 genotype on neuromuscular, cognitive, and technical performance in table tennis players within the framework of the Financing of Internal Research Projects 2025 funded by Universidad Pontificia Comillas (grant number: CHS-Redes-25.3).

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PREVALENCE OF LOW ENERGY AVAILABILITY AND MENSTRUAL DYSFUNCTION IN SPANISH FEMALE TRIATHLETES

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INTRODUCTION: Menstrual dysfunction (MD) constitutes one of the main clinical indicators of low energy availability (LEA) in female athletes and is considered a key component of the Relative Energy Deficiency in Sport (RED-S) model. Endurance sports such as triathlon present characteristics potentially associated with an increased risk of LEA due to their high energy demands and substantial training volumes. However, prevalence data regarding menstrual health in triathletes remains limited, particularly across different competitive levels. Therefore, the aim of this study was to analyze the prevalence of menstrual dysfunction and the risk of low energy availability in cohort of female triathletes.

METHODS: A cross-sectional observational study was conducted in 139 female triathletes holding a license from the Spanish Triathlon Federation. Data collection was carried out through a self-administered questionnaire including sociodemographic variables, training volume and intensity, and the Low Energy Availability in Females Questionnaire (LEAF-Q). Menstrual dysfunction variables included primary amenorrhea (absence of menarche by ≥ 15 years), secondary amenorrhea (absence of menstruation for ≥ 3 consecutive months), and oligomenorrhea (< 9 menstrual cycles/year or cycle length > 35 days), according to SEGO clinical guidelines and previous literature. Statistical analyses included descriptive analyses of continuous and categorical data (means $\pm$ standard deviations) and relative frequencies.

RESULTS: A total of 139 female triathletes were included in the analysis. The mean age of the sample was 25.2 ± 8.5 years, with a weekly training volume of 13.9 ± 5.7 h/week. Mean height, body weight, and body mass index were 164.9 ± 5.7 cm, 57.1 ± 5.6 kg, and 20.1 ± 1.7 kg/m², respectively. Mean age at menarche was 12.0 ± 1.2 years, while the mean age of triathlon specialization was 17.6 ± 7.9 years. The prevalence of overall menstrual dysfunction was 43.2%. Primary amenorrhea was present in 16.6% of participants, secondary amenorrhea in 34.5%, and oligomenorrhea in 11.5%. Additionally, 34.5% of the sample presented LEAF-Q scores compatible with risk of low energy availability (LEAF-Q ≥ 8).

CONCLUSION: Spanish female triathletes exhibit a high prevalence of menstrual dysfunction and risk of low energy availability. The prevalence observed in the present study appears higher than that reported in the general population, although like values previously described in endurance athletes. These findings reinforce the importance of monitoring menstrual health and screening for low energy availability in female triathletes to support both athlete health and sports performance.

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EFFECTS OF RESISTANCE TRAINING ON ISOMETRIC RATE OF FORCE DEVELOPMENT IN HEALTHY ADULT WOMEN: AN UPDATED SYSTEMATIC REVIEW

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OBJECTIVE: Although there is a review analyzing improvements after resistance training (RT) on rate of force development (RFD) from studies utilizing mixed-sex cohorts (1), no previous review has systematically evaluated the effectiveness in women. This systematic review aimed to synthesize the effectiveness of RT on RFD in healthy adult women.

METHODS: This study represents a subset of a pre-registered systematic review (CRD420261363418). A search was conducted across the Cochrane Library, PubMed, and Web of Science up to October 2025 for randomized and non-randomized studies examining effects of RT on isometric RFD and rate of torque developments in healthy adult women aged 18 to 60 years. Specific RFD measures were included: early RFD (≤ 100 ms), late RFD (>100 to 400 ms) and maximum RFD. Risk-of-bias assessments were conducted.

RESULTS: This study encompassed 10 studies and 13 interventions arms, involving 135 women performing RT (mean age range: 20.2 - 22.7 years). Only one study reported low risk of bias. The RT duration ranged from 4 to 12 weeks with a predominant training frequency of 3 days per week. The training intensity reported ranged from 40 to 95% of the one-repetition maximum. A notable heterogeneity in the RFD measures was reported with the following time windows: 20, 30, 50 80, 100, 120, 150, 180, 200 and 250 ms from the onset of the contraction. Assessments included knee extension and leg press in 3 studies; squat, plantar flexion and elbow flexion in 2 studies; and mid-thigh pull and knee flexion in 1 study. Early RFD was evaluated in 7 RT interventions, showing significant improvements in 6 of them (ranging from 6.4-72.4%). Late RFD was assessed in 8 arms, all reporting significant enhancements (7.0-69.1%). Maximum RFD was analyzed in 4 studies, with two demonstrating significant improvements (40.1-43.3%).

CONCLUSION: RT is an effective intervention to improve RFD in healthy adult women. A major evidence gap is found in RT analyzing RFD improvements in middle-aged women.

PRACTICAL APPLICATION: Practitioners should prescribe RT programs from 4 to 12 weeks, with a frequency of 3 days per week, progressing from moderate to high intensity to improve RFD in healthy young women. These improvements are crucial for enhancing performance and health.

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THE INFLUENCE OF PREGNANCY HISTORY ON MENSTRUAL SYMPTOMS IN PHYSICALLY ACTIVE WOMEN

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OBJECTIVES: To analyze the association between pregnancy history and menstrual distress in physically active women (1) and to examine the relationship between the number of pregnancies, births, and miscarriages and perceived menstrual symptoms.

METHODS: This is a preliminary cross-sectional analysis from the PERCIVIR project (2) including 78 physically active women of reproductive age (39.05 ± 4.08 y). Menstrual distress was assessed using the Menstrual Distress Questionnaire (MEDI-Q) (3) subscales: Menstrual Symptoms (MS), Menstrual Symptoms Distress (MSD), and Menstrual Specificity Index (MESI). Participants were age-matched and classified according to their pregnancy history: 1) with childbirth; 2) without childbirth/pregnancy, matched to group 1; 3) with miscarriages; 4) without childbirth/pregnancy, matched to group 3.

RESULTS: After adjusting for athletic level, women with a history of childbirth had significantly lower MS scores than those without childbirth/pregnancy and those with miscarriages (4.50 ± 0.83 vs. 7.35 ± 0.83 and 7.75 ± 1.02 , respectively), indicating fewer symptoms during menstruation. Regression analysis showed a significant negative association between the number of miscarriages and MESI score ($\beta = -0.136$), which remained significant after adjusting for athletic level ($\beta = -0.140$), reflecting a lower proportion of worsening symptoms during the menstrual phase compared to the rest of the menstrual cycle.

CONCLUSIONS: Pregnancy history appears to modulate menstrual symptoms in physically active women, regardless of their athletic level. Women with a history of childbirth presented fewer overall symptoms, especially during menstruation, while pregnancy, miscarriage numbers, is associated with less symptom worsening during the menstrual phase compared to the pre- and intermenstrual phases.

PRACTICAL APPLICATIONS: Reproductive history could be a relevant factor for individualizing menstrual health assessments in physically active women, allowing for a tailored interpretation of their symptoms and facilitating training planning and monitoring. These findings suggest the need for exercise and health professionals to incorporate reproductive history into their practice.

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PSYCHOMETRIC EVALUATION OF PHYSICAL ACTIVITY QUESTIONNAIRES DURING PREGNANCY: A PRISMA-COSMIN SYSTEMATIC REVIEW

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INTRODUCTION: Regular physical activity (PA) during pregnancy provides significant health benefits, and guidelines recommend at least 150 min of moderate-intensity aerobic exercise per week plus strength training. However, accurate assessment remains challenging because of the reliance on self-reported questionnaires and substantial heterogeneity among the available instruments (1). This review aimed to evaluate the psychometric properties, structure, and domain coverage of PA questionnaires for pregnant women in order to develop a new questionnaire.

METHODS: A systematic literature search was conducted in the PubMed, Web of Science, and EBSCO Host databases without time restrictions (from the inception of indexing to May 10, 2026), following the PRISMA-COSMIN guidelines (PROSPERO ID: CRD420251166808). The methodological quality and risk of bias were assessed using the COSMIN Risk of Bias checklist.

RESULTS: A total of 47 studies assessing 15 validated questionnaires during pregnancy were included in the review. Most tools were self-administered and primarily assessed validity, generally against accelerometers or pedometers, with poor to moderate results (2). Reliability was examined less frequently, and measurement errors and responsiveness were rarely reported (3). Among the 15 validated instruments (423 items), the content focused mainly on recreational and household activities, with limited assessment of sedentary behavior and psychosocial constructs. The overall methodological quality was low, with substantial heterogeneity in the domains, recall periods, and scoring systems.

CONCLUSION: These findings indicate that the current instruments for assessing PA during pregnancy are not psychometrically robust and underscore the need for more comprehensive, methodologically rigorous tools in this field. Improving PA assessment may facilitate more accurate exercise prescription, monitoring, and research in pregnant populations.

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HANDGRIP STRENGTH THRESHOLDS IDENTIFY DIFFERENCES IN METABOLIC CAPACITY DURING EXERCISE IN YOUNG ADULTS

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INTRODUCTION: Muscular strength is a powerful marker of health status, functional capacity, and disease risk. Handgrip strength (HGS) has been established as a valid, practical, and reliable measure of muscular strength across the lifespan, with age and sex-specific normative cut-off values available. However, the extent to which established HGS thresholds reflect differences in exercise metabolic capacity has not been well characterized.

PURPOSE: To evaluate whether HGS below age- and sex-specific thresholds is associated with lower fat and carbohydrate oxidation during exercise.

METHODS: A total of 470 young adults were classified according to sex-specific HGS thresholds corresponding to the 20th percentile of the normative values proposed by Tomkinson et al. (2025) (men, 40.5 kg; women, 24.0 kg). Cardiorespiratory fitness ($\text{VO}_{2\text{peak}}$) and metabolic response during exercise were evaluated through a maximal incremental exercise test with breath-by-breath gas analysis, with maximal fat oxidation (MFO) and maximal carbohydrate oxidation (MCHOx) estimated using indirect calorimetry Frayn's stoichiometric equations. Sex-stratified differences in metabolic outcomes were examined using independent-samples t-tests ($p < 0.05$), and effect sizes were calculated using Cohen's d.

RESULTS: Sex-stratified analyses revealed that participants with HGS values below cut-off points exhibited significantly lower MFO (women 0.228 vs 0.278 $\text{g} \cdot \text{min}^{-1}$; men: 0.368 vs 0.485 $\text{g} \cdot \text{min}^{-1}$) during the CPET compared with those above the threshold. The magnitude of these differences was moderate in women ($d = 0.56$) and large in men ($d = 0.90$). Likewise, MCHOx (g/min) was significantly reduced in the low-HGS group (women: 2.79 vs 3.23 $\text{g} \cdot \text{min}^{-1}$; men: 5.08 vs 5.64 $\text{g} \cdot \text{min}^{-1}$), with small-to-moderate effect sizes in women ($d = 0.43$) and moderate effect sizes in men ($d = 0.59$).

CONCLUSIONS: HGS below age- and sex-specific normative thresholds was associated with lower maximal fat and carbohydrate oxidation during exercise in both women and men. These findings suggest that muscle strength may reflect, in part, metabolic characteristics related to substrate utilization during exercise in young adults.

PRACTICAL APPLICATIONS: Specific HGS thresholds could help detect individuals who may benefit from targeted interventions aimed at improving muscular strength and metabolic health.

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A RESTING PHYSIOLOGICAL APPROACH TO PREDICT HYPOXIA SENSITIVITY: A PILOT STUDY

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OBJECTIVE: Recognition of the substantial inter-individual variability in responses to hypoxia has increased interest in practical approaches for characterizing hypoxia sensitivity. Simple assessments based on easily obtainable physiological responses during hypoxic exposure may help identify individual hypoxia sensitivity. Therefore, this study aimed to investigate whether resting heart rate (HR) and peripheral oxygen saturation (SpO₂) can be used to characterize hypoxia sensitivity and to explore the potential influence of sex on these relationships.

METHODS: Thirty-four adults (male = 17, female = 17) completed a cross-sectional study. Participants underwent the full Richalet test 3, from which HR and SpO₂ responses to normobaric hypoxia (fraction of inspired oxygen $\approx$ 0.115) and normoxia at rest and during exercise were collected.

RESULTS: Our model based on resting HR and SpO₂ responses to acute normobaric hypoxia was significantly associated with Richalet test hypoxia sensitivity indices in the overall sample (adjusted R²=0.25, p=0.008). However, the observed sex-specific resting physiological responses to the same acute normobaric hypoxia exhibited a faster SpO₂ decline in females (ES=-0.72) and a greater HR in males (ES = -0.81), supporting the use of sex-specific models, which improved predictive capacity in both sexes (adjusted R²=0.46, p=0.02 and adjusted R²=0.75, p<0.001 respectively).

CONCLUSIONS: Resting-based models may represent a simplified approach to assessing individual physiological responses to hypoxia. Sex-specific modelling enhanced predictive capacity, supporting the role of sex-related physiological variability in hypoxia. However, additional research is needed to strengthen the present findings.

PRACTICAL APPLICATIONS: Resting HR and SpO₂ measurements may be integrated as a simple, non-invasive tool to detect a highly sensitive response to altitude, particularly when exercise testing is not feasible. The sex-specific response patterns further suggest that uniform criteria may not be appropriate when assessing hypoxia responsiveness. This approach may be relevant for pre-exposure assessment to altitude, as well as for clinical and occupational settings involving hypoxic exposure, potentially contributing to acclimatisation strategies and decision-making.

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WITHIN-SESSION REPEATABILITY OF STATIC AND DYNAMIC INSPIRATORY MUSCLE STRENGTH ASSESSMENT IN OLDER ADULTS

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OBJECTIVE: Maximum inspiratory pressure (MIP) and S-Index assess inspiratory muscle strength (IMS) statically and dynamically, respectively. Although a learning effect requiring at least 8 maneuvers has been described for S-Index in young adults (1), this behaviour remains uncharacterized in older adults (OA). This study compared the within-session repeatability of both measures across 8 consecutive maneuvers in OA.

METHODS: Twenty OA (69.52 ± 5.59 y; MIP $n=19$: 8 men/11 women, S-Index $n=20$: 8 men/12 women) performed 8 consecutive maneuvers of MIP (MicroRPM) and S-Index (POWERbreathe K5®), with at least 30-second rest intervals, following Kowalski et al. (2), with randomized order. ICC (model 2.1, 95%CI), standard error of measurement (SEM: absolute measurement error in cmH₂O) and intra-subject CV% were calculated. CV% was compared between measures with Wilcoxon signed-rank test and Friedman test evaluated systematic trends across maneuvers.

RESULTS: Both measures showed excellent within-session reliability: MIP ICC=0.918 (95%CI 0.856–0.962) and S-Index ICC=0.917 (95%CI 0.842–0.963). SEM was 7.8 cmH₂O for MIP and 7.3 cmH₂O for S-Index. Intra-subject CV% did not differ significantly between measures (MIP=12.8±12.7%, S-Index=9.1±4.1%; $p=0.891$). However, systematic trends differed markedly: MIP remained stable across all 8 maneuvers ($\chi^2=1.90$, $p=0.965$), while S-Index increased significantly ($\chi^2=44.53$, $p<0.001$), rising 13% from maneuver 1 to maneuver 7, stabilizing from maneuver 5 onwards.

CONCLUSIONS: Despite equivalent ICC and SEM, MIP was stable from the first maneuver, contrasting with the learning effect previously described for MIP in young adults (3), while S-Index showed a significant learning effect (~13% underestimation) stabilizing around repetition 5. As both measures followed the same warm-up, this reflects an intrinsic characteristic of the dynamic maneuver rather than insufficient familiarization.

PRACTICAL APPLICATIONS: Preliminary evidence suggests that S-index values from the first 4 test maneuvers may underestimate true IMS in OA even after extensive warm-up, with stabilization occurring at repetition 5. MIP appears more practical when session time is limited. Changes below 7-8 cmH₂O in either measure should be interpreted with caution.

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NEVER TOO OLD TO LIFT: WEIGHTLIFTING PERFORMANCE, SKELETAL MUSCLE SIZE AND NEUROMUSCULAR FUNCTION IN A 77-YEAR-OLD SPANISH RECORD HOLDER

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OBJECTIVE: Research on resistance athletes aged >75 years may reveal how regular heavy resistance training affects age-related decline in muscle mass and function. However, studies involving this population remain poorly explored. This study aimed to investigate how lifelong resistance training affects the age-related decline in muscle mass and function in a case study.

METHODS: This study assessed the oldest weightlifter competing at the 2026 Spanish Master Championship (age: 77 years old; height: 1.66 m; body mass: 78.4 kg; weightlifting experience: 32 years, former absolute national record holder in 1973 [280 kg weightlifting total (WT)]). The subject currently holds the Spanish master records in the M75 category (88 kg weight class) with a WT of 116 kg. Body composition was analyzed using bioelectrical impedance. Anatomical cross sectional area (CSA) of the rectus femoris (RF) and vastus lateralis (VL) muscles at different femur distances, and VL muscle volume were measured using ultrasonography. The 30-s sit-to-stand (STS) power was assessed using equations (1). Countermovement jump (CMJ) height and peak force in the isometric start position pull (ISPP) (2) were measured with a force plate. Power and force data were normalized by body mass.

RESULTS: The subject won the M75 category (79 kg weight class), lifting 45 kg in the Snatch and 57 kg in the Clean & Jerk (102 kg WT). Bioimpedance revealed a fat mass of 14.0 kg (17.9%) and a lean mass of 61.2 kg (78.1%). RF and VL CSAs at 35% (proximal), 50%, and 65% (distal) were 6.4 and 17.4, 4.6 and 17.0, and 1.5 and 10.8 cm², respectively. VL muscle volume was 329.4 cm³. Absolute, allometric and relative STS power were 358.6 W, 130.1 W·m⁻² and 4.6 W·kg⁻¹. CMJ height was 15.9 cm, while absolute and relative ISPP peak force were 1663.0 N and 21.21 N·kg⁻¹, respectively.

CONCLUSION: Excellent muscle function and preserved muscle mass are physiologically plausible even in population >75 years.

PRACTICAL APPLICATION: Long-term structured resistance training allows older individuals successfully sustain competitive master weightlifting performance even at 77 years of age.

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KNEE EXTENSOR STRENGTH AND SPASTICITY IN PEOPLE WITH MULTIPLE SCLEROSIS

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OBJECTIVE: Lower-extremity strength is a key determinant of physical function in people with multiple sclerosis (1,2), yet its relationship with patient-perceived spasticity is not well established. This study investigated the associations between knee-extensor strength, functional mobility, disability, and perceived spasticity.

METHODS: Eighty-seven adults with multiple sclerosis (61 women, 26 men) participating in a regional strength-training program were included in this cross-sectional study. Disability was assessed using the Expanded Disability Status Scale (EDSS). Bilateral knee-extensor strength was evaluated by maximal voluntary isometric contraction (MVIC) and one-repetition maximum (1RM) using a leg-extension machine. Functional mobility was assessed with the Timed Up and Go (TUG) and Five Times Sit-to-Stand (5STS) tests, while perceived spasticity was evaluated using the Multiple Sclerosis Spasticity Scale-88 (MSSS-88) (3). Group comparisons were performed using nonparametric tests, and associations were examined using Spearman's rank correlation coefficients. All participants provided written informed consent.

RESULTS: Using sex-standardized strength scores, higher disability (EDSS) was associated with lower knee-extensor strength (1RM: $\rho = -0.554$; MVIC: $\rho = -0.511$) and poorer functional mobility (5STS: $\rho = 0.777$; TUG: $\rho = 0.625$), as well as greater perceived spasticity (MSSS-88: $\rho = 0.669$) (all $p < 0.01$). Greater perceived spasticity was also associated with lower knee-extensor strength (1RM: $\rho = -0.475$; MVIC: $\rho = -0.421$) and poorer mobility (5STS: $\rho = 0.576$; TUG: $\rho = 0.403$) (all $p < 0.01$).

CONCLUSIONS: Lower knee-extensor strength was associated with greater perceived spasticity and poorer functional mobility in people with multiple sclerosis. The combined assessment of 1RM, TUG, 5STS, and MSSS-88 provides a more comprehensive characterization of functional status than the assessment of any single measure alone.

PRACTICAL APPLICATIONS: These findings support the routine assessment of knee-extensor strength to guide individualized resistance training in people with multiple sclerosis. Strength training interventions targeting the knee extensors may help improve functional mobility, although their effects on perceived spasticity require confirmation in longitudinal and intervention studies.

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WALKING FOOTBALL AS ECOLOGICAL MODEL FOR MUSCLE HEALTH AND FUNCTIONAL CAPACITY IN ADULTS ≥50: PILOT-STUDY

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OBJECTIVES: Walking Football (WF) has emerged as an innovative and accessible strategy to promote health, physical activity, and social interaction among older adults. By adapting traditional football rules to eliminate running and high-impact actions, WF provides a safe environment for participation while preserving the physical, psychological, and social benefits associated with team sports (2,3). Its practice may help maintain functional capacity and encourage long-term adherence to exercise in real-world settings (3); however, evidence under non-intervention conditions remains limited. Objective: To assess changes in body composition, muscle quality (MQ), and functional capacity in WF players after 8 weeks of regular training.

METHODS: A longitudinal observational study with repeated measures was conducted in WF players aged over 50 years. Assessments were performed at the beginning of the season (T1) and after 8 weeks (T2), without modifying participants' habitual training routines. Body composition was evaluated using bioelectrical impedance analysis (TANITA®), isometric strength through the Handgrip test, lower-limb functionality via a countermovement jump (CMJ) using a Chronojump® platform, flexibility using the Sit-and-Reach test, and muscle quality (MQ), calculated as the ratio between handgrip strength and appendicular skeletal muscle mass (ASM). Due to the lack of standardized cut-off points, MQ was classified into tertiles (low, medium, high). Participants also completed questionnaires assessing cardiovascular risk (ACSM) and adherence to the Mediterranean diet (PREDIMED). Statistical significance was set at $p \leq 0.05$.

RESULTS: Sixteen players were included (80% male with a median age of 55.5 years). At baseline, median body weight was 83.5 kg (76.4–90.7), BMI was 29.9 kg/m² (27.3–32.5), body fat percentage was 29.4% (24.7–34.1), and MQ was 1.57 (medium category). Moderate adherence to the Mediterranean diet was observed in most participants. After 8 weeks, a significant reduction in BF% was found ($p=0.0019$). Flexibility improved significantly ($p=0.046$), whereas CMJ performance decreased significantly ($p=0.0001$). No significant changes were observed in the remaining variables; however, their maintenance over time may be considered clinically relevant in this age group.

CONCLUSIONS: WF may represent an effective, safe, and accessible strategy to improve body composition and selected aspects of functional capacity in older adults. The observed improvements in body fat and flexibility after 8 weeks highlight its potential to support healthy aging, preserve physical function, and promote social participation in community settings (2,3).

PRACTICAL APPLICATIONS: This pilot study characterizes older Walking Football players in a real-world context, providing baseline data to support the design of future larger and more controlled studies.

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