

# **XII SIMPOSIO INTERNACIONAL DE FUERZA Y PROYECTO IronFEMME I NSCA Spain NATIONAL CONFERENCE**

***XII International Symposium in Strength Training and  
IronFEMME Study  
I NSCA Spain NATIONAL CONFERENCE***

**Editores/Editors:** Ana B. Peinado, Pedro J. Benito, Rocío Cupeiro & Francisco J. Calderón



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Departamento de Salud y Rendimiento Humano

NSCA-Spain

XII Simposio Internacional de Fuerza y Proyecto IronFEMME  
I NSCA Spain National Conference  
Madrid, 13-14 de diciembre 2019

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## PRÓLOGO

En un mundo donde la información ya es desbordante, lo relevante no es la cantidad de información, si no la calidad y la priorización en el uso de nuestro tiempo disponible. Por eso, invertir cada año un fin de semana de diciembre para compartir experiencias y conocimiento se ha vuelto una tradición. Como la amistad y el buen turrón, el Simposio de Fuerza “vuelve por navidad” para hacernos un poquito más felices y mejorar nuestro conocimiento, en el apasionante mundo de las Ciencias del Deporte.

Cumplimos doce años ya haciendo este congreso y cada año damos un paso más, para seguir aunando ciencia y práctica, en ese equilibrio inestable que ambas disciplinas mantienen. Pocos eventos resisten el paso del tiempo y a veces, las dificultades logísticas ponen en entredicho nuestras posibilidades, pero la suerte está con nosotros y nos permite seguir realizando este evento otro año más.

Vivimos con especial orgullo esta edición, dedicada a profundizar en el conocimiento de la fisiología femenina y potenciando la ciencia en las mujeres, llenos de ilusión por trabajar con compañeras tan capaces en este desempeño y contribuyendo a mejorar el conocimiento en este campo.

Nuestros compañeros de viaje, NSCA spain, celebran su primera National Conference, en un nuevo proyecto que nos ayuda a mejorar a todos. Contribuyendo de forma determinante en la mejora de la calidad de nuestro evento, con la publicación de los trabajos seleccionados por nuestro Comité Científico, en el Journal of Strength and Conditioning Research, todo un privilegio para los mejores trabajos.

Contar con vuestra presencia nos ayuda a seguir esforzándonos, y este año por primera vez presentamos dos workshops nuevos que añaden práctica al evento. Espero que lo disfrutéis tanto como nosotros lo hacemos al prepararlo.

Muchas gracias por estar un año más aquí.

Pedro J. Benito Peinado

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## **PREFACE**

*In a world where the information is already overflowing, what is relevant is not the quantity of information rather the quality and prioritization in the use of our available time. Therefore, investing a December weekend each year to share experiences and knowledge has become a tradition. Like friendship and good nougat, the International Symposium of Strength Training "returns for Christmas" to make us a little happier and improve our knowledge in the exciting world of Sports Sciences.*

*We are celebrating twelve years already doing this congress, and every year we take one more step to continue uniting science and practice in that unstable balance that both disciplines maintain. Few events stand the test of time and sometimes logistical difficulties call into question our possibilities, but luck is with us and allows us to continue this event another year.*

*We live with special pride this edition, dedicated to deepening the knowledge of female physiology and enhancing science in women, full of illusion to work with colleagues so capable in this performance and contributing to improve knowledge in this field.*

*Our travelling companions, NSCA Spain, celebrate their first National Conference in a new project that helps us all to improve. Contributing in a decisive way in the improvement of the quality of our event with the publication of the works selected by our Scientific Committee, in the Journal of Strength and Conditioning Research, a privilege for the best works.*

*Having you here helps us to continue working, and this year for the first time we present two new workshops that add practice to the event. I hope you enjoy it as much as we do preparing it.*

*Thank you very much for coming here one more year.*

Pedro J. Benito Peinado

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## 1. Presentación del Simposio

Novedades muy interesantes os esperan este año, ya que celebramos muchas actualizaciones.

Las compañeras del LFE Research Group, la Dra. Peinado y la Dra. Cupeiro, nos mostrarán los resultados más relevantes del proyecto IronFEMME, por lo que aprenderemos mucho sobre el metabolismo del hierro y el daño muscular en mujeres deportistas.

Este año tendremos el placer de escuchar a Sergio Espinar hablarnos de los aspectos más actuales sobre Nutrición Deportiva. Además, contaremos por primera vez con una ponencia sobre Psicología del Deporte que será impartida por Manuela Rodríguez Marote. Un eminente ginecólogo, el Dr. José Luis Neyro, nos explicará con detalle cómo funciona el ciclo menstrual femenino y la investigadora australiana Xanne Janse de Jonge, nos hablará del entrenamiento de fuerza en mujeres. También se tocará el tema del envejecimiento saludable con nuestro compañero y amigo David Jiménez Pavón.

Intentando siempre mantener actualizados a nuestros entrenadores y compañeros de profesión, David Marchante nos hablará sobre las claves del entrenador en el mundo digital. Un regalo para todos los seguidores de Power Explosive.

Nuestros ponentes internacionales son de excepción. De NSCA USA nos visitan tres importantes científicos/entrenadores. Travis Triplett es la primera presidenta de la National Strength and Conditioning Association (NSCA) y una científica muy reputada. También vendrá a visitarnos Ian Jeffreys, un magnífico profesor y entrenador que ha escrito libros que todos estudiamos.

Uno de los mejores cardiólogos del mundo hablará sobre la muerte súbita y sus factores asociados, se trata del doctor Carl J. Lavie.

También está confirmada la temática de la mesa redonda: embarazo y postparto; donde se establecerán los riesgos y beneficios del deporte

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en este aspecto. En cuanto a los workshops, tendremos la inmensa suerte de contar con Raquel López y Elisa García de MAMIfit para impartirnos un taller práctico de suelo pélvico. También estará el Dr. Butragueño, que hablará en otro workshop sobre trabajo práctico con obesos...

Todo el equipo científico y organizador del SDF estamos deseando recibiros en esta duodécima edición tan especial del Simposio Internacional de Actualizaciones en Entrenamiento de la Fuerza y I NSCA Spain National Conference.

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## **1. Symposium Presentation**

*Very interesting news are waiting for you this year, as we celebrate many updates in Strength Training.*

*The IronFEMME project, managed impeccably by Ana Belén Peinado Lozano and Rocío Cupeiro Coto, will show us the latest and most relevant results about iron metabolism and muscle damage in female athletes.*

*This year we will have the pleasure of listening to Sergio Espinar talk to us about the most current aspects of Sports Nutrition. In addition, we will have for the first time a presentation on Sports Psychology to be given by Manuela Rodríguez Marote. An eminent gynaecologist, Dr. José Luis Neyro, will explain in detail how the female menstrual cycle works and the Australian researcher Xanne Janse de Jonge, will talk to us about strength training in women. The topic of healthy aging will also be discussed with our colleague and friend David Jiménez Pavón.*

*Always trying to keep our coaches and colleagues up to date, David Marchante will talk to us about the keys of the coach in the digital world. A gift for all Power Explosive fans.*

*Our international speakers are exceptional. From NSCA USA we are visited by three important scientists/coaches. Travis Triplett is the first president of the National Strength and Conditioning Association (NSCA) and a highly regarded scientist. Also coming to visit us is Ian Jeffreys, a great teacher and coach who has written books that we all study.*

*A world-class cardiologist will talk about sudden death and its associated factors, Dr. Carl J. Lavie.*

*The topic of the round table is also confirmed: pregnancy and postpartum; where the risks and benefits of sport in this aspect will be established. As for the workshops, we will have the immense luck of having Raquel López and Elisa García from MAMIfit to give us a*

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*practical pelvic floor workshop. There will also be Dr. Butragueño, who will speak at another workshop on practical work with obese people...*

*All the SDF organizer and scientific team are looking forward to receiving you in this twelfth special edition of the International Symposium in Strength Training and I NSCA Spain National Conference.*

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## 2. Dirección, Comité Científico y Organización

### **Directores**

Dr. Pedro J. Benito Peinado y Dr. Francisco Javier Calderón Montero.

### **Comité Científico**

Presidente: Dra. Ana Belén Peinado Lozano.

Secretaria: Dra. Rocío Cupeiro Coto.

Miembros: Dra. Marcela González-Gross, Dr. Azael Herrero Alonso, Dr. Jacobo Ángel Rubio Arias, Dr. David García López, Dr. Javier Butragueño Revenga, Dr. Miguel Angel Rojo Tirado, Dr. Antonio García de Alcaraz Serrano, Dra. Barbara Szendrei, Dra. Eliane Aparecida de Castro, Dr. Alejandro San Juan Ferrer, Dr. Carlos Balsalobre Fernández y Dra. Amelia Guadalupe Grau.

### **Comité Organizador**

Dra. Ana Belén Peinado Lozano, Dr. Pedro J. Benito Peinado, Dra. Rocío Cupeiro Coto, Dr. Javier Butragueño Revenga, Dr. Miguel Angel Rojo Tirado, Dr. Antonio García de Alcaraz Serrano, Dr. Jacobo Ángel Rubio Arias, D. Iván Gonzalo Martínez, Dra. Barbara Szendrei, Dra. Laura Barba Moreno, Dra. Amelia Guadalupe Grau, Dña. Nuria Romero Parra, Dr. Alejandro San Juan Ferrer, Dña. Beatriz Rael Delgado, D. Víctor Manuel Alfaro Magallanes, Dra. Cristina Maestre Cascales, Dña. Patricia López Navarro, Dña. Lara Pablos Martínez (NSCA-Spain), D. Ismael Parrilla (NSCA-Spain), Dña. Isabel Guerra Quesada (NSCA-Spain), D. Jorge Sánchez Carrillo (NSCA-Spain).

### **Secretario Administrativo**

D. Carlos Monedero Pérez.

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## **2. Direction, Scientific and Organizing Committee**

### ***Directors***

Dr. Pedro J. Benito Peinado and Dr. Francisco Javier Calderón Montero.

### ***Scientific Committee***

*President:* Dr. Ana Belén Peinado Lozano.

*Secretary:* Dr. Rocío Cupeiro Coto.

*Members:* Dr. Marcela González-Gross, Dr. Azael Herrero Alonso, Dr. Jacobo Ángel Rubio Arias, Dr. David García López, Dr. Javier Butragueño Revenga, Dr. Miguel Angel Rojo Tirado, Dr. Antonio García de Alcaraz Serrano, Dr. Barbara Szendrei, Dr. Eliane Aparecida de Castro, Dr. Alejandro San Juan Ferrer, Dr. Carlos Balsalobre Fernández and Dr. Amelia Guadalupe Grau.

### ***Organizing Committee***

Dr. Ana Belén Peinado Lozano, Dr. Pedro J. Benito Peinado, Dr. Rocío Cupeiro Coto, Dr. Javier Butragueño Revenga, Dr. Miguel Angel Rojo Tirado, Dr. Antonio García de Alcaraz Serrano, Dr. Jacobo Ángel Rubio Arias, D. Iván Gonzalo Martínez, Dr. Barbara Szendrei, Dr. Laura Barba Moreno, Dr. Amelia Guadalupe Grau, Ms. Nuria Romero Parra, Dr. Alejandro San Juan Ferrer, Ms. Beatriz Rael Delgado, Mr. Víctor Manuel Alfaro Magallanes, Dr. Cristina Maestre Cascales, Ms. Patricia López Navarro, Ms. Lara Pablos Martínez (NSCA-Spain), Mr. Ismael Parrilla (NSCA-Spain), Ms. Isabel Guerra Quesada (NSCA-Spain), Mr. Jorge Sánchez Carrillo (NSCA-Spain).

### ***Congress secretary***

Mr. Carlos Monedero Pérez.

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**3. Programa científico / *Scientific Program***

Horario / Time	VIERNES / FRIDAY
8:30 - 9:00	Acreditación / Registration
9:00 - 10:30	Comunicaciones orales 1 / Oral presentations 1
10:30 - 11:30	NUTRICIÓN EN LA MUJER DEPORTISTA: DE LA TEORÍA A LA PRÁCTICA Sergio Espinar
11:30 - 12:00	DESCANSO / BREAK / Poster presentations
12:00 - 1:00	LIDERAR A MUJERES DEPORTISTAS Manuela Rodríguez Marote
1:00 - 2:00	CLAVES PARA EL ENTRENADOR EN EL MUNDO DIGITAL David Marchante (Power Explosive)
2:00 - 3:30	COMIDA / LUNCH WORKSHOPS
3:30 - 5:30	APERTURA DEL SIMPOSIO / OPEN CEREMONY PROYECTO IronFEMME Equipo de investigadores proyecto
5:30 - 6:00	Comunicaciones orales 2 / Oral presentations 2
6:00 - 6:30	DESCANSO / BREAK / Poster presentations
6:30 - 7:30	FISIOPATOLOGÍA DE LA MUJER DEPORTISTA José Luis Neyro
7:30 - 9:00	MESA REDONDA / ROUND TABLE: EMBARAZO Y POSTPARTO Raquel López y Elisa García (MAMIfit) Lidia Romero (OWA)

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<b>Horario</b>	<b>SÁBADO 14</b>
<b>8:30 a 9</b>	Acreditación
<b>9 a 9:30</b>	Comunicaciones orales 3
<b>9:30 a 10:30</b>	SPECIAL CONSIDERATIONS FOR PHYSICAL TRAINING IN WOMEN Travis Triplett
<b>10:30 a 11:30</b>	AGILITY DEVELOPMENT - BLIND ALLEYS, WRONG TURNS AND NAVIGATING THE WORLD OF THE UNKNOWN Ian Jeffreys
<b>11:30 a 12</b>	DESCANSO / PÓSTERES
<b>12 a 13</b>	ACUTE AND CHRONIC RESPONSES TO RESISTANCE TRAINING IN REPRODUCTIVE AGED FEMALES Xanne Janse de Jonge
<b>13 a 14</b>	ENTRENAMIENTO EN MUJERES POSTMENOPÁUSICAS Alberto García Bataller
<b>14 a 15:30</b>	COMIDA Y WORKSHOPS
<b>15:30 a 16:30</b>	EJERCICIO Y ENVEJECIMIENTO SALUDABLE David Jiménez Pavón
<b>16:30 a 17:30</b>	CARDIORESPIRATORY FITNESS AND SUDDEN CARDIAC DEATH: EFFICACY, DOSING, SAFETY AND TOXICITY OF THE EXERCISE Carl J. Lavie
<b>17:30 a 18</b>	Comunicaciones orales 4
<b>18 a 18:30</b>	DESCANSO
<b>18:30 a 19:30</b>	Conclusiones, entrega de premios y clausura del Simposio
<b>19:30 a 21</b>	THE ROLE OF A MIND-MUSCLE CONNECTION IN RESISTANCE TRAINING. SQUAT PROGRESSIONS AND VARIATIONS TO BUILD MUSCULAR STRENGTH Rachel Larson

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**4. Programa ampliado / Extended Program**

**VIERNES, 13 DE DICIEMBRE / FRIDAY, DECEMBER 13**

<b>Descripción <i>Description</i></b>	<b>Hora <i>Time</i></b>	<b>Lugar <i>Location</i></b>	<b>Idioma <i>Language</i></b>
<b>Acreditación <i>Registration</i></b>	8:30-9:00 am		
<b>Comunicaciones orales 1 <i>Oral Presentations 1</i></b>	9:00-10:30 am	Auditorio	Spanish/ English
1. Menstrual cycle influence on oxygen consumption and ventilation in physically active women during an intervallic running protocol <b>Laura Barba Moreno</b>	9:00-9:15		
2. Role of cardiorespiratory fitness and muscular strength in maximal fat oxidation in young adults <b>Edgardo Opazo Díaz</b>	9:15-9:30		
3. Comparación de la respuesta mecánica y la velocidad entre dos métodos de entrenamiento de fuerza <b>Pilar Sánchez</b>	9:30-9:45		
4. Step frequency and length alterations during repeated sprint test in elite female hockey players <b>Pablo González Frutos</b>	9:45-10:00		
5. Efecto agudo de la hipertermia sobre la fuerza máxima sujetos no entrenados <b>Ignacio Bartolomé Sánchez</b>	10:00-10:15		

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6. A pilot study examining the effects of menstrual cycle-based training versus traditional undulating program on body composition and strength in resistance-trained women <b>Salvador Vargas Molina</b>	10:15-10:30		
<b>NUTRICIÓN EN LA MUJER DEPORTISTA: DE LA TEORÍA A LA PRÁCTICA</b>  <b>Sergio Espinar</b>	10:30-11:30 pm	Auditorio	Spanish
<b>PÓSTERES/POSTERS DESCANSO/BREAK</b>	11:30-12:00 pm		Spanish/ English
<b>LIDERAR A MUJERES DEPORTISTAS</b>  <b>Manuela Rodríguez Marote</b>	12:00-1:00 pm	Auditorio	Spanish
<b>CLAVES PARA EL ENTRENADOR EN EL MUNDO DIGITAL</b>  <b>David Marchante</b>	1:00-2:00 pm	Auditorio	Spanish
<b>COMIDA/LUNCH</b>  <b>WORKSHOPS 1* y 2*</b>	2:00- 3:30 pm		Spanish

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<b>APERTURA DEL SIMPOSIO OPEN CEREMONY</b>			
<b>PROYECTO IronFEMME</b> <b>Equipo de investigadores del proyecto</b>	3:30- 5:30 pm	Auditorio	Spanish
<b>Comunicaciones orales 2</b> <b>Oral Presentations 2</b>	5:30-6:00 pm	Auditorio	Spanish/ English
7. Effect of a strength exercise program on muscle function in children with CF: preliminary results <b>Fernando Cobo Vicente-Arche</b>	5:30-5:45		
8. Comparison of maximal aerobic speed obtained in a treadmill or a track test in middle-distance women runners <b>Luis Alberto Marco Contreras</b>	5:45-6:00		
<b>PÓSTERES/POSTERS</b> <b>DESCANSO/BREAK</b>	6:00-6:30 pm		Spanish/ English
<b>FISIOPATOLOGÍA DE LA MUJER DEPORTISTA</b> <b>José Luis Neyro</b>	6:30-7:30 pm	Auditorio	Spanish
<b>MESA REDONDA</b> <b>ROUND TABLE</b> <b>EMBARAZO Y POSTPARTO</b> <b>Raquel López, Elisa García y Lidia Romero</b>	7:30-9:00 pm	Auditorio	Spanish

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**WORKSHOP 1\* SUELO PÉLVICO**

**ELISA GARCÍA (MAMIfit)**

**Lugar/Location: Auditorio**

**WORKSHOP 2\* ENTRENAMIENTO, MUJER Y OBESIDAD**

**JAVIER BUTRAGUEÑO (OMS)**

**Lugar/Location: Gimnasio INEF (sótano)**

En los workshops el aforo es limitado a los inscritos en la actividad, excepto si el evento tiene lugar en el Auditorio, donde podrán asistir como oyentes todos los interesados inscritos al Simposio.

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**SÁBADO, 14 DE DICIEMBRE / SATURDAY, DECEMBER 14**

Descripción <i>Description</i>	Hora <i>Time</i>	Lugar <i>Location</i>	Idioma <i>Language</i>
<b>Acreditación <i>Registration</i></b>	8:30-9:00 am		
<b>Comunicaciones orales 3 <i>Oral Presentations 3</i></b>	9:00-9:30 am	Auditorio	Spanish/ English
9. Bone mineral density in well-trained females <b>Beatriz Rael Delgado</b>	9:00-9:15		
10. Acute moderate altitude effect on metabolic response after a hypertrophy-oriented resistance training session <b>Cristina Benavente Bardera</b>	9:15-9:30		
<b>SPECIAL CONSIDERATIONS FOR PHYSICAL TRAINING IN WOMEN</b> <b>Travis Triplett</b>	9:30-10:30 am	Auditorio	English (Traducida)
<b>AGILITY DEVELOPMENT - BLIND ALLEYS, WRONG TURNS AND NAVIGATING THE WORLD OF THE UNKNOWN</b> <b>Ian Jeffreys</b>	10:30-11:30 am	Auditorio	English (Traducida)
<b>PÓSTERES/POSTERS</b> <b>DESCANSO/BREAK</b>	11:30 - 12:00 pm		Spanish/English

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<b>ACUTE AND CHRONIC RESPONSES TO RESISTANCE TRAINING IN REPRODUCTIVE AGED FEMALES</b>  <b>Xanne Janse de Jonge</b>	12:00- 1:00 pm	Auditorio	English (Traducida)
<b>ENTRENAMIENTO EN MUJERES POSTMENOPÁUSICAS</b>  <b>Alberto García Bataller</b>	1:00-2:00 pm	Auditorio	Spanish
<b>COMIDA/LUNCH</b>  <b>WORKSHOPS 1* y 2*</b>	2:00- 3:30 pm		Spanish
<b>EJERCICIO Y ENVEJECIMIENTO SALUDABLE</b>  <b>David Jiménez Pavón</b>	3:30-4:30 pm	Auditorio	Spanish
<b>CARDIORESPIRATORY FITNESS AND SUDDEN CARDIAC DEATH: EFFICACY, DOSING, SAFETY AND TOXICITY OF THE EXERCISE</b>  <b>Carl J. Lavie</b>	4:30-5:30 pm	Auditorio	English (Traducida)
<b>Comunicaciones orales 4</b> <b><i>Oral Presentations 4</i></b>	5:30-6:00 pm	Auditorio	Spanish/ English

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11. The influence of pre-pregnancy physical activity levels on cardiac function during pregnancy <b>Olga Roldán Reoyo</b>	05:30-05:45		
12. Eccentric Overload Training in youth team female athletes: training conditions and relationship with performance changes <b>Algirdas Stuknys</b>	05:45-06:00		
DESCANSO/BREAK	6:00 -6:30 pm		
<b>Conclusiones, entrega de premios y clausura del Simposio</b>  <i>Conclusions, Awards and Closing Ceremony</i>	6:30-7:30 pm	Auditorio	Spanish
<b>THE ROLE OF A MIND-MUSCLE CONNECTION IN RESISTANCE TRAINING. SQUAT PROGRESSIONS AND VARIATIONS TO BUILD MUSCULAR STRENGTH</b>  <b>Rachel Larson</b>	07:30-09:00 pm	Auditorio	English (Traducida)

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**WORKSHOP 1\* SUELO PÉLVICO**

**ELISA GARCÍA (MAMILfit)**

**Lugar/Location: Sala de Expresión (sótano)**

**WORKSHOP 2\* ENTRENAMIENTO, MUJER Y OBESIDAD**

**JAVIER BUTRAGUEÑO (OMS)**

**Lugar/Location: Auditorio**

En los workshops el aforo es limitado a los inscritos en la actividad, excepto si el evento tiene lugar en el Auditorio, donde podrán asistir como oyentes todos los interesados inscritos al Simposio.

## 5. Ponentes Internacionales / International Speakers



**Dr. Carl J. Lavie**

**John Ochsner Heart and Vascular Institute  
Ochsner Clinical School  
The University of Queensland School of  
Medicine  
New Orleans, USA**

*Dr. Lavie graduated from Louisiana State University Medical School in 1983 and completed internal medicine residency at Ochsner and fellowship in cardiovascular diseases at Mayo Clinic. Lavie's research interests include cardiac rehabilitation and prevention, lipids, hypertension, obesity, and exercise, as well as noninvasive testing, encompassing echocardiography, exercise testing, and nuclear cardiology. He is the author of over 1000 medical publications including two cardiology textbooks, and nearly 60 book chapters, and nearly 775 listed currently on Pub Med. Dr. Lavie serves as a frequent lecturer, reviewer for several medical journals, and is Associate Editor and Cardiovascular Section Editor of the Mayo Clinic Proceedings and is Editor in Chief of Progress in Cardiovascular Diseases and Associate Editor of Current Problems in Cardiology and Progress in Preventive Medicine and serves on the Editorial Boards of the Journal of the American College of Cardiology, American Journal of Cardiology, Heart, Canadian Journal of Cardiology, Sports Medicine, Journal of Cardiopulmonary Rehabilitation Prevention, and 35 other Journals. In 2019, he won the first John Ochsner Award and was named Ochsner Alumnus of the Year. From a personal stand-point, he is an avid sports fan and competitive runner, with personal records in the 5K, 10K, Half-Marathon and Marathon. He is the author of "The Obesity Paradox" released April, 2014.*

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El Dr. Lavie se graduó de la Facultad de Medicina de la Universidad Estatal de Louisiana en 1983 y completó su residencia en medicina interna en Ochsner y su especialización en enfermedades cardiovasculares en la Clínica Mayo. Los intereses de investigación de Lavie incluyen rehabilitación y prevención cardíaca, lípidos, hipertensión, obesidad y ejercicio, así como pruebas no invasivas, que incluyen ecocardiografía, evaluación del ejercicio y cardiología nuclear. Es autor de más de 1000 publicaciones médicas, incluyendo dos libros de texto de cardiología, y casi 60 capítulos de libros, y casi 775 publicaciones indexadas actualmente en PubMed. El Dr. Lavie es frecuentemente invitado como conferencante, revisor de varias revistas médicas, editor asociado y editor de la Sección Cardiovascular de Mayo Clinic Proceedings y es editor jefe de Progress in Cardiovascular Diseases, así como editor asociado de Current Problems in Cardiology and Progress in Preventive Medicine, y es miembro de las juntas editoriales de la Journal of the American College of Cardiology, American Journal of Cardiology, Heart, Canadian Journal of Cardiology, Sports Medicine, Journal of Cardiopulmonary Rehabilitation Prevention y otras 35 revistas. En 2019, ganó el primer premio John Ochsner y fue nombrado alumno del año de Ochsner. Desde un punto de vista personal, es un ávido aficionado a los deportes y corredor de competición, con récords personales en las pruebas de 5K, 10K, Media Maratón y Maratón. Es autor de "The Obesity Paradox", publicado en abril de 2014.

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**Dr. Xanne Janse De Jonge**  
Lecturer Exercise and Sport Science  
University of Newcastle, Australia

*Xanne Janse de Jonge is an academic in Exercise and Sport Science at The University of Newcastle Australia. Her main area of research is the effects of female hormones on exercise performance. Throughout ovulatory menstrual cycles women are exposed to continuously changing female steroid hormone profiles. The use of oral contraceptives suppresses these natural fluctuations, but introduces exogenous female hormones. The physiological changes accompanying these hormone fluctuations may affect exercise performance. Areas of focus in her initial menstrual cycle research were temperature regulation, endurance performance, aerobic performance and muscle function. Since then Xanne has focussed more on muscle function and she is also interested in assessing if the "trainability" of females is affected by the fluctuations in female steroid hormones. For example, should resistance training programs for females be adapted to their menstrual cycle? Xanne's research focuses on effects of both the endogenous hormones fluctuations of the menstrual cycle, as well as the effects of exogenous female hormones in oral contraceptives. Besides her research publications, Xanne has also written several reviews on female hormones and exercise performance, including one focusing on the important methodological considerations for menstrual cycle research. It has been great to see interest and research in this area growing over recent years, but there are still many conflicting findings and countless questions to be answered. This topic not only affects sports performance, but has wider implications. For example, in 2017 Xanne was invited to present at the International Congress on*

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*Soldiers' Physical Performance on the biological aspects of gender integration on military performance. It is great to see that this important area of research is getting more attention and next year Xanne will be presenting a symposium on "Muscle function and resistance training adaptations in females throughout the life span" at the European College of Sports Science conference.*

Xanne Janse de Jonge es profesora de Ejercicio y Ciencia del Deporte en la Universidad de Newcastle, Australia. Su principal área de investigación son los efectos de las hormonas femeninas en el rendimiento deportivo. A lo largo de los ciclos menstruales ovulatorios, las mujeres están expuestas a cambios continuos en el perfil de las hormonas esteroideas femeninas. El uso de anticonceptivos orales suprime estas fluctuaciones naturales, pero introduce hormonas femeninas exógenas. Los cambios fisiológicos que acompañan a estas fluctuaciones hormonales pueden afectar el rendimiento Deportivo. Las áreas de enfoque en su investigación inicial del ciclo menstrual fueron la regulación de la temperatura, el rendimiento de resistencia, el rendimiento aeróbico y la función muscular. Desde entonces, Xanne se ha centrado más en la función muscular y también está interesada en evaluar si la "entrenabilidad" de las mujeres se ve afectada por las fluctuaciones de las hormonas esteroideas femeninas. Por ejemplo, ¿deberían los programas de entrenamiento de resistencia para mujeres adaptarse a su ciclo menstrual? La investigación de Xanne se centra en los efectos de las fluctuaciones hormonales endógenas del ciclo menstrual, así como en los efectos de las hormonas femeninas exógenas en los anticonceptivos orales. Además de sus publicaciones de investigación, Xanne también ha escrito varias revisiones sobre las hormonas femeninas y el rendimiento del ejercicio, incluyendo una que se centra en las importantes consideraciones metodológicas para la investigación del ciclo menstrual. Por ejemplo, en 2017 Xanne fue invitada a presentar en el Congreso Internacional sobre el Desempeño Físico de los Soldados sobre los aspectos biológicos de la integración de género en el desempeño militar.

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**Dr. Travis Triplett**  
President of the National Strength and  
Conditioning Association (NSCA)  
Appalachian State University, USA

*N. Travis Triplett, PhD, is a Professor of Exercise Science at Appalachian State University, and the current President of the National Strength and Conditioning Association (USA). She has worked in Sports Physiology at the US Olympic Training Center, and done international research at Southern Cross University (Lismore), the University of Jyvaskyla (Finland) and the University of Valencia (Spain). She is a founding Fellow of the NSCA, and holds the Level 1 certification from USA Weightlifting and is a Certified Strength and Conditioning Specialist with the NSCA.*

N. Travis Triplett, PhD, es profesora de Ciencias del Ejercicio en la Universidad Estatal de los Apalaches, y la actual presidenta de la National Strength and Conditioning Association (USA). Ha trabajado en Fisiología del Deporte en el Centro de Entrenamiento Olímpico de los Estados Unidos, y ha realizado investigaciones internacionales en la Southern Cross University (Lismore), la Universidad de Jyvaskyla (Finlandia) y la Universidad de Valencia (España). Ella es una de las fundadoras de la NSCA, y tiene la certificación de nivel 1 de halterofilia en USA y es una Especialista Certificada en Fuerza y Acondicionamiento por la NSCA (CSCS).

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**Special Considerations for Physical Training in Women**

**N. Travis Triplett, PhD, CSCS\*D, FNSCA**

While it is generally accepted that men and women can perform similar resistance training programs with regard to program variables, there are several physical aspects that may need special attention when designing a training regimen for women. Practitioners should be aware of the basic anatomical and physiological sex differences, many of which are related to body size. A smaller heart and lungs result in lower blood and lung volumes and oxygen delivery ability, as well as differences in how energy fuels are utilized. Women also typically have a greater proportion of body fat and less muscle and bone mass, which impacts strength and power production. There are some skeletal differences in alignment which can have an impact on the performance of some motor skill movements. The distribution of muscle mass is different between the sexes, which also impacts strength and power production.

The menstrual cycle, which is unique to women, has some impact on training and performance. More importantly, the menstrual cycle is adversely affected by certain types and amounts of training, which has greater implications for long-term health. There is some evidence that endurance exercise performance may be slightly higher prior to ovulation, while strength performance may be higher after ovulation and before the menstrual period. However, these differences are relatively modest and difficult to program around unless the woman has a highly individualized training program. Relative to the menstrual cycle, the most important aspect of training program design is to minimize or avoid severe menstrual cycle irregularities, which result in losses in bone mineral density.

Heavy training can promote menstrual cycle irregularities and bone mineral loss, and when coupled with disordered eating, is referred to as the Female Athlete Triad. While more common in female athletes, it can occur in any woman who is training hard and has poor eating habits. The most serious consequences of the Female Athlete Triad are

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the severe losses in bone mineral density and content, which accelerates osteoporosis.

Using resistance training to improve and maintain bone mineral density is extremely important, especially for older women. In addition, older women benefit from hypertrophy- and strength-based programs to regain muscle lost to atrophy from aging, as well as functional strength for activities of daily living.

Pregnancy presents unique challenges and requires adjustments to programming strategies. Exercises which cause dramatic increases in blood pressure should be avoided to protect the fetus. In addition, supine, prone, and overhead exercises are affected by changes to the body late in pregnancy which include greater levels of hormones that increase joint laxity and greater pressure of the fetus on the abdominal cavity. Therefore, all aspects of exercise programming can be impacted by pregnancy.

In summary, while most aspects of training can be the same or similar between men and women, training programs can be optimized better for women with a basic understanding of some of the key sex differences. As with anyone, programs are most effective when designed for an individual's needs.

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**Dr. Ian Jeffreys**  
**Faculty of Life Sciences and Education**  
**University of South Wales, USA**

*Ian is an internationally renowned coach, educator and author and is regarded as a world authority in the development of speed & agility and conditioning for team sports. He is a Professor of strength and conditioning at the University of South Wales, where he co-ordinates all of the University's strength and conditioning activities. He also consults extensively with several professional sports organizations and work with athletes, clubs and sports organizations around the world. He was the NSCA's High School Professional of the Year in 2006 for his pioneering work in developing a Performance Academy for youth athletes which produced numerous international performers and championship teams. In July 2009 Ian was awarded a Fellowship by the NSCA, for his outstanding contributions to the industry. He was been on the Board of Directors of the NSCA between 2016 and 2019 and was the vice President between 2018 and 2019. Ian is a Founder member of the United Kingdom Strength and Conditioning Association and was a member of the Board of Directors from the organization's inception in 2004 through to 2013. With the UKSCA he is an Accredited Strength and Conditioning Coach (ASCC), an assessor and a tutor for the UKSCA education workshops, as well as an honorary fellow. Ian has authored nine books among which the Gamespeed system and RAMP warm-up protocols have been adopted by a wide range of coaches and organizations. He has authored over 20 book chapters and numerous strength and conditioning articles which have featured in the leading international Journals. He is the Editor of the UKSCA Journal,*

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*"Professional Strength and Conditioning" and is on the Editorial Board for the NSCA's Strength and Conditioning Journal, and the Journal of Australian Strength and Conditioning.*

Ian es un entrenador, educador y autor de renombre internacional y está considerado como una autoridad mundial en el desarrollo de la velocidad, la agilidad y el acondicionamiento para los deportes de equipo. Es profesor de fuerza y acondicionamiento en la Universidad del Sur de Gales, donde coordina todas las actividades de fuerza y acondicionamiento de la universidad. También asesora extensamente a varias organizaciones deportivas profesionales y trabaja con atletas, clubes y organizaciones deportivas de todo el mundo. Fue el Profesional del Año de la Escuela Secundaria de NSCA en 2006 por su trabajo pionero en el desarrollo de una Academia de Desempeño para atletas jóvenes de la que surgieron numerosos artistas y equipos de campeonato internacionales. En julio de 2009, Ian recibió una beca de la NSCA, por sus extraordinarias contribuciones a la industria. Fue miembro de la Junta Directiva de la NSCA entre 2016 y 2019 y fue vicepresidente entre 2018 y 2019. Ian es miembro fundador de la Asociación de Fuerza y Acondicionamiento del Reino Unido (UKSCA) y fue miembro de la junta directiva desde la creación de la organización en 2004 hasta 2013. Con la UKSCA es Entrenador Acreditado de Fuerza y Acondicionamiento (ASCC), asesor y tutor para los talleres educativos de la UKSCA, así como miembro honorario. Ha escrito nueve libros, entre los cuales el Sistema Gamespeed y los protocolos de calentamiento RAMP han sido adoptados por una amplia gama de entrenadores y organizaciones. Es autor de más de 20 capítulos de libros y de numerosos artículos de fuerza y acondicionamiento que han aparecido en las principales revistas internacionales. Es Editor del UKSCA Journal, "Professional Strength and Conditioning" y forma parte del Consejo Editorial del NSCA's Strength and Conditioning Journal, y del Journal of Australian Strength and Conditioning.

**Agility Development - Blind alleys, wrong turns and navigating the world of the unknown**

The ability to move effectively is fundamental to performance in a large number of sports. This capacity is normally encompassed by the term agility, yet no fitness variable confounds us more than agility. We know it when we see it, yet we continue to struggle to accurately define and measure this elusive component of performance. In recent years concepts such as reactive agility and change of direction deficit have been introduced in order to better understand this elusive component but could these be misguided. Rather ironically, it could be that the very act of trying to measure and define this elusive capacity utilising traditional reductionist approaches is sending us in the wrong direction. Agility performance is complex, involving multiple capacities, many of which preclude measurement, and which will always demonstrate a level of context specificity – as a result, traditional methods of analysis simply may not work, and the conclusions drawn from this type of analysis may lead to erroneous analysis. If a problem cannot be solved from one approach, then we need different approaches. This presentation looks at how a design-based approach, focusing on the goal of agility rather than on the traditional quantifiable, definitional approach can help shed light on the best way forward to help athletes improve their movement capacities.

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**Dr. Rachel Larson**  
Sports Science Department  
Arizona State University, USA

*Rachel Larson is currently a Professor in the Sports Science Department at Arizona State University. She has been teaching since 2011 and instructs theory and practice of strength and conditioning, muscular strength, exercise testing and prescription, coaching science and leadership and management courses. Larson holds her CSCS\*D and TSAC-F certifications through the National Strength and Conditioning Association. She is also very involved with the NSCA and serves as the Rocky Mountain Regional Coordinator, a member of the women's committee, Rugby Special Interest Group Founding Member, and the International Task Force. As a strength and conditioning coach, Larson has worked with a myriad of athletes over the past 13 years. More recently, she has focused her work with local fire fighter academies, US Army Reserves, USA Rugby HSAs (U16-U18), Tempe Rugby Club, and Eagle Impact Rugby Academy. In addition, Larson has presented both locally and internationally on resistance training for muscular strength and rugby strength and conditioning. Her current research focus is on different resistance training strategies to improve muscular strength and power. Her most recent publication was on the mind muscle connection and hypertrophy.*

Rachel Larson es actualmente profesora en el Departamento de Ciencias del Deporte de la Universidad Estatal de Arizona. Enseñando desde 2011 teoría y práctica de la fuerza y el acondicionamiento, fuerza muscular, pruebas y prescripción de ejercicios, entrenamiento científico y cursos de liderazgo y gestión. Larson tiene sus

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certificaciones CSCS\*D y TSAC-F a través de la National Strength and Conditioning Association. También está muy involucrada con la NSCA y sirve como Coordinadora Regional de las Montañas Rocosas, miembro del comité de mujeres, Miembro Fundadora del Grupo de Interés Especial de Rugby y del Grupo de Trabajo Internacional. Como entrenadora de fuerza y acondicionamiento, Larson ha trabajado con multitud de atletas durante los últimos 13 años. Más recientemente, ha centrado su trabajo en las academias locales de bomberos, en las Reservas del Ejército de los EE.UU., en las HSAs de Rugby de los EE.UU. (U16-U18), en el Club de Rugby Tempe y en la Academia de Rugby Eagle Impact. Además, Larson ha presentado trabajos tanto a nivel local como internacional sobre el entrenamiento de resistencia para la fuerza muscular y la fuerza y el acondicionamiento del rugby. Su investigación actual se centra en diferentes estrategias de entrenamiento de resistencia para mejorar la fuerza y la potencia muscular. Su publicación más reciente fue sobre la conexión entre la mente y los músculos y la hipertrofia.

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**The role of a mind-muscle connection in resistance training**

Strength and conditioning coaches, personal trainers, and rehabilitation specialists all use verbal instruction and encouragement to guide an individual through the process of seeing where they are, where they want to go, and how to get there. In this presentation you will learn not only how to properly instruct your client or athlete's focus of attention but also which focus is best depending on the muscular adaptation desired. The information presented will be a mixture of theory and practice with illustrated examples on how to apply the concepts. Having a better understanding of ideal coaching terminology will not only allow you to be successful as a coach but also optimize the performance of those you work with.

**Squat progressions and variations to build muscular strength**

When most people hear the word “squat”, they think of a back squat when in fact there are multiple variations of this exercise. A back squat is not a starting point for most populations. By participating in this practical session, you will learn the proper progression of a squat that allows the lifter to build up foundational strength and decrease the likelihood of injury. You will also learn how all variations can be used to build strength through proper execution and appropriate loading.

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**6. Ponentes Nacionales / National Speakers**



**Equipo de investigación  
Proyecto IronFEMME**  
**(Influencia del ciclo menstrual en mujeres deportistas: metabolismo del hierro y daño muscular)**  
DEP2016-75387-P  
Universidad Politécnica de Madrid



Dr. Ana B. Peinado Lozano  
IP1



Dr. Rocío Cupeiro Coto  
IP2



Dr. Laura Barba  
Moreno



Nuria Romero  
Parra



Beatriz Rael  
Delgado



Víctor M. Alfaro  
Magallanes

*The IronFEMME research group, made up of more members than those showed here, focuses on the study of the menstrual cycle influence on iron metabolism and muscle damage in physically active women. The research team is formed by predoctoral and postdoctoral students and professors of the faculty. The IronFEMME project is divided into two main and different study phases: 1º) Iron metabolism regulation in female athletes: menstrual cycle influence on hepcidin secretion; 2º) Menstrual cycle influence on post-exercise muscle damage. Research with women in the field of exercise physiology is reduced, both from the point of view of health and sports performance. The studies conducted*

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*with females should consider the hormonal influence, in many cases ignored and/or unknown. The results of the current project will be useful to know the influence of sex hormones on different parameters that affect the health and sports performance of physically active women, such as iron metabolism and muscle damage. This information is vital to avoid, among other things, the athlete's anemia (more frequent in women due to menstrual bleeding), as well as to try to clarify and adjust the physical activity programs and nutrition to the several circumstances taking place in the women's life. Additionally, the results will allow the optimal use of the physical activity benefits for women's health.*

El equipo investigador IronFEMME, formado por más miembros de los que aquí se exponen (contratados predoctorales, posdoctorales y profesores de la Universidad Politécnica de Madrid), se centra en el estudio de la influencia del ciclo menstrual en el metabolismo del hierro y daño muscular en mujeres deportistas. El proyecto IronFEMME se divide en dos fases de estudio principales y distintas a su vez: 1º) Regulación del metabolismo del hierro en mujeres deportistas: influencia del ciclo menstrual en la secreción de hepcidina; 2º) Influencia del ciclo menstrual en el daño muscular post-ejercicio. La investigación con mujeres en el campo de la Fisiología del Ejercicio es reducida, tanto desde el punto de vista de la salud como del rendimiento deportivo. Cualquier estudio realizado con mujeres debe tener en cuenta la influencia hormonal, en muchos casos, obviada y/o desconocida. Los resultados del presente proyecto servirán para conocer qué influencia tienen las hormonas sexuales en diferentes parámetros que deterioran la salud y el rendimiento de mujeres deportistas o físicamente activas como puede ser el metabolismo del hierro o el daño muscular. Información vital para evitar entre otras cosas, la famosa anemia en atletas (más frecuente en mujeres debido al sangrado menstrual), así como intentar clarificar y ajustar los programas de actividad física, entrenamiento y nutrición, a las diversas circunstancias que tienen lugar en la vida de la mujer. Además, los resultados permitirán utilizar de forma óptima los beneficios que conlleva la práctica de actividad física para la salud de las mujeres.

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**Manuela Rodríguez Marote**  
**Psicóloga del Comité Paralímpico**  
**Español**  
**Federación Española de Triatlón**  
**Club de Campo Villa de Madrid**

*Psychologist specialized in High Performance Sports. Psychologist of the Spanish Triathlon Federation, the Spanish Paralympic Committee, the Villa de Madrid Country Club, the Spanish Federation of Para-Horse Riding. Psychologist of professional athletes (F1, boxing, athletics, cycling, horse riding, etc.) Business Consultant, Coach of Businessmen and Executives of Senior Management. Expert in Winning and Training Mentality.*

Psicóloga experta en Alto Rendimiento Deportivo. Psicóloga de la Federación Española de Triatlón, Psicóloga del Comité Paralímpico Español, Psicóloga del Club de Campo Villa de Madrid, Psicóloga de la Federación Española de Hípica Paraecuestre, Psicóloga de Deportistas Profesionales (F1, boxeo, atletismo, ciclismo, hípica, etc.) Consultora de empresas. Coach de Empresarios y Ejecutivos de Alta dirección. Experta en Mentalidad Ganadora y Formadora.

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**Dr. José Luis Neyro**  
**Médico especialista en Ginecología y Obstetricia**

*Degree in Medicine and Surgery and Doctorate at the University of the Basque Country. Physician Specialized in Gynecology and Obstetrics. University professor and international speaker. Among other formations: Postgraduate in Female Sexual Dysfunction, Training in Menopause. Author of more than 360 scientific papers in national and international journals and more than 80 chapters in books - texts of the specialty of Gynecology and Obstetrics, Assisted Reproduction, Climateric and Menopause. Creator and sole responsible for the contents of the blog <http://www.neyro.com>.*

Licenciado en Medicina y Cirugía y Doctorado en la Universidad del País Vasco. Profesor universitario y ponente internacional. Entre otras formaciones: Postgrado en Obstetricia y Ginecología, Postgrado en Disfunción Sexual Femenina, Formación en Menopausia. Autor de 360 artículos científicos en revistas nacionales e internacionales y más de 80 capítulos en libros – textos de la especialidad de Ginecología y Obstetricia, Reproducción asistida, Climaterio y Menopausia. Creador y único responsable de contenidos del blog <http://www.neyro.com>.

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**Dr. David Jiménez Pavón**  
**Universidad de Cádiz, Spain**

*Bachelor degree in Sport Sciences and Physical Activity at the University of Granada. Master in Human Nutrition and European Ph.D. at the Faculty of Medicine, Granada. Postdoctoral research University of Zaragoza. "Ramon y Cajal" tenure track grant at University of Cádiz (UCA). Currently IP of several projects and his research interests focus on "Empowering the health through physical activity, exercise and nutrition" with specific projects being centered on the prevention and treatment of obesity and Alzheimer.*

Graduado en Ciencias del Deporte y Actividad Física en la Universidad de Granada. Máster en Nutrición Humana y Doctorado Europeo en la Facultad de Medicina de Granada. Investigación postdoctoral Universidad de Zaragoza. Beca "Ramón y Cajal" en la Universidad de Cádiz (UCA). Actualmente IP de varios proyectos y sus intereses de investigación se centran en "Potenciar la salud a través de la actividad física, el ejercicio y la nutrición" con proyectos específicos centrados en la prevención y el tratamiento de la obesidad y el Alzheimer.

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**Dr. Alberto García Bataller**  
Universidad Politécnica de Madrid,  
Spain

*Degree and Ph.D. in Physical Activity and Sports Sciences at the Universidad Politécnica de Madrid, Spain. Professor of the Faculty of Physical Activity and Sports Sciences (INEF) of Madrid. Triathlon coach, expert in resistance sports planning, women's training and altitude training. He attended 3 Olympic Games as a coach.*

Licenciado y Doctor en Ciencias de la Actividad Física y del Deporte en la Universidad Politécnica de Madrid. Profesor de la Facultad de Ciencias de la Actividad Física y del Deporte (INEF) de Madrid. Entrenador de triatlón, experto en planificación de deportes de resistencia, de entrenamiento de la mujer y de entrenamiento en altura. Ha participado como entrenador en 3 Juegos Olímpicos.

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**Sergio Espinar**

**Nutricionista Deportivo especializado  
en la pérdida de grasa y salud en la  
mujer**

*Degree in Pharmacy and Nutrition. Sports Nutritionist specialized in fat loss and women's health. A great communicator specialized in social networks and conferences.*

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Licenciado en Farmacia y graduado en Nutrición. Nutricionista Deportivo especializado en la pérdida de grasa y salud en la mujer. Un gran comunicador especializado en redes sociales y conferencias.

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En su ponencia aprenderemos la importancia que tiene la nutrición en las mujeres atletas, profundizando en las posibles diferencias que nos encontramos a nivel hormonal y en función del objetivo. Además, podremos ver de primera mano los problemas ocasionados por una baja disponibilidad energética, siendo este uno de los problemas que más afecta a las deportistas, independientemente de la disciplina en la que se encuentren.

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**David Marchante**  
**Power Explosive**

*Degree in Physical Activity and Sports Sciences. He holds the GUINNESS RECORD of the Heaviest weighted Pull up in the world (104.55 kg). Creator of the Power Explosive where he shares information on training, nutrition, improving the physique and performance and avoiding injuries, always based on scientific evidence.*

<https://powerexplosive.com/>

Graduado en Ciencias de la actividad Física y el Deporte. Tiene el RECORD GUINNESS de la dominada más pesada del mundo (104,55KG). Creador de Power Explosive donde divulga información sobre entrenamiento, nutrición, mejorar el físico, mejorar el rendimiento y evitar lesiones, siempre basada en la evidencia científica.

<https://powerexplosive.com/>

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Madrid, 13-14 de diciembre 2019



**Dr. Javier Butragueño**  
**Obesity Management School**

*Degree in Physical Education at the Complutense University of Madrid. Bachelor and Doctor of Physical Activity and Sports Sciences, Universidad Politécnica de Madrid. Master in Physical Activity and Sports Sciences and Master in International Business Administration and Management, International Executive MBA. Professor in sports performance courses. Personal Trainer specialized in pathologies of the metabolic and locomotor system. Founder and CEO of Obesity Management School (WHO). <https://oms-edu.org/>*

Diplomado en Educación Física por la Universidad Complutense de Madrid. Licenciado y Doctor en Ciencias de la Actividad Física y del Deporte por la Universidad Politécnica de Madrid. Máster en Ciencias de la Actividad Física y del Deporte y Máster en Administración y Dirección Internacional de Empresas, MBA International Executive. Profesor en cursos de rendimiento deportivo. Entrenador Personal especialista en patologías de sistema metabólico y locomotor. Fundador y CEO de Obesity Management School (OMS). <https://oms-edu.org/>

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**Raquel López**  
**Elisa García**  
**MAMIfit**

*MAMIfit® (Exercise for pregnant women, postpartum and hypopressive technique)*

*Elisa García is a Physical Therapist, specialized in Obstetrics and Urogynecology and has a degree in Physical Education, specialized in pregnancy and postpartum. Director of the MAMIfit® training department since 2017.*

*Raquel López has a Degree in Physical Activity and Sports Sciences and in Physical Education and Foreign Language (English), and a MBA in Management and Management of Sports Companies. She is an official trainer of Hypopressive Techniques. Director of MAMIfit® in Madrid since 2013 and CEO of MAMIfit® International in Spain, Colombia, Chile and Peru since 2016.*

**MAMIfit® (Ejercicio para embarazadas, posparto e hipopresivos)**

Elisa García es Fisioterapeuta especialista en Obstetricia y Uroginécología y Licenciada en Educación Física especialista en embarazo y postparto. Directora del departamento de formaciones de MAMIfit® desde el año 2017.

Raquel López es Licenciada en Ciencias de la Actividad Física y del Deporte, Diplomada en Educación Física y en Lengua Extranjera (inglés), MBA en Gestión y Dirección de Empresas Deportivas y formadora oficial de Técnicas Hipopresivas. Directora de MAMIfit® en Madrid desde el año 2013 y CEO de MAMIfit® en España, Colombia, Chile y Perú desde 2016.

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**Lidia Romero**  
**OWA (Only about Women Academy)**

*Degree in Physical Activity and Sports Sciences and Master in Personal Training from the University of Granada. Doctoral student of Biomedicine in the branch of Physical Activity and Health from the University of Granada. Coordinator of the GESTAFIT Project (Research Project in Physical Exercise in Pregnant Women next to Clinical Cases in High Performance Pregnant Athletes) until September 2018. Founder, Teacher and Trainer at OWA (Only about Women Academy), dedicating exclusively to Personal Training in pregnancy and postpartum joining SCIENCE and PRAXIS. <https://www.owacademy.com/>*

Licenciada en Ciencias de Actividad Física y del Deporte y Máster Propio en Entrenamiento Personal por la Universidad de Granada. Doctoranda de Biomedicina en la rama de Actividad Física y Salud por la Universidad de Granada. Coordinadora en GESTAFIT Project hasta septiembre de 2018 (Proyecto de Investigación en Ejercicio Físico en Embarazadas junto a los Casos Clínicos en Atletas Embarazadas de Alto Rendimiento). Fundadora, Profesora y Entrenadora en OWA (Only about Women Academy), dedicándose exclusivamente al Entrenamiento Personal en embarazo y postparto uniendo CIENCIA y PRAXIS. <https://www.owacademy.com/>

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## **7. Comunicaciones Orales / Oral Presentations**

### **Comunicaciones orales 1 / Oral Presentations 1**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
9:00 AM**

#### **Autores/Authors:**

Barba-Moreno, L.1, Alfaro-Magallanes, VM.1, Romero-Parra, N.1, Rael, B.1, Benítez, JA.1, Cupeiro, R.1, Castro, EA.1,2, Peinado, AB.1, on behalf of the IronFEMME Study Group.

#### **Filiación/Affiliations:**

1 LFE Research Group, Dept. of Health and Human Performance. Faculty of Physical Activity and Sport Science (INEF). Universidad Politécnica de Madrid. 2 Department of Sports Sciences and Physical Conditioning, Faculty of Education, Universidad Católica de la Santísima Concepción, Concepción, Chile

#### **Título/Title:**

Menstrual cycle influence on oxygen consumption and ventilation in physically active women during an intervallic running protocol

#### **Resumen/Abstract:**

##### **Introduction**

Steroid hormone fluctuations throughout the menstrual cycle may have potential effects on respiratory variables . Literature is controversial regarding the real influence of sexual hormone variations on oxygen uptake (VO<sub>2</sub>) and ventilation (VE) (1). Most of these studies only consider one or two hormonal profiles along the menstrual cycle (2) and none under the influence of an intense intervallic endurance protocol. Therefore, the main objective of this study was to analyse different female hormone environments on respiratory variables during a high intensity protocol. Methods

Twenty-one endurance-trained females (31.75±5.69 yrs; 57.63±8.63 kg; 162.96±6.51 cm; 25.23±6.73 % body fat; 48.52±4.41 ml/kg·min

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VO<sub>2max</sub>) performed 3 intervallic running sessions at different phases of the menstrual cycle (early-follicular phase: EFP; late-follicular phase: LFP; luteal phase: LP). The protocol consisted of 8 intervals of 3 minute at 85% of the maximal aerobic speed with 90-second rest between them. Results

Mix linear model showed lower VE levels during the LFP ( $74.25 \pm 12.78$  l/min), compared to the EFP ( $78.65 \pm 11.09$  l/min;  $p=0.001$ ) and the LP ( $78.50 \pm 13.40$  l/min;  $p=0.003$ ). Similarly, VO<sub>2</sub> reported a trend to significance ( $p=0.072$ ) for menstrual cycle phase factor, being the lowest VO<sub>2</sub> registered during the LFP ( $2148.50 \pm 346.01$  ml/min) compared to the EFP ( $2242.43 \pm 279.38$  ml/min) and the LP ( $2148.69 \pm 453.60$  ml/min). Discussion

Menstrual cycle seems to influence VE response during an intervallic running protocol and to slightly affect VO<sub>2</sub>. Specifically and contrary to literature (2) both respiratory variables present their lower values during the LFP when the oestrogen peak is produced. This fact points out a higher respiratory efficiency for the same intensity and volume, suggesting for coaches and athletes the LFP as the most suitable for increments in respiratory strain. Nevertheless, more studies analysing the LFP are needed to confirm our findings.

1. Janse de Jonge XA. Sport Med. 2003;33(11):833–51.
2. Smekal G et al. Med Sci Sport Exerc. 2007;39(7):1098–106. Funding:

The IronFEMME Study is supported by the Ministerio de Economía y Competitividad, Convocatoria de ayudas I+D 2016, Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 (Contract DEP2016-75387-P).

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## **Comunicaciones orales 1 / Oral Presentations 1**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
9:15 AM**

### **Autores/Authors:**

Opazo-Díaz E., Velázquez-Díaz D., Pérez-Bey A.; Corral-Roman J., Marín-Galindo A., Montes-De-Oca A., Costilla M., Ponce-González JG.

### **Filiación/Affiliations:**

MOVE-IT Research group. University of Cádiz, Cádiz, Spain. Department of Physical Education, Faculty of Education Sciences. University of Cádiz, Cádiz, Spain. Departament of Physical Therapy, Faculty of Medicine. University of Chile, Santiago, Chile

### **Título/Title:**

Role of cardiorespiratory fitness and muscular strength in maximal fat oxidation in young adults

### **Resumen/Abstract:**

#### Introduction

Increase fat oxidation capacity is a key objective in health and sport . It is known that variables indicators of fitness (2) are related to maximal fat oxidation (MFO) but is less clear if there is a role of the combined effect of CRF and strength in MFO. The aim of this study is to analyze the independent and combined effect of CRF and muscular strength on MFO.

#### Methodology

81 young adults (51 males; mean age,  $22.7 \pm 4.4$  years old) were included. An incremental exercise protocol in cycle ergometer with two consecutive phases was performed to determine MFO and VO<sub>2max</sub> using indirect calorimetry. The first phase aimed to determine MFO and consist in 3 min steps of 15/30W (depending on weight status) increments with a cadence of 60-80rpm. The test was stopped when RER  $\geq 1$ . After 3-5 min rest, the second phase to detect the VO<sub>2max</sub>

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was initiated with steps of 1 min and same incremental load until exhaustion. Bioimpedance analysis was used to assess body composition (fat mass and fat free mass (FFM)), following the corresponding previous considerations. The muscular strength (MS) was assessed by handgrip dynamometry and distance in longitudinal jump test. Linear regression analyses were performed to determine the independent associations of CRF and MS on fat oxidation (MFO and MFO/ FFM) and sex interaction. ANCOVA was used to observe differences between CRF and MS on MFO using combined groups separated by high/low CRF and high/low MS. Then, the differences in MFO between groups were studied by analysis of variance.

### Results

MS/FFM and CRF were positively correlated with MFO/FFM ( $r= 0.23$ ,  $p=0.04$ ;  $r=0.57$ ,  $p<0.001$ ). No interaction between sex was found. Significative differences were observed between HighCRF/HighMS and LowCRF/LowMS ( $p<0.001$ ), HighCRF/HighMS and LowCRF/HighMS ( $p=0.004$ )

### Discussion

Maximal fat oxidation capacity is highly influenced by CRF, but the role of MS assessed by handgrip and longitudinal jump is not relevant.

1. Achten J, Jeukendrup A. Optimizing fat oxidation through exercise and diet. Nutrition. 2004; 20(7/8):716-727.
2. Venables M, Achten J, Jeukendrup A. Determinants of fat oxidation during exercise in healthy men and women: a cross-sectional study. J Appl Physiol 2005 Aug; 98(1):160-167.

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## **Comunicaciones orales 1 / Oral Presentations 1**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
9:30 AM**

**Autores/Authors:**

Sánchez-Tregón P., Díaz-Ureña G., Lara-García J., Molina-Martín JJ

**Filiación/Affiliations:**

Universidad Europea de Madrid

**Título/Title:**

Comparación de la respuesta mecánica y la velocidad entre dos métodos de entrenamiento de fuerza

**Resumen/Abstract:**

Introducción: La velocidad es uno de los factores de entrenamiento más eficaz para valorar la intensidad de trabajo . El Método Cluster, consiste en la inclusión de descansos inter-repeticiones, con el objetivo de evitar grandes pérdidas de velocidad y por lo tanto de rendimiento durante los entrenamientos (3). Por ello, el objetivo es comparar la evolución de la velocidad y de la respuesta mecánica del cuádriceps tras un entrenamiento de fuerza máxima.

Material y Métodos: 29 hombres jóvenes y sanos realizaron dos entrenamientos: método de esfuerzos máximos (MEM) y método cluster (MC). El MC consistió en añadir 30 segundos de recuperación en mitad de cada una de las series. Los ejercicios realizados fueron, Back Squat y Split. Se valoró el comportamiento de las características mecánicas de la musculatura a través variables tensiométricas: tiempo de contracción (Tc) y deformación máxima (Dm) (4) en los músculos vasto lateral (VL), vasto medial (VM) y recto femoral (RF), además de la velocidad de ejecución. El análisis estadístico se realizó con el SPSS v.21. Para valorar el efecto sobre las características mecánicas en función del método empleado se realizó un análisis factorial multivariante (MANOVA).

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Resultados: Se observó un efecto significativo respecto al tiempo sobre las características mecánicas en: RF (Tc: p=0,001), VM (Dm: p= 0,013) y VL (Tc: p=0,004 y Dm: p= 0,024). No se observaron cambios significativos respecto a la velocidad de ejecución entre los dos métodos.

Conclusiones: La realización del MEM y MC, provocan cambios pre-post sobre el RF, VM y VL, pero no existe diferencia entre métodos. La velocidad de ejecución no ha sufrido pérdidas significativas entre los entrenamientos realizados (p=0,05).

Aplicaciones Prácticas:

El MC es una buena alternativa para variar los métodos de entrenamiento de fuerza, manteniendo la velocidad idónea durante la práctica.

Referencias:

1. González-Badillo JJ, Ribas-Serna J. Bases de la programación del entrenamiento de fuerza. INDE; 2002
2. Sanchez-Medina L, González-Badillo JJ. Velocity Loss as an Indicator of Neuromuscular Fatigue during Resistance Training. *Med Sci Sport Exerc.* 2011; 43(9):1725–34.
3. Haff GG, Hobbs RT, Haff EE, Sands WA, Pierce KC, Stone MH. Cluster Training: A Novel Method for Introducing Training Program Variation. *Strength Cond J.* 2008;30(1):67–76.
4. Gil S, Loturco I, Tricoli V, Ugrinowitsch C, Kobal R, Cal Abad CC, et al. Tensiomyography parameters and jumping and sprinting performance in Brazilian elite soccer players. *Sport Biomech.* 2015;14(3):340–50.

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## Comunicaciones orales 1 / Oral Presentations 1

**Viernes, 13 de diciembre de 2019 / Friday, December 13 / 9:45 AM**

**Autores/Authors:**

González-Frutos P1., Morencos E1., Mallo J2., Veiga S3.

**Filiación/Affiliations:**

1 GEIN Salud y Rendimiento, Ciencias de la Actividad Física y el Deporte, Facultad de Ciencias de la Salud, Universidad Francisco de Vitoria. 2 Real Madrid C.F. 3 Facultad de Salud y Rendimiento Humano, Universidad Politécnica de Madrid.

**Título/Title:**

Step frequency and length alterations during repeated sprint test in elite female hockey players

**Resumen/Abstract:**

Introduction: The ability of athletes to perform repeated sprints is regarded by coaches and researchers as a predictor of superior performance in many intermittent and team sports [1]. Some studies have studied the evolution of some variables during repeated sprints test in male team players [2] but not in elite female team players.

Objective: To describe the evolution of sprint times, step frequency and step length during a repeated sprint ability (RSA) test in elite female field hockey players.

Methods: Thirteen elite-female field hockey players performed 6 x 30 m sprints interspersed with 30 s of active recovery. The sprint times were measured using electronic photocells (placed at 0, 10, 20 and 30 m) and the step frequency and step length were determined using a video analysis method. RSA was assessed using five scores for sprint time, step frequency and step length: the best, the mean and the worst of the six repetitions, and two fatigue indexes [ $Fmean=(mean/best*100)-100$ ;  $Fworst=(worst/best*100)-100$ ].

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Results: Sprint times increased from the first to the last repetition (4.1%;  $p < 0.001$ ), whereas step frequency decreased across trials (4.0%;  $p < 0.001$ ) and step length remained constant. Sprint times decreased ( $p < 0.001$ ) and step length increased ( $p < 0.001$ ) across the 10-m sections into which the sprint was divided, whereas step frequency showed greater values in the 10-20 m section in relation to 0-10 m ( $p < 0.01$ ) and 20-30 m ( $p < 0.001$ ) zones. Very large correlations were observed between frequency and sprint time for both fatigue indexes (Fmean:  $r = -0.81$ ,  $p < 0.001$ ; and Fworst index:  $r = -0.77$ ,  $p < 0.01$ ), but not for step length.

Discussion: Our results suggest that changes in sprint times could be related to variations in step frequency during the repeated sprints. This might suggest that maintaining stride frequency values during speed training might be a critical aspect for performance in repeated sprint ability tests.

References:

- 1) Rampinini, E., Bishop, D., Marcora, S.M., Ferrari Bravo, D., Sassi, R. & Impellizzeri, F.M. (2007). Validity of simple field test as indicators of Match-Related Physical Performance in Top-Level Professional Soccer Players. *Journal of Sports Medicine*, 28, 228-235.
- 2) Girard O, Brocherie F, Morin JB, et al. Comparison of four sections for analysing running mechanics alterations during repeated treadmill sprints. *J Appl Biomech.* 2015;31(5):389–95.

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## Comunicaciones orales 1 / Oral Presentations 1

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
10:00 AM**

**Autores/Authors:**

Bartolomé, I.; Toro-Román, V.; Siquier-Coll, J.; Grijota, F. J.; Montero-Arroyo, J.; Robles-Gil, C. M.; Muñoz, D.; Maynar, M.

**Filiación/Affiliations:**

Departamento de Fisiología. Facultad de Ciencias de la Actividad Física y del Deporte, Universidad de Extremadura (España).

**Título/Title:**

Efecto agudo de la hipertermia sobre la fuerza máxima sujetos no entrenados

**Resumen/Abstract:**

Introducción: Los baños de sauna inducen una respuesta termorreguladora en el organismo . Este proceso hace que se produzcan un aumento de la actividad enzimática y una respuesta endocrina (2). Sin embargo, los estudios sobre el efecto del estrés térmico sobre la fuerza son escasos.

Objetivos: Este estudio tuvo como objetivo evaluar el efecto agudo de la hipertermia a altas temperaturas ( $100\pm2^{\circ}\text{C}$ ) sobre la fuerza máxima en sujetos no entrenados.

Métodos: 10 participantes varones (peso:  $66,45 \pm 8,03$  kg; talla:  $1,74 \pm 0,09$ ) fueron evaluados del 1RM del tren inferior en prensa inclinada empleando la ecuación de Brzycki (3) en dos días separados por tres semanas. El primero se realizó en condiciones normotérmicas ( $22^{\circ}\pm2^{\circ}\text{C}$ ) y el segundo tras la exposición a calor a altas temperaturas ( $100\pm2^{\circ}\text{C}$ ) durante 12 minutos en sauna (Harvia C105S Logix Combi Control; 3-15 W). Todos los sujetos firmaron un consentimiento donde se les informaba sobre los riesgos y beneficios del estudio. Esta investigación fue realizada según las directrices éticas de la declaración de Helsinki (2008) para la investigación en seres humanos.

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Resultados: Hubo un aumento en el 1RM tras la exposición al calor en comparación con el primer día ( $p<.01$ ). También se halló un aumento en el 1RM relativo al peso ( $p<.01$ ), y el 1RM relativo muscular ( $p<.05$ ) con respecto al primer día.

Discusión: Parece ser que el efecto agudo de la hipertermia produce una respuesta termorreguladora favorable para el aumento de desarrollo de la fuerza. Este hecho puede aplicarse para el trabajo de cargas submáximas en sujetos no entrenados, desarrollando así mayores mejores adaptaciones al entrenamiento de fuerza.

Referencias

1. Zychowska M, Polrola P, Chruscinski G, Zielinska J, Goral-Polrola J. Effects of sauna bathing on stress-related genes expression in athletes and non-athletes. Annals of Agricultural and Environmental Medicine. 2017;24(1):104-7.
2. Kukkonen-Harjula K, Kauppinen K. How the sauna affects the endocrine system. Ann Clin Res. 1988;20(4):262-6.
3. Brzycki M. Strength Testing—Predicting a One-Rep Max from Reps-to-Fatigue. Journal of Physical Education, Recreation & Dance. 1993;64(1):88-90.

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## **Comunicaciones orales 1 / Oral Presentations 1**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
10:15 AM**

### **Autores/Authors:**

Vargas, S., Romance, R., Petro L.J., Bonilla, D.A., Schoenfeld, B.J., Kreider, R.B., Benítez-Porres, J.

### **Filiación/Affiliations:**

Body Composition and Biodynamic Laboratory, Faculty of Education Sciences, University of Málaga, Spain;EADE-University of Wales Trinity Saint David, Málaga, Spain;Research Group in Physical Activity, Sports and Health Sciences, Universidad de Córdoba, Montería, Colombia;Research Division, DBSS, Bogotá, Colombia; Department of Health Sciences, CUNY Lehman College, NY, USA;Exercise & Sport Nutrition Lab, Human Clinical Research Facility, Texas A&M University, USA.

### **Título/Title:**

A pilot study examining the effects of menstrual cycle-based training versus traditional undulating program on body composition and strength in resistance-trained women

### **Resumen/Abstract:**

**PURPOSE:** The aim of this study was to evaluate changes on body composition and strength after menstrual cycle-based or traditional undulating resistance training programs in women. **METHODS:** Ten resistance-trained and eumenorrheic women ( $26.6 \pm 3.0$  years;  $164.7 \pm 6.5$  cm;  $62.3 \pm 6.8$  kg;  $23.0 \pm 1.8$  kg·m<sup>2</sup>) were randomly assigned to a menstrual cycle-based periodized upper/lower training (n=5, MC) or an undulating training group (n=5, UT) for 8 weeks, with 3 extra weeks dedicated to familiarization. The number of repetitions and load were adjusted to each phase of the menstrual cycle (3-5 repetition maximum [RM] in the follicular phase, 8-10 RM during ovulation phase, 20-25 RM in luteal phase, and 12-15 RM in the pre-menstrual/menstrual phase, including a decrease in volume in this last

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phase for recovery), whereas the UT group performed the same periodization scheme without attempting to match the menstrual cycle phases. Fat free mass (FFM) and fat mass (FM) were evaluated by dual x-ray absorptiometry (DXA); maximal strength was assessed by the 1 repetition maximum (1-RM) test in the back squat (SQ) and bench press (BP); and muscle power was assessed by the countermovement jump (CMJ) test using a jump contact mat. All subjects were instructed to follow a hyperenergetic diet ( $45 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$ ). Wilcoxon signed-ranks test, Mann-Whitney U-test, GLM repeated measures, and Cohen's d effect sizes were employed for statistical analyses. RESULTS: There were no differences in any of the variables at baseline ( $p>0.05$ ). A significant increase in FFM was observed for UT ( $1.4\pm0.9$ ;  $p=0.043$ ;  $\text{ES}=0.6$ ) with no difference in MC ( $1.7\pm1.8$ ;  $p=0.080$ ;  $\text{ES}=0.3$ ). No changes in FM were observed for either condition (MC:  $0.9\pm1.2$ ;  $p=0.225$ ;  $\text{ES}=0.2$ , and UT:  $0.5\pm1.0$ ;  $p=0.345$ ;  $\text{ES}=0.1$ , respectively). Strength increases were observed for both MC and UT in the BP ( $8.9\pm3.4$ ;  $p=0.042$ ;  $\text{ES}=1.0$  and  $5.0\pm1.8$ ;  $p=0.039$ ;  $\text{ES}=0.7$ , respectively) and SQ ( $15.3\pm9.2$ ;  $p=0.043$ ;  $\text{ES}=1.0$  and  $16.4\pm7.6$ ;  $p=0.042$ ;  $\text{ES}=1.5$ , respectively). CMJ showed differences in MC ( $4.0\pm2.5$ ;  $p=0.043$ ;  $\text{ES}=1.2$ ) but no changes were seen in UL ( $1.2\pm2.0$ ;  $p=0.225$ ;  $\text{ES}=0.4$ ). There were no differences between groups for any of the study variables ( $p>0.05$ ). CONCLUSIONS: Our pilot data suggests that eight weeks of either a menstrual cycle-based periodized training or non-matched undulating RT program, along with a hyperenergetic diet, have a differential impact on aspects of body composition and muscular adaptations in trained women.

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## **Comunicaciones orales 2 / Oral Presentations 2**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
5:30 PM**

**Autores/Authors:**

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**Título/Title:**

Effect of a strength exercise program on muscle function in children with CF: preliminary results

**Resumen/Abstract:**

Introduction Cystic fibrosis is the most lethal autosomal recessive disease with higher prevalence in Caucasian population [1]. More than 1,800 mutations have been identified and can be clustered in six functional groups, therefore, altering the secretion and absorption in different tissues. Recurrent infections result in an increased damage to the lungs that leads to hypoxia in peripheric tissues such as skeletal muscle. Then, skeletal muscle weakness displays very early in patients with CF [2]. Recent studies have shown that CFTR protein is expressed in skeletal muscle, and therefore CF has a direct effect in this tissue [3]. Both respiratory damage and muscular weakness result in a reduced exercise capacity that will lead to exercise intolerance and reduction of expectoration and pulmonary function. Objective: Determine the effect of a strength exercise program on muscle function in children with CF.

Methods: 17 pediatric patients with CF participated in a randomized, prospective, controlled design. They were divided in two groups: Control Group (CG) (n=9; Age 12.43 ± 3.78 years; follow standard

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medical care), and Exercise Group (EG) (n=8; Age 12.75 ± 3.06 years; follow 8 weeks of supervised exercise program). We measured muscle strength by 5RM test of both the upper and lower limbs in pediatric weight training machines. Mean differences between groups and measurements was determined using a mixed multivariate analysis of variance.

**Results:** The EG showed a significant improvement in strength relative to body weight compared to the CG ( $p=0.015$ ). A large and significant effect size was observed on the leg press strength ( $p=0.003$ ;  $\eta^2 p = 0.514$ ), bench press ( $p=0.008$ ;  $\eta^2 p=0.428$ ) and seated lateral row ( $p=0.008$ ;  $\eta^2 p = 0.435$ ).

**Discussion:** In this preliminary data it seems that the muscles of the CF pediatric patient can respond to exercise and improve muscle strength despite having CFTR deficit. Practical application: To maintain a correct body composition and physical condition in CF it's related with better disease prognosis. Strength exercise programs may be a useful and capable tool to maintain and improve the body muscle mass in CF.

**References:**

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**Funding:** This study was funded by Cátedra Fundación Asisa-UE ref. 2018/UEM50.

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## **Comunicaciones orales 2 / Oral Presentations 2**

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
5:45 PM**

**Autores/Authors:**

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**Título/Title:**

Comparison of maximal aerobic speed obtained in a treadmill or a track test in middle-distance women runners

**Resumen/Abstract:**

Introduction: Laboratory tests are assessment tools widely used in athletes, but the results obtained in the measured variables sometimes differ from those obtained in the athlete's natural environment [1, 2, 3]. Some studies analyzed the differences between both testing forms in different sports population.

Objective: To analyze the differences in maximum aerobic speed (MAS) performance in a test performed on a motorized treadmill or on a track in women runners of national and international level.

Methods: 13 middle-distance women runners (800 to 3000 m) of national and international level (1500m personal best range: 4:04-4:45) performed two MAS tests, one on a treadmill (MT) with a 1% grade and another on a track (AT), separated by 48 hours. The test started at 8 km/h and progressively increased 0.5 km/h per minute. Athletes finished the test when they could not maintain the speed. The variables measured were: total time (MAS\_t), maximum speed (MAS\_spe), maximum (HRmax) and average (HRavg) heart rate, lactate concentration [L] and the initial and final countermovement jump (CMJ), calculating the jump loss (CMJ\_loss). Additionally, athletes

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performed some other strength related tests: squat (SQ), squat jumps (SJ) and speed (SP) over 0-10, 10-20 and 0-20 m.

Results: Significant differences were found in MAS\_t and MAS\_spe between MT and AT ( $p < 0.01$ ), with higher MAS\_t and MAS\_spe in MT. No significant differences were found in HRmax, HRavg, Initial CMJ, CMJ\_loss, and L. In addition, SP (10-20m) showed a significant positive relationship ( $p < 0.05$ ) with the MAS\_t and MAS\_spe ( $r = 0.62$ ).

Conclusions: Higher total time and speed were observed when the test was performed on the MT compared to the AT although both produced the same degree of effort represented by the HR values, CMJ loss and L concentration. Differences in performance quantify the effect of air opposition to displacement for the same degree of fatigue [4, 5].

Practical application:

1. To establish extrapolated values between those obtained in a motorised treadmill over an athletic track and vice-versa in the performance of MAS and predictors of specific performance.

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5. Pugh LG. J Physiol. 1970;207(3):823–35.

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### **Comunicaciones orales 3 / Oral Presentations 3**

**Sábado, 14 de diciembre de 2019 / Saturday, December 14 / 9:00 AM**

#### **Autores/Authors:**

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#### **Filiación/Affiliations:**

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#### **Título/Title:**

Bone mineral density in well-trained females

#### **Resumen/Abstract:**

Introduction: Although the association between sex hormones and bone mineral density in healthy sedentary women has been widely studied (1,2), only a few studies have evaluated this relationship in trained females (3). Therefore, the purpose of this study was to assess the influence of sex hormones on BMD in physically active females: eumenorrheic females, oral contraceptive (OC) users and postmenopausal women. The secondary aim was to determine if maximal oxygen consumption ( $V\text{O}_2\text{max}$ ) or maximal back squat strength (1RM) could be good predictors of BMD in this population.

Material and methods: Fifty-two eumenorrheic females ( $32 \pm 11$  years;  $59.74 \pm 10.51$  kg;  $26.15 \pm 7.8$  body-fat %) thirty-one monophasic OC users ( $25 \pm 4$  years;  $58.10 \pm 5.85$  kg;  $25.71 \pm 5.47$  body-fat %) and fourteen postmenopausal women ( $51 \pm 3$  years;  $54.10 \pm 4.10$  kg;  $24.18 \pm 5.17$  body-fat %) participated in this study. All of them were well-trained in endurance and/or in strength training. Volunteers performed a dual-energy X-ray Absorptiometry scan (DXA) scan, a maximal back squat

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and/or a maximal treadmill test. All these tests were carried out during the early follicular phase for the eumenorrheic females and in the withdrawal phase for the OC group.

Results: One way ANOVA tests reported significant differences for BMD ( $F_{2,94}=5.015$ ;  $p=0.009$ ) among groups (eumenorrheic females:  $1.19\pm0.07$  g/cm<sup>2</sup>; OC users:  $1.17\pm0.06$  g/cm<sup>2</sup>; postmenopausal females:  $1.13\pm0.08$  g/cm<sup>2</sup>). Scheffé test reported lower values of BMD in postmenopausal females compared to the eumenorrheic group ( $p=0.008$ ). Pearson's correlation did not show significant association between BMD and VO<sub>2max</sub> ( $r=0.095$ ;  $p=0.355$ ), whereas a positive relationship between BMD and 1RM ( $r=0.479$ ;  $p<0.001$ ) was observed.

Conclusions: The present study showed a decrease of BMD in postmenopausal compared with eumenorrheic women in well-trained females. The loss of BMD after menopause seems to be not fully compensated by exercise (4), but this could effectively mitigate the loss of BMD. Moreover, 1RM back squat reported a slight association to BMD. Hence, strength training may be the best choice for preventing BMD loss. Health care professionals should consider this finding when training with women.

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Funding: The IronFEMME Study takes place with the financial support of the Ministerio de Economía y Competitividad, Convocatoria de ayudas I+D 2016, Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 (Contract DEP2016-75387-P).

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**Comunicaciones orales 3 / Oral Presentations 3**

**Sábado, 14 de diciembre de 2019 / Saturday, December 14 / 9:15 AM**

**Autores/Authors:**

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**Título/Title:**

Acute moderate altitude effect on metabolic response after a hypertrophy-oriented resistance training session

**Resumen/Abstract:**

Introduction: Evidence supports a potential benefit of resistance training in a hypoxic environment for enhancing the hypertrophic response, possibly due to an increased production of metabolites linked to muscle growth mechanisms (3,4). However, studies to date have exclusively employed simulated hypoxia while it has been suggested that natural altitude is a more severe environmental condition (2). In addition, some microRNAs, which could be significant regulators of muscle protein expression and local factors, are being currently studied in regard to gains in strength and muscle mass (1). This study investigated the effect of acute exposure to moderate altitude on the metabolic stress and associated responses induced by a standard hypertrophy-oriented RT session.

Method: Thirteen males completed two counterbalanced hypertrophic RT sessions (3set x10RM, 2min rest) under moderate altitude (H;2320m asl) and normoxic conditions (N;<700m asl) with 72h rest between sessions. Blood (lactate [Lac], inorganic phosphate [Pi],

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calcium [Ca2], liquid carbon dioxide [CO2L]), hormones (testosterone [T] and growth hormone [GH]) and miRNA (miR-378) were assessed before and throughout 30min post-exercise.

Results: Compared to pre-exercise, RT increased serum levels of Ca2+, GH and Lac ( $p<0.05$ ) under H and N conditions. Altitude effects were observed in Pi and CO2L (3.00±0.71 vs 3.41±1.03 mg·dl $^{-1}$ ;  $p=0.044$  and 21.06±2.62 vs 25.35±2.30 mmol·L $^{-1}$ ;  $p=0.020$  respectively for H and N). Serum miRNA-378 and T remained unchanged at all studied conditions ( $p>0.05$ ).

Discussion: The acute moderate altitude did not affect the serum level of ions, hormones nor miR-378 measured after a RT session. Despite the strong influence of oxygen availability on phosphocreatine resynthesis, recovery times longer than 90s could limit hypoxic effects and reduce the potential anabolic impact of metabolic stress (5). Contrary to findings observed in pathological and sedentary subjects under N conditions (1,6) miR-378 does not seem to influence the immediate adaptations to a hypertrophy-RT protocol in trained subjects. Our findings do not support a potentiated effect of acute moderate terrestrial hypoxia on metabolic and hormonal factors linked to muscle growth after a hypertrophic resistance training session.

Fundings: DEP2015-64350-P, MINECO/FEDER and PGC2018-097388-B-I00.

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## **Comunicaciones orales 4 / Oral Presentations 4**

**Sábado, 14 de diciembre de 2019 / Saturday, December 14 / 5:30 PM**

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**Título/Title:**

The influence of pre-pregnancy physical activity levels on cardiac function during pregnancy

**Resumen/Abstract:**

Introduction: Pregnancy triggers some notable haemodynamic adaptations that impose increased demands on the cardiovascular system [1]. Although physical activity during pregnancy does not impair resting cardiac function [2], its influence during acute exercise is more poorly understood. Pre-pregnancy physical activity level (PAL) could also potentially modify the cardiac response to acute exercise during the subsequent antenatal period. This study therefore sought to determine whether pre-pregnancy PAL influences the antenatal cardiac response to acute exercise, assessed via heart rate (HR) and stroke volume (SV).

Methods: Twenty-six pregnant women participating in the ‘PE-CAMP’ randomized controlled trial, underwent physiological assessment at 18–22 weeks gestation. HR and SV were continuously recorded using the Task Force Haemodynamic Monitor (CN Systems, UK) during rest (5-mins), during exercise on a cycle-ergometer at a workload equivalent to 40–60% HR reserve (15-mins), and during post-exercise recovery (20-mins). Pre-pregnancy moderate-to-vigorous physical activity (MVPA) levels were self-reported via questionnaire, and antenatal PAL was

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measured using a wrist-worn accelerometer (ActiGraph GT9X, ActiGraph, USA) for 24 hours on each of seven consecutive days during the second trimester.

**Results:** A two-step, bootstrapped hierarchical regression was run to test the influence of pre-pregnancy MVPA on cardiac function (measured as the mean and maximum values of HR and SV) during each protocol stage. Seven predictors were included in this analysis: Age, Body Mass Index (BMI), pre-pregnancy MVPA, time spent in inactivity, and time spent undertaking Light, Moderate and Vigorous PA during the second trimester. When all predictors were included pre-pregnancy MVPA significantly influenced mean SV ( $R^2=0.571$ ;  $F(1, 18)=3.428$ ;  $p=0.017$ ) and maximal SV ( $R^2=0.538$ ;  $F(7, 18)=2.989$   $p=0.029$ ) during the exercise stage. Time spent in vigorous PA during the second trimester (mean=  $2.19\pm2.39$  mins/week) was the strongest predictor of the SV response to exercise, having a significant positive influence on maximal SV ( $b=3.011$ ;  $p=0.030$ ). None of the selected predictors influenced HR.

**Conclusion:** Pre-pregnancy time spent in MVPA and antenatal time spent in vigorous PA both increased the SV response to exercise during the second trimester.

**Practical application:** MVPA should be recommended for pregnant women and women seeking to become pregnant, given its potential influence on the cardiac (SV) response to exercise.

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under the Marie Skłodowska-Curie grant agreement No 663830-SU-079.

#### References

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## **Comunicaciones orales 4 / Oral Presentations 4**

**Sábado, 14 de diciembre de 2019 / Saturday, December 14 / 5:45 PM**

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### **Título/Title:**

Eccentric Overload Training in youth team female athletes: training conditions and relationship with performance changes

### **Resumen/Abstract:**

**Introduction:** Eccentric overload training is a useful method for the inter-limb asymmetries detection in sport-specific actions (1) and beneficial to improve unilateral lower limb strength power (2). We aim to analyze the relationship between training variables (velocity, power and movement variability) and mid-term changes in single leg countermovement jump (SLCMJ), according training conditions.

**Methods:** With written informed consent obtained, and conformed to the recommendations of the Declaration of Helsinki, thirteen under-16 female basketball and volleyball players performed a 6-week EOT using a flywheel device (Eccomii, Byomedic) which consisted of 1 specific change of direction exercise (Shuffle Step [SS] in right and left directions, 1 set of 6 reps, twice/week). The constant group ( $n = 7$ ) performed the SS in one direction (e.g., right) and, thereafter, in the other direction, while variable group ( $n = 6$ ) performed the exercise in

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three random directions (12 reps in total). During training sessions, acceleration was measured using an inertial measurement unit (WIMU, Realtrack Systems), and the mean velocity and power of both concentric (CON) and eccentric (ECC) phases were collected using Chronojump software (v1.9). Sample Entropy (SampEn) were computed using SPRO Software v1.0.0 (Realtrack Systems). The SLCMJs (horizontal, vertical, and lateral) were assessed before and after the training protocol. Results: In constant group, the CON velocity ( $r = 0.80$ ) and power ( $r = 0.81$ ) recorded during SS left training were significantly correlated with changes in SLCMJ right (lateral). In variable group, the CON velocity ( $r = -0.95$ ) and power ( $r = -0.89$ ) during SS left were significantly correlated with changes in SLCMJ left (lateral). Also, the SampEn ( $r = -0.94$ ) during SS left were significantly correlated with changes in SLCMJ left (vertical). Furthermore, the CON velocity ( $r = -0.94$ ) during SS right were significantly correlated with changes in SLCMJ left (lateral). Discussion: Training variables during EOT and mid-term changes in SLCMJ are differently related according to training condition. Practitioners could provide more accurate daily basis real-time feedback to achieve expected results for each training condition.

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## 8. Pósteres / Posters

### Póster sesión 1/*Poster session 1*

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
11:30 AM**

#### **WOMEN AND SPORT 1**

**1**

##### **Autores/Authors:**

Alfaro-Magallanes, VM.1, Rael, B.1, Romero-Parra, N.1, Barba-Moreno, L.1, Bodoque, M.1, Cupeiro, R.1, Benito, PJ.1, Peinado, AB.1, on behalf of the IronFEMME Study Group

##### **Filiación/Affiliations:**

LFE Research Group, Dept. of Health and Human Performance. Faculty of Physical Activity and Sport Science (INEF). Universidad Politécnica de Madrid.

##### **Título/Title:**

Hepcidin regulation in physically active women after an intervallic running protocol throughout the menstrual cycle

##### **Resumen/Abstract:**

Introduction Intense running exercise produces IL-6 elevation, as either myokine , inflammatory cytokine (2) or both. It results in the up-regulation of hepcidin three hours afterwards (2), reducing iron availability (3). This well-known process could be affected by oestrogen and progesterone fluctuations during the menstrual cycle, since both hormones had been reported as hepcidin modulators (3). The purpose of this study was to compare the influence of menstrual cycle phases on hepcidin and IL-6 regulation after an intervallic running protocol in women. Methods Twenty-one endurance-trained females ( $31.75 \pm 5.69$  yrs;  $57.63 \pm 8.63$  kg;  $162.96 \pm 6.51$  cm;  $25.23 \pm 6.73$  % body fat;  $48.52 \pm 4.41$  ml/min·kg VO<sub>2max</sub>) performed an intervallic running protocol in the early-follicular phase (EFP), late-follicular phase (LFP) and mid-luteal

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phase (LP). These sessions consisted of 8 x 3 minutes intervals at 85% VO<sub>2max</sub> speed with 90-seconds recoveries. Blood samples were collected pre-exercise, 0h, 3h and 24h post-exercise. Results Mix linear model showed higher hepcidin concentrations at 3h post-exercise during the LFP ( $3.01\pm4.16$  nM/l) than in the EFP ( $1.26\pm1.25$  nM/l;  $p=0.003$ ) and MLP ( $1.75\pm1.98$  nM/l;  $p=0.052$ ). As expected, hepcidin exhibited higher values at 3h post-exercise ( $2.01\pm2.81$  nM/l) in comparison with pre-exercise ( $0.93\pm1.71$  nM/l;  $p<0.001$ ), 0h ( $1.13\pm1.43$  nM/l;  $p=0.001$ ) and 24h post-exercise ( $1.36\pm2.25$  nM/l;  $p=0.026$ ). According to the literature, IL-6 was higher at 0h post-exercise ( $4.44\pm2.26$  pg/ml) compared with pre-exercise ( $1.70\pm0.71$  pg/ml;  $p<0.001$ ), 3h ( $1.71\pm0.56$  pg/ml;  $p<0.001$ ) and 24h post-exercise ( $1.81\pm1.06$  pg/ml;  $p<0.001$ ). Lastly, no differences were found regarding IL-6 and menstrual cycle phase. Discussion Menstrual cycle affects hepcidin response to running exercise, but not IL-6. This fact points out the likely influence of sex hormones on hepcidin synthesis (3). LFP seems to be the less suitable period of the menstrual cycle to restore iron reserves in active women, since iron absorption and recycling are expected to be lower than in other menstrual cycle phases. Therefore, iron fortified diets or supplementation should preferably be reinforced in EFP and MLP when the goal is to restore iron reserves.

#### References

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Funding: The IronFEMME Project is funded by the Ministerio de Economía y Competitividad, Convocatoria de ayudas I+D 2016, Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 (Contract DEP2016-75387-P).

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**Título/Title:**

La preparación física operativa de la mujer militar. Eficacia del entrenamiento concurrente de alta intensidad

**Resumen/Abstract:**

Introducción: Como consecuencia de las diferencias entre sexos respecto a la composición corporal, sistema musculo-esquelético, sistema cardiorrespiratorio, función metabólica y termorreguladora , es necesario emplear tareas específicas para cada sexo para optimizar las adaptaciones al entrenamiento (2). Además, los nuevos requerimientos exigidos a los militares en las zonas de despliegue (3) , requieren de una elevada y permanente preparación física integrada con habilidades tácticas y técnicas específicas a desarrollar, normalmente, en ambientes hostiles (4). Objetivo: Comprobar la eficacia de un entrenamiento concurrente de alta intensidad para mejorar la condición física y la composición corporal de mujeres militares. Métodos: Dieciséis mujeres militares de la Academia de Infantería realizaron una fase de ocho semanas de entrenamiento con una frecuencia de tres sesiones (60') semanales, empleando un entrenamiento concurrente de alta intensidad (Edad:  $37,5 \pm 3,93$  años. Peso:  $66,02 \pm 12,93$  Kgs. Altura:  $161,94 \pm 6,28$  cms.). Se realizaron semanalmente, al menos una vez, ejercicios cardiovasculares, de levantamiento y gimnásticos. Se buscó equilibrar las tareas de fuerza, movilidad y resistencia. En la evaluación de la composición corporal se obtuvieron datos de Masa total Ósea (MOT), Muscular (MMT) y Grasa (MGT). El rendimiento físico se evaluó mediante las pruebas de potencia de tren inferior mediante salto en contramovimiento (CMJ), resistencia muscular de tren superior en empuje (PB) y tracción (FB),

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flexo-rotación de tronco (FRT) y la estimación del VO<sub>2</sub>máx. Resultados: La MGT descendió (-13,62%) y la MMT aumentó (+4,41 %) significativamente ( $p<0,05$ ), no siendo significativa en la MOT (+3,12%). En CMJ (-2,07%) y VO<sub>2</sub>máx (-0,43%) los efectos no fueron significativos, mientras que para PB (+45,12%), FB (+45,12%) y FRT (+30,43%) sí lo fueron ( $p<0,05$ ). Conclusión: Las diferencias evidenciadas entre mujeres y hombres, en especial la fuerza del tren superior y la potencia junto con las demandas del combate moderno, parecen poner a las mujeres en desventaja. Un nuevo modelo de preparación física militar puede minimizar esta desventaja, implementando programas de entrenamiento que pongan el foco en las cualidades críticas para ellas. Aplicación práctica: Proporcionar a los preparadores físicos militares una herramienta alternativa, enfatizando en el entrenamiento de mujeres militares en las tareas de fuerza, trabajo postural y capacidades aeróbica/anaeróbica.

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**Título/Title:**

Nutritional intervention in Spanish female soccer players: exchange diet vs diet based on pre-established menus

**Resumen/Abstract:**

**INTRODUCTION** Both training demands and the high frequency of competitions require an implementation of nutritional strategies to satisfy nutritional demands. The aims of the current research were: (a) to quantify energy and nutrient intake in Spanish female soccer players, (b) to analyse the effects of an exchanges-diet and a controlled diet on nutritional knowledge (NK), habits, anthropometric data, biochemical values, physical performance and adherence to the diet. We hypothesized that an exchanges-diet could be a better tool to improve female soccer player nutritional status. **METHODS** 15 female soccer players ( $20.75 \pm 3.09$  years;  $62.3 \pm 8.5$  kg) were randomly divided into two groups: "close dietetic supervision group" (CG) (n=7) and "exchange-diet group" (EG) (n=8). CG was trained to perform a diet based on pre-established menus and food combinations while EG was trained to design their menus with an exchanges-diet. Both diets were designed to have a similar timing and to provide the same amount of energy and nutrients. Nutritional intake, NK and diet adherence were assessed by records and questionnaires. Anthropometric measurements, blood analysis and physical tests were taken along the intervention. **RESULTS** Total energy intake, CHO, PROT, vitC, vitE, vitD, Ca, Mg and Fe were below the current recommendations for female soccer players, while total fat and saturated fat intake were higher. Both groups presented values outside the range pre- and post-intervention of haemoglobin, ferritin and vit D despite the fact that

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haemoglobin and vit D improved post-intervention. Subject presented average NK, which improve more in the EG post-intervention. Both groups have had greater difficulties with the specific protein intakes and the general difficulty increases with the time along the intervention. Both groups lower extremities perimeters were maintained and skinfolds sum decreased faster in the EG. Physical performance in EG and CG did not present differences in the test used.

**CONCLUSIONS** There is a high risk of nutritional deficit in Spanish female soccer players. Practitioners must be alert to the deficit intake of CHO, PROT, vitC, vitE, vitD, Ca, Mg and Fe, and the excess of saturated fat. Both interventions improve NK and habits, body composition and biochemical parameters, but physical values were maintained. An exchanges-diet seems to be more effective to improve NK and habits, this make it easier its compliance and corporal composition control in shorter time.

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**Título/Title:**

Training program for the prevention of injuries due to increased Q-angle in female gymnasts

**Resumen/Abstract:**

**Introduction:** Rhythmic Gymnastics is an aesthetic sport, mostly of female, in which the injuries due to the repetitive and high difficulty movements performed by gymnasts are very frequent (1,2). The observation of Q-angle could help to predict certain injuries when its values are higher than normal (between 15º and 20º) (3). Women have shorter stature, wider and lower pelvis and shorter femur than men. The consequence is a greater knee valgus, evidenced by an increased Q-angle. This makes the woman acquire a greater predisposition to injury (4). The objective was to carry out a review of the specific movements in which the risk to injury is greater in women due to an increased Q-angle and to formulate a preventive or prophylactic training for the women gymnasts of RG to minimize the risk of injuries.

**Method:** For the review was used PubMed, SportDISCUS and ScienceDirect data bases. The keywords “Q-angle, female sports, gymnastics, rhythmic gymnastics, injuries, performance, training, anatomy, prevention, somatotype” were selected. Prisma 2009 Flow Diagram (5) was used. **Results:** After four filters applied, 1009 articles related to Q-angle and female sport were found; 171 articles were selected and 36 of those were related to gymnastics. Four particularly movements that could cause injury related to the Q-angle have been identified: jump landing, changes in direction, high jumps with kicks and exercises in which the knee supports weight while 30º flexion angle. **Discussion and practical applications:** The proposal of preventive

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exercises was based on a work of changes of the direction with coordination exercises and the correction and improvement of the jump technique, with the potentiation of the hamstrings and quadriceps muscles with exercises that increase the knee flexion and hip flexion/extension balance. Moreover, exercises that decrease the valgus of the knee increasing the external rotation of the hip with the potentiation of the gluteus muscles group, specially the medial gluteus. In addition, the work of the core and supination and dorsiflexion exercises for the ankle helps to the balance of the knee.

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## MUSCLE PHYSIOLOGY

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### Título/Title:

Effect of the herbal supplement ReWin(d) on the recovery of delayed onset muscle soreness induced-exercise

### Resumen/Abstract:

**Introduction:** The need for strength training with a large component of eccentric contraction to achieve positive muscle adaptations is inherent to the development of delayed onset muscle soreness . Herbal supplementation has increased among athletes, in order to increase muscle hypertrophy and beta-oxidation of fats to improve performance (1). The objective was to investigate the effectiveness of a polyherbal mixture in the muscle pain and performance in young athletes after undergoing inducing eccentric exercise. **Methods:** The study followed a double-blind, placebo-controlled design (n=40) carried out in physically active males (18-35 years), randomly assigned to ReWin(d) 2g intake (natural organic blend of a Zingiber officinale rhizome powder and Bixa Orellana), or placebo (maltodextrin). Muscle performance was evaluated in countermovement jump (CMJ) monitored with an accelerometer (Encoder) and muscle pain through the visual analog scale (VAS) (2) after performing the exercise protocol (3). For statistical analysis, a mixed ANOVA 5x2 or the non-parametric

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Friedman or the U Mann Whitney tests were applied adjusting with the Bonferroni test (SPSS v.21, IBM, USA). Results: The perception of pain increased after the training session in both groups ( $p<0.001$ ). Significant differences were observed between the group ReWin(d) and group placebo at 48h post-exercise ( $p=0.004$ ;  $d=0.82$ ). The muscular power of the lower limb showed significant interaction between the ReWin(d) and placebo groups in the first 24 hours. ( $p=0.049$ ;  $d=0.63$ ). The muscular power in the placebo group moderately decreased in the first 24h ( $p$ ) Discussion: Results show that the ReWin(d) supplement in trained youth athletes attenuates DOMS achieving an anticipated recovery compared to the placebo group. Practical application: Although more studies to corroborate these initial results are needed, it seems that with the ReWin(d) supplement could anticipate the next bout of exercise performed by athletes.

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**Título/Title:**

Acute Effects of 20-40% Velocity Loss Training on Leg Muscle Oxygenation During Back Squat

**Resumen/Abstract:**

INTRODUCTION: Despite resistance training at different velocity loss (20% or 40%) obtained similar hypertrophy and squat strength gains after 8 weeks, the percentage of type IIX fibers is reduced in the RT program based on repetitions to failure (40%) (1). This fact could be explained by different muscle oxygenation. Therefore, the aim of this study was to describe the within-and-between-conditions differences in tissue oxygenation index (TOI) of two RT programs that only differed in the velocity loss in every set: 20% (20VL) or 40% (40VL). METHODS: 28 young men ( $21.8 \pm 2.3$  yrs) were randomly allocated to 20VL or 40VL and performed three sets of back squat exercise. One week apart the order was reversed following a crossover design. Exercise intensity was set at  $1 \text{ m} \cdot \text{s}^{-1}$ , previously calculated with a progressive resistance test. TOI was measured before and continuously during the exercise in Vastus Lateralis (VL) and Vastus Medialis (VM) with a spatially resolved spectroscopy tissue oximeter (NIRO-200Nx). Differences within-and-

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between-conditions were determined through repeated measures ANOVA and Bonferroni post hoc ( $p<0.05$ ). RESULTS: At 20VL, TOI was  $76.5\pm4.6\%$  and  $76.0\pm5.6\%$  at rest for VL and VM respectively. TOI decreased from the previous data to  $45.3\pm16.4\%$  and  $46.9\pm12.9\%$  during the first set, to  $45.2\pm16.5\%$  and  $46.7\pm12.8\%$  during the second,  $44.8\pm18.1\%$  and  $47.3\pm13.3\%$  during the third. TOI showed significant differences before and during the exercise ( $p<0.001$ ) However, no significant differences were found between the sets. At 40VL, TOI was  $75.5\pm4.8\%$  and  $75.8\pm3.3\%$  at rest for VL and VM respectively. During exercise TOI dropped to  $43.8\pm16.9\%$  and  $47.4\pm12\%$  during the first set, to  $43.6\pm16.2\%$  and  $46.7\pm12.8\%$  during the second,  $48.4\pm19.1\%$  and  $47.3\pm13.3\%$  during the third. Similarly to 20VL, there were significant differences in TOI before and during the execution of the set ( $p<0.001$ ), while no differences between sets were observed. No significant between-groups differences were found when the sets were compared. DISCUSSION: Our results showed a decrease in TOI during the exercise performance with both velocity loss protocols. Nevertheless, there were no significant differences between both conditions. Hence, variation in muscle fiber type distribution in 40VL RT could not be due to differences in muscle oxygenation during exercise compared to 20VL RT. REFERENCES: 1. Pareja-Blanco F, Rodríguez-Rosell D, Sánchez-Medina L, Sanchis-Moysi J, Dorado C, Mora-Custodio R, et al. Effects of velocity loss during resistance training on athletic performance, strength gains and muscle adaptations. Scand J Med Sci Sports. 2017;27(7):724–35.

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**Título/Title:**

Kinetics of s $\alpha$ -klotho protein after plyometric exercise in physically active young men

**Resumen/Abstract:**

**Introduction:** High soluble-fraction levels of Alpha-Klotho have been related with anti-inflammatory effects on the organism, decreased degenerative processes, and longevity[1-2]. In addition, SaKL levels increase immediately after an acute endurance exercise that does not occur after plyometric exercise[3]. Nevertheless, there is no literature to date regarding the behavior of the protein during the recovery period following plyometric exercise. Due to its well-known anti-inflammatory response, we hypothesized that a SaKL levels increment could happen during the hours following a plyometric exercise session. Our main objective was to analyze the acute effect of a single plyometric exercise bout on SaKL and its kinetics during the 72 following hours. **Method:** 39 physically-active males (aged=18-35; VO<sub>2max</sub>=55.6±5.19 ml/kg/min) underwent one eccentric-focused plyometric session. Their serum SaKL and Creatine-Phosphokinase (CPK) levels were measured before (PRE) and immediately after (POST) the session, as well as 24, 48 and 72 hours later. **Results:** We found overall significant differences in the SaKL kinetics ( $F=4.182$ ;  $p=0.011$ ). SaKL increased significantly between POST and 24h ( $p=0.041$ ;  $d=0.499$ ) and between POST and 48h ( $p=0.007$ ;  $d=0.873$ ). Statistically significant differences were also observed in the CPK measures through the

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different time intervals ( $F=22.591$ ;  $p=0.001$ ). Discussion: There are some studies focusing on the s $\alpha$ KI response to aerobic or anaerobic exercise[1, 4], but to the best of our knowledge this is the first study analyzing the acute effect of a specific plyometric exercise protocol on s $\alpha$ KI secretion during 72h. s $\alpha$ KI levels presented a late response after the exercise session, remaining elevated from 24h to 72h post exercise. Furthermore, s $\alpha$ KI followed similar kinetics to CPK, a muscle damage and inflammation biomarker. In conclusion, we suggest that Klotho protein could play an anti-inflammatory role after plyometric exercise. And although more studies are needed, in this regard, the finding could have a relevant practical implication both in the clinic and in sport.

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**Título/Title:**

Mediciones de saturación de oxígeno muscular durante una prueba de fatiga isocinética de alta intensidad

**Resumen/Abstract:**

Introducción: La dinamometría isocinética representa un método generalizado para evaluar el rendimiento muscular, en particular se observan los cambios en déficit de fuerza porque ayudan a explicar el riesgo de lesión deportiva. Asimismo, La Saturación de Oxígeno Muscular es un parámetro relativamente nuevo utilizados por científicos del deporte, aunque existe un vacío fisiológico de cómo interpretarla y asociarla al rendimiento deportivo [1]. Objetivo: Valorar la SmO<sub>2</sub>% durante una prueba de fatiga isocinética de alta intensidad. Método: veintidós jugadores de rugby (22 ± 5 años de edad, 176 ± 8 cm, 89,8 ± 12,6 kg) realizaron la Prueba de fatiga isocinética de alta intensidad en un dinamómetro isocinético (Biodex System3, Shirley, New York, USA), la prueba consiste en realizar 30 contracciones concéntricas recíprocas máximas consecutivas a una velocidad angular de 180°/s. Se obtuvieron los valores de pico de fuerza Máximos (PFmax), Mínimos (PFmin) y Medios (PFmed) de los músculos de Extensión y Flexión de la rodilla, Ratio Isquiotibial-Cuadriceps (Ratio I:C) y el Índice de Fatiga (IF%). La SmO<sub>2</sub>% se evaluó mediante un monitor portátil (MOXY, USA), donde se obtuvo valores Máximos (SmO<sub>2</sub>%max), Mínimo (SmO<sub>2</sub>%min), Medios (SmO<sub>2</sub>%med), curva de consumo de oxígeno muscular (SmO<sub>2</sub>%slope), el tiempo donde se alcanzó SmO<sub>2</sub>%max (SmO<sub>2</sub>%time-max) y SmO<sub>2</sub>%min

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(SmO<sub>2</sub>%time-min). Se aplicó la prueba t-student para la comparación entre pierna dominante (PD) y pierna no dominante (PNoD) y la correlación de Pearson entre SmO<sub>2</sub>% y picos de fuerza. Resultados: Se encontró en PD menores valores de SmO<sub>2</sub>%min (PD=11.7 ± 10.8 vs PNoD=16.4 ± 13.3), mayores PFmax (PD=210.3 ± 37.6 vs PNoD=201.0 ± 31.8) y PFmed (PD=157.4 ± 27.7 vs. PNoD=148.7 ± 24.6). En PNoD la SmO<sub>2</sub>%min y SmO<sub>2</sub>%slope se relacionaron con el aumento y disminución del IF% ( $r=0.454/r=-0.445$ ), también el SmO<sub>2</sub>%time-min fue más rápido cuando la PFmax, PFmed fue mayor ( $r=-0.580/r=-0.549$ ). Asimismo entre más rápido sea el SmO<sub>2</sub>%time-min menores valores de Ratio-I:C ( $r=0.459$ ). Conclusión: La SmO<sub>2</sub>% está asociado con el déficit de fuerza, además el pronóstico de soportar la fatiga y riesgo de lesión durante el ejercicio mejoran con la rapidez en la que se utiliza la SmO<sub>2</sub>%. Aplicación Práctica: Se presenta la medición de SmO<sub>2</sub>% como parámetro que influye en el rendimiento, para su posterior aplicación por médicos y entrenadores en el monitoreo de deportistas.

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**Título/Title:**

Erythrocyte membrane dha depletion after a gran fondo cycling race: A pilot observational case study

**Resumen/Abstract:**

**INTRODUCTION.** Fatty acid composition defines structural and functional properties of cell membranes and is tissue-specific [1]. FA-based membrane lipidomic profile assesses membrane fluidity through saturated/monounsaturated ratio and PUFA balance index, inflammatory/anti-inflammatory potential through the presence of omega-6 and omega-3 FAs and the extent of oxidative damages through peroxidation index. Athletes' health status related to nutrition, workout load, metabolism and oxidative status can be inferred analysing mature Red Blood Cell (mRBC) lipidome due to the high value of this reporter cell [2]. The impact of a Gran Fondo cycling race was determined using membrane FA composition of mRBC of an endurance-trained, non-elite road cyclist. **METHODS.** mRBC membrane phospholipids were analysed for FA profiling (GC-MS) 6 weeks prior (t0, baseline), 3 days (t1) and 9 weeks after (t2) the Granfondo Sestriere race. After t0 and t1, 250mg of docosahexaenoic acid (DHA)/day, 3 weeks/month, were supplemented. **RESULTS.** After the race, a 1.8-fold mRBC DHA reduction was observed (t0=4.4% and t1=2.4% of total FAs). After DHA supplementation, mRBC DHA levels were restored (t2=7.3%), being 3-fold higher than t1. **DISCUSSION.** After the race, erythrocyte membranes undergo acute remodelling with depletion of DHA levels, consequent increase of omega-6/omega-3 ratio and decrease of Omega-3 Index for cardiovascular risk [3]. This study highlights lipidomic analysis as a tool to monitor the impact of athletes'

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training routines because heart and skeletal muscle preferentially incorporate DHA, modulating oxygen consumption, improving fatigue resistance and neuromotor function [4,5]. Lipidomic analysis can be applied to personalise lipid supplementation and verify the improvement of performance and recovery after exercise and races.

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## EXERCISE IN ADULTS AND OLDER PEOPLE

10

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### Título/Title:

Pilates mat improves strength in older adults: a quasi-experimental study

### Resumen/Abstract:

**ABSTRACT** Introduction. The ageing process involves progressive functional and structural losses, such as a decrease in muscle mass [1]. This functional deterioration has been associated with mobility restrictions, an increased risk in falls and loss of autonomy [2]. Otherwise, evidence suggest that physical exercise may reduce the physical complications of ageing process [3]. Objectives. To analyse the effects of an exercise programme based on the Pilates mat method on strength among older adults. Methods. Participants: twenty-four participants aged  $60.6 \pm 6.8$  (50% women) were included in this quasi-experimental study conducted in Cuenca (Spain). Intervention: Two of Pilates mat sessions/week lasting 50 min each were performed with the supervision of a trained Pilates' instructor. Main outcome: participants' muscular strength was assessed at baseline and after 28 weeks using handgrip strength test (N/m<sup>2</sup>) for each hand and with 30-s sit-to-stand test to assess upper and lower limbs strength respectively. Results. Handgrip strength increased significantly for left hand ( $29.85 \pm 12.74$  vs  $31.31 \pm 11.19$ ;  $p=0.01$ ), but not significantly for right hand ( $32.96 \pm 12.38$  vs  $33.18 \pm 11.19$ ;  $p=0.75$ ). Lower limbs strength improved significantly ( $19.33 \pm 4.08$  vs  $27.47 \pm 4.56$ ;  $p=0.0001$ ).

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Discussion: A 28-week Pilates training was effective for improving strength among older adults. Greater benefits were shown in lower limbs strength. Our results are in accordance with those of previous studies reporting an improvement in strength after Pilates intervention [4]. Strength gains could be explained through a better neuromotor recruitment pattern as well as greater trunk stabilization [5]. However, in order to promote a neuromuscular stimulation that allows for an increase in muscular strength, control of the load and intensity of the effort are postulated as crucial items. Finally, Pilates should be considered as a remarkable option in order to improve strength among older adults, and consequently to minimize sarcopenia and their related negative consequences.

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**Título/Title:**

Postural control: Effects of 12 weeks hiit training in older people

**Resumen/Abstract:**

**BACKGROUND:** For several decades now, global population has been aging and the percentage of those over 65 is growing dramatically in our society [1]. Approximately one third of this population have experienced falls [1] which have caused them minor or serious injuries such as hip fractures and traumatic brain injury [2]. Fall risk and fear of falling are mainly due to the loss of balance and confidence, prompting individuals to avoid certain activities of daily living (ADL) and lowering their physical and mental performance. **OBJECTIVE:** The aim of this study was to compare the effect of high and moderate intensity training program (HIIT vs. MIIT) consisted of a 12-week TRX system program on balance in older adults. **METHODS:** For the study of postural control, a stabilometric platform of resistive pressure sensors was used (Sensor Medica, Rome, Italy) together with the FreeStep© Standard 3.0 software (Italy) for the analysis of displacements of the pressure center. The test was performed following the same methodology previously used in other studies and based on the Romberg test [3]. 28 people were assigned to the HIIT group, 27 to the MIIT group, and 27 to the CG. **RESULTS:** A significant main effect of the time variable was found, with a decrease at the end of the intervention

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for the Romberg measure ( $F(1,70)=24.59$ ,  $p<.001$ ,  $\eta^2=.26$ ) and an increase for the YEO variable ( $F(1,70)=7.69$ ,  $p=.007$ ,  $\eta^2=.10$ ). The variables XEOMEDIA and YEOMEDIA revealed significant group x time interactions ( $F(2,70)=30.97$ ,  $p<.001$ ,  $\eta^2=.47$ , and  $F(2,70)=49.86$ ,  $p<.001$ ,  $\eta^2=.59$ , respectively), and statistically significant main effects for group ( $F(2,70)=32.90$ ,  $p<.001$ ,  $\eta^2=.49$ ;  $F(2,70)=40.70$ ,  $p<.001$ ,  $\eta^2=.54$ ) and time ( $F(1,70)=81.14$ ,  $p<.001$ ,  $\eta^2=.54$ ;  $F(2,70)=315.26$ ,  $p<.001$ ,  $\eta^2=.82$ ). CONCLUSIONS: In conclusion, our study shows that an elderly population experienced improvements in balance after performing a high intensity intervention with a TRX training system.

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**Título/Title:**

Effects of high intensity suspension training on sleep quality and fall risk in older people

**Resumen/Abstract:**

**BACKGROUND:** Risk of falls is one of the main problems related to aging, increasing disability, and morbidity in this population, and it causes serious public health problems [1]. Moreover, fall risk among the elderly has also been associated with sleep disorders [2]. Falls can also result from the side effects of medication used for the treatment of sleep problems and other medical conditions [3]. **OBJECTIVES:** The aim of this study was to compare the effect of high and moderate intensity training program consisted of a 12-week TRX system program on the sleep quality and fall risk in older adults. **METHODS:** A total of 82 persons ( $68.23 \pm 2.97$  years, 75.61% women) finished the study. Sleep quality was assessed using the Japanese version of the Pittsburgh Sleep Quality Index (PSQI). The Activities-specific Balance Confidence Scale (ABC) was used to assess balance confidence and Fear of falling was assessed using the FES-I. In HIIT group the main squat activity with suspension system divided into four four-minute intervals at an intensity of 90–95% of the maximum HR and in MIIT group their intensity were lower: 70% the maximum HR. **RESULTS:** Regarding variables sleep latency and sleep disturbances, statistically significant

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group x time interactions were found ( $F(2,70)=10.55$ ,  $p<.001$ ,  $\eta^2=.23$ ;  $F(2,70)=9.08$ ,  $p<.01$ ,  $\eta^2=.21$ , respectively). When the dependent variable was the post-intervention score obtained in the FES-I test, the ANOVA showed the existence of a main effect of the intervention group variable ( $F(2,69)=6.68$ ,  $p=.002$ ,  $\eta^2=.16$ ), as well as a statistically significant interaction of group x measurement time ( $F(2,69)=8.62$ ,  $p<.01$ ,  $\eta^2=.20$ ). In the ABC test revealed a main effect of the intervention group variable ( $F(2,69)=7.13$ ,  $p=.002$ ,  $\eta^2=.17$ ), DISCUSION: In conclusion, our study shows that an elderly population experienced improvements in sleep quality and fall risk after performing a high intensity intervention with a TRX training system.

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**Título/Title:**

Different factors affect maximal fat oxidation during exercise in healthy adults: A cross-sectional study

**Resumen/Abstract:**

**Background:** An inability to oxidize lipids appears to be an important factor in the etiology of disorders like obesity and/or insulin resistance [1]. Several factors affect maximal fat oxidation during exercise, however, which one influences to a greater extent, is unclear. **Objective:** The main objective of this study was to analyse the independent and combined effect of different factors affecting fat oxidation during exercise, such as cardiorespiratory fitness (CRF), muscular strength (MS), dietary intake, physical activity and plasma triacylglycerides (TAG). Secondly, we aimed to study which variable influence the most MFO. **Methodology:** 82 young adults (51 males) were included. An incremental exercise protocol with two consecutive phases was performed to determine MFO and VO<sub>2max</sub>. The first phase aimed to determine MFO and consisted in 3 min steps of 15/30W increments (depending on weight status), maintaining a pedalling cadence of 60-80rpm. The test was stopped when RER ≥1. After 3-5 min rest, the second phase to detect the VO<sub>2max</sub> was initiated until exhaustion (with increments every minute). In a second day, plasma TAG, body composition (bioimpedance), handgrip and standing long

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jump tests (strength component) were assessed. Moreover, nutritional intake (7 days dietary) and objectively measured physical activity (Ob-PA) (accelerometers) were performed during one week. Linear regression analyses were performed to determine the independent and combined associations of different factors on MFO. Results: MFO was associated with variables which affect fat oxidation ( $\beta$  ranges from -0.2 to 1.02; p<0.001, respectively), however this positive association with MS disappeared when CRF and MS were introduced in the same regression model, and on the other hand this association was maintained to CRF. Conclusions: More than 50% of MFO could be explained by individual fat mass, dietary intake, TAG, OPA, MS and CRF. However, the CRF was the main factor that affects fat oxidation. References: Venables MC, Achten J & Jeukendrup AE. Determinants of fat oxidation during exercise in healthy men and women: a cross-sectional study. Journal of Applied Physiology. 2005; 98(1), 160–7.

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**Título>Title:**

Is mtDNA copy number a good biomarker for predict cardiorespiratory fitness level?

**Resumen/Abstract:**

**BACKGROUND.** Mitochondrion is the cellular organelle that produces energy for the organism, generating adenosine triphosphate using O<sub>2</sub> and nutrients. Physical capacity levels are thus directly related with mitochondrial activity (1). Mitochondrial DNA (mtDNA) copy number is proportional to the mtDNA volume in a cell, and can be used as a measure of mitochondrial function (2). The aim of this study was to evaluate the possible relationship between cardiorespiratory fitness level and leukocyte relative mtDNA copy number in healthy men. **METHODS.** 103 healthy men aged between 18-45 divided into two groups: high cardiorespiratory fitness level with VO<sub>2max</sub> above 55 ml.kg<sup>-1</sup>.min<sup>-1</sup> (Group 1) and low cardiorespiratory fitness level with VO<sub>2max</sub> below 45 ml.kg<sup>-1</sup>.min<sup>-1</sup> (Group 2). VO<sub>2max</sub> was measured in a maximal incremental treadmill test with gas analyser (ULTIMA series, MEDGRAPHICS, cardiorespiratory diagnostic). mtDNA copy number was measured in peripheral blood leukocytes. Blood samples were collected in collection tubes containing EDTA and DNA extraction was obtained using the High Pure PCR Template Preparation Kit. The leukocyte relative mtDNA copy number was analysed using a real-time polymerase chain reaction (RT-PCR) method with SYBR Green.

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Threshold cycle number (Ct) values of the  $\beta$ -globin nuclear gene and the COX1 mitochondrial gene were used to determine the mtDNA content. The content of the mtDNA was calculated using the following equation: relative copy number =  $2\Delta Ct$  ( $\Delta Ct = Ct_{nDNA} - Ct_{mtDNA}$ ). For statistical analyses, we used the U the Mann-Whitney test with software SPSS for Windows version 25.0 (SPSS Inc., Chicago, IL, USA). RESULTS. VO<sub>2max</sub> was  $58.7 \pm 3.9$  ml.kg<sup>-1</sup>.min<sup>-1</sup> for group 1 and  $39.6 \pm 3.8$  ml.kg<sup>-1</sup>.min<sup>-1</sup> for group 2. We found significant differences in mtDNA copy number between the groups ( $392.18 \pm 881.2$  for group 1 and  $156.41 \pm 154.3$  for group 2) ( $p=0.044$ ). DISCUSSION. Our results are in accordance to Chang et al. 2016 results in postmenopausal women (3) and to Bayarca et al. 2016 results in athletes (4). In conclusion, it seems that mtDNA copy number can represent an interesting novel biomarker for cardiorespiratory fitness capacity level. Practical implementation: mtDNA copy number is a good indirect predictor of mitochondrial function and useful for measure mitochondrial biogenesis in physical activity. REFERENCES. 1. McBride el al. Curr Biol 2006;16:R551-60; 2. Eynon et al. Physiological Genomics. 2011;43(13):789-798.; 3. Chang et al. Korean J Fam Med 2016;37:334-339; 4. Baykara et al. Cell. Mol. Biol.2016, 62 (12): 109-115. FUNDING: Universidad Europea de Madrid. Ref: 2018UEM05

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## Póster sesión 2/*Poster session 2*

**Viernes, 13 de diciembre de 2019 / Friday, December 13 /  
06:00 PM**

### **TEAM SPORT**

**1**

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#### **Título/Title:**

Efecto crónico de potenciación postactivación en adaptaciones en potencia de ejecución pressbanca en balonmano élite

#### **Resumen/Abstract:**

La potenciación post-activación es un fenómeno que de forma aguda puede mejorar la potencia muscular y por tanto el rendimiento en deportes de equipo como balonmano. El objetivo principal de este trabajo es comparar las adaptaciones crónicas generadas en la potencia de ejecución en pressbanca (PB) entre un grupo de jugadores que realizan un protocolo PAP en cada sesión de entrenamiento y otro grupo que no lo realiza. Para lograr el principal objetivo propuesto se cuenta con 14 jugadores de balonmano nivel élite ( $25.3 \pm 5.1$  años), dividido en 2 grupos de 7 jugadores, grupo control (GC) y grupo de jugadores que realizarán protocolo PAP (GPAP). Se realizan pre test para conocer el valor inicial de potencia de ejecución en PB (WPB) y post test para conocer la magnitud de las mejoras en WPB. El protocolo PAP consiste en realizar 2 series de 2 repeticiones de PB separadas entre sí 3 minutos y 3 minutos después de la 2<sup>a</sup> serie realizar PB con normalidad, al igual que GC. La primera serie del protocolo PAP al 65% de 1RM y la 2<sup>a</sup> al 90% de 1RM. Los análisis estadísticos realizados tras post test indican diferencias estadísticamente

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significativas ( $p<0.05$ ) entre las mejoras logradas por los jugadores que realizan el ejercicio PB como primer ejercicio del circuito (GPAP-A y GC-A) y los jugadores de su mismo grupo que no realizan PB como primer ejercicio del circuito (GPAP-X y GC-X). También hay diferencias estadísticamente significativas entre mejora de WPB lograda por GPAP-A y la lograda por GC; entre la mejora de WPB lograda por GPAP-A y la lograda por GC-A; y en las mejoras logradas entre pre test y post test en GPAP-A y en este mismo parámetro en GC-A. Estos resultados sugieren que entrenadores y preparadores físicos deben establecer un ejercicio principal por grupo muscular y situarlos al inicio de la sesión y tras un protocolo PAP que optimice las mejoras de potencia de ejecución. Izquierdo, M., González-Badillo, J.J., Ibáñez, J., Häkkinen, K., Kraemer, W.J., Ratamess, M.A., y Gorostiaga, E.M. Adaptaciones neuromusculares y entrenamiento de fuerza. En M. Izquierdo, director. Biomecánica y bases neuromusculares de la actividad física y el deporte (pp.677-699). Madrid, España: Médica Panamericana. Sanchez-Sánchez, J., Rodríguez-Fernández, A., Petisco, C., Ramirez-Campillo, R., y Nakamura, F.Y. (2018). Effects of different post-activation potentiation warm-ups on repeated sprint ability in soccer players from different competitive levels. Journal of Human Kinetics, 61, 189–197, doi: 10.1515/hukin-2017-0131.

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**Título/Title:**

Effect of a strength training program on physical performance in elite handball players

**Resumen/Abstract:**

**Introduction:** The aim of this paper is to analyze the effect of an 8-week resistance training program with free weight on physical and competitive performance in high-performance handball players during the season. Previous studies showed that the improvement of power levels and power evolution improves on the performance factors of elite handball players. However, few studies analyze the effects of strength training on elite handball teams during the season. **Methods:** The strength training program used consisted of 3 sessions per week for 8 weeks . Resistance training was always carried out before the technical-tactical training session except on Mondays, in which half of the team performed strength training and the other half performed specific job, changing later. Each session of the strength program took between 27 and 35 minutes.The strength sessions were organized in blocks of 5 exercises. Each block was composed of a push exercise, a pull exercise, a knee dominance, another with hip dominance and the last one focused on the CORE. The players in a group worked with an exercise block the same week, at least one strength session with structural priority and another strength session with neural priority. **Results:** The results corroborate the hypothesis that an 8-week strength-free weight training program during the season produces improvements in the physical performance of the players on a high-performance handball team and the performance in competition during the season does not suffer improvements during the application of the protocol. **Conclusion:** The improvement of

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all strength values in both upper and lower body with significant improvements in all exercises (except two) allows us to determine that an 8-week strength training program causes improvements in the physical parameters of strength and performance of a high performance handball team. Practical Application: It is shown that it is possible to integrate strength training with loads during the season and obtain great gains in earnings. On the other hand, the work of complex force and its transfer to the explosive force and the performance in handball make it an indispensable element given the capacity of differentiation that it has .

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**Título/Title:**

Effect of ascent and training at moderate altitude on elite judokas performance

**Resumen/Abstract:**

Introduction Judo techniques require great muscular power to move high loads at high velocities [1]. Ascent to moderate altitude is known to improve explosive actions[2], but the effect of power-oriented training at moderate altitude on leg push capacity and associated technical performance has not been studied. Therefore, the aim of this study was to analyze the effect of an acute exposure and of a power-oriented AT on counter movement jump (CMJ) peak velocity (PV), the ippon-seoi-nage, and the relationship between them. Methods Twenty-four elite male judokas were divided into a hypobaric hypoxia (HHT, n=13) or normoxia group (NT, n=11). They performed an incremental CMJ test and an ippon-seoi-nage test before (N1) and after the ascent to moderate altitude (H, only HHT), after a 3-week training camp (N2), and 1 week later (N3). A wearable sensor was used to assess the time to reach the horizontal position of the dummy (Thor) and acceleration of the leg extension phase (Max2\_accelT) during the ippon-seoi-nage and a linear velocity transducer was used to assess CMJ-PV. Results The ascent to moderate altitude did not change ippon-seoi-nage performance, while small increases in CMJ-PV were achieved (3.67%;p<0.05). Discussion Neuromuscular adaptations and explosive enhancement induced by acute altitude exposure [2] and training [3]

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were expected to produce greater improvements than sea level training. However, this did not occur, likely because judokas reached earlier their maximal neuromuscular and structural capacity to assimilate power-training and thus were unable to benefit from an additional AT-period. Furthermore, there was not sufficient technique-specific training to allow the adjustments to ippon-seoi-nage new space-time patterns probably caused by changes in physical capacity. Although differences between conditions were not significant, the greater relative improvement under hypoxia versus normoxia suggests that AT may be beneficial to obtain faster and higher improvements in leg extension capacity. Additionally, AT should include specific-technique-oriented training.

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**Título/Title:**

Trunk and upper extremity muscle coordination influence the wheelchair basketball performance

**Resumen/Abstract:**

In wheelchair basketball free throw shooting and passing requires trunk and upper extremity muscle strength and activation in a synchronized way . Therefore the aim of the study was to investigate trunk and upper extremity muscle coordination and its influence on the free throw and passing in wheelchair basketball players. Methods: With institutional ethics approval, 11 right handed males (age =  $33.4 \pm 5.5$  years; wheelchair basketball experience =  $12.5 \pm 1.9$ ) of 4 different classifications completed free throw shots and forward passes during an analytical basketball task. Surface electromyography (EMG) (Cwmfelinfach, Gwent, UK type NOS. SX2301, Data Log Biometrics, Ltd) was used to analyze muscle activation of the dominant and non-dominant sides of external oblique muscle (trunk muscle), anterior deltoid muscle, triceps muscle (upper extremity muscles). The variables measured were i) mean EMG amplitude (%); ii) muscles activation timings on the dominant and non-dominant sides; iii) and number of successful free throw shots. Results: Cross-correlation results showed that the trunk muscles and upper extremity muscles of the dominant

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side are positively correlated during the free throw shot ( $r = 0.87$ ;  $p = 0.01$ ) and negatively correlated during passing on the non-dominant side ( $r = -0.66$ ,  $p = 0.03$ ) in players having a higher classification. Muscle activation timings during successful and unsuccessful free throw shots showed a large difference between external oblique muscle and anterior deltoid muscle activation ( $ES = -0.58$ ;  $-0.64$ ) as well as a medium difference in external oblique and triceps muscle activation ( $ES = -0.42$ ) on the dominant side. Significant differences were also found in a number of successful free throw shots between players having correlated and uncorrelated movement with substantial large differences ( $ES = -1.4$ ;  $p = 0.01$ ). Discussion: Trunk and upper extremity muscles work in a synchronized way in the successful free throw shot in each classification of wheelchair basketball players, whereas shoulder complex muscles played an important role during passing. Early activation of trunk muscles increases the chances of successful free throw shots in the wheelchair basketball players. References: da Silva Santos, Sileno & Alonso, Angelica & Greve, Julia, 2016, Motriz: Revista de Educação Física, 22, 69-72

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## **WOMEN AND SPORT 2**

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### **Título/Title:**

Electromyographic activity during core strengthening exercises in elite youth soccer players: sex influence

### **Resumen/Abstract:**

INTRODUCTION Core strengthening represents a regular intervention strategy to prevent pathologies, but sex-differences in muscle activation are still controversial . Due to this reason, our objective was (a) to determine if these differences existed for electromyographic activity (EMG) of the erector spinae, gluteus medius, external oblique and rectus abdominis during four static and two dynamic exercises. METHODS Sixteen U19 elite youth soccer players participated in this cross-sectional study: 8 males ( $18.42 \pm 0.91$  years, with an average of  $9.1 \pm 0.72$  years of soccer experience) and 8 females ( $18.72 \pm 1.70$  years, with an average of  $8.4 \pm 1.34$  years of soccer experience). To start up the data collection, each subject performed twelve maximal voluntary isometric contractions (MVICs), each set of three was focused on one of the muscles previously listed. Then, EMG was registered during four static exercises (front plank, side plank, bilateral bridge and unilateral bridge) and two dynamic ones (forward lunge and forward step-up). The muscle activity recorded during the exercises was then expressed as a percentage of the MVICs. RESULTS Data collected from female participants registered relatively higher EMG activity in all muscles evaluated, in all exercises, in comparison with male participants. Unilateral bridge and forward lunge seemed to be the exercises where

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there were more differences between sexes. Gluteus medius in static exercises and rectus abdominis in both, static and dynamic tasks, showed more significant differences between males and females.

**CONCLUSIONS** Results suggested that, in general, female participants would reach a greater benefit developing these exercises. The unilateral bridge exercise seemed to be essential to improve hip and trunk stabilization, while side plank, front plank and bilateral bridge could be highlighted as important tasks in a preventive program for female youth soccer players.

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**Título/Title:**

Field test to assess neuromuscular fitness in physically active women

**Resumen/Abstract:**

Introduction The assessment of muscle fitness by simple field tests has been studied in older adults and adolescents (2). To our knowledge, there are no reference data by age in women from a test battery to assess neuromuscular conditioning with simple material available in fitness centers, that can be used with population groups of different age and fitness level. The purpose of this study was to offer reference data by age of four neuromuscular fitness tests on a representative sample of adult recreationally active women who regularly attend fitness centers. Methods 407 Spanish women (16-69 years old) ( $38.82 \pm 10.75$  years,  $64.20 \pm 12.04$  kg), performed four tests: knee Push-Ups in one minute,  $45^\circ$  suspended rows in one-minute, horizontal jump and 3kg ball throwing. To find out if there were differences in the results obtained between different age decades, a one-way ANOVA for each test was carried out. Results No differences between age ranges were found for Push-Ups ( $F_{2,217}=0.6$ ;  $p=0.7$ ) and suspended rows ( $F_{5,171}=2.185$ ;  $p=0.058$ ), whilst differences were found out for horizontal jump ( $F_{5,369}=17.944$ ;  $p<0.001$ ) and ball throwing ( $F_{5,312}=8.301$ ;  $p<0.001$ ). Discussion The muscular endurance tests for time in the upper limb do not reflect changes in physical condition in this population, in contrast to what happens when shorter efforts are made, that a significant difference is perceived from the age of 38 onwards (3). In tests that involve the evaluation of neuromuscular power (horizontal jump and ball throw), a notable change is perceived

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for decades. It is recommended the priority use of these two tests to assess neuromuscular fitness in physically active women.

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**Título/Title:**

Influencia del género en el control motor lumbopélvico en atletas CrossFit®: un estudio transversal

**Resumen/Abstract:**

**Introduction:** Crossfit® has seen a huge growth in popularity around the world since its inception twelve years ago, but in addition to having health benefits, it has been associated with musculoskeletal injuries, with one of the most common being lower back. Lumbopelvic motor control plays a critical role in stabilizing the spinal system. Deficits in dynamic stability can compromise segmental spinal stability and may lead to tissue damage, and the development of chronic low back pain.  
**Aims:** The purpose of this study was to identify differences in LPMC depending on the gender of CrossFit® athletes. **Methods:** 100 CrossFit® athletes participated in this study ( $20 \pm 3.2$  years; 71 men; the age range was 18 to 29 years;  $167.9 \pm 6.5$  cm;  $68.0 \pm 15.2$  kg; mean 6 SD). Lumbopelvic movement control was evaluated using a pressure biofeedback unit, and a structured survey was used to collect data. **Results:** Significant differences in LPMC were observed according to the gender of CrossFit® athletes. **Discussion:** The LPMC was better in women CrossFit® practitioners than men. Coaches can consider gender characteristics of their athletes to improve the LPMC during their sessions. Men will need more attention in exercises that involve the lumbopelvic area to avoid the risk of injury to this population in CrossFit® sessions.

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**Título/Title:**

Jumping but not sit-to-stand tests explain strength differences with regard to exercise training and sex

**Resumen/Abstract:**

Introduction: Neuromuscular functioning is affected by the aging process<sup>1</sup>, with muscle mass and strength decreasing with the advance of age, especially in lower limbs<sup>2</sup>. Despite being healthy, physical inactivity -main cause of muscular weakness- accelerates these loses in the elderly, both in men and women<sup>3</sup>, whilst being physically active is highly effective in counteracting them<sup>4</sup>. Due to the widespread use of different strength test, the aim of the study was to analyse differences in lower limbs strength with regard to exercise training and sex in the vertical jump with countermovement test 5 and the 5-times-sit-to-stand test (5STS)<sup>6</sup> (Rate of force development and strength, respectively). Methods: 27 healthy active elderly [71,04 (4,21) years; 16 women, 11 men], undergoing a multicomponent exercise training program for at least one year, were compared with 40 inactive ones [72,35 (3,39) years; 21 women, 19 men]. Both groups were assessed of CMJ and 5STS. After testing for normality, a multivariate generalized linear model was conducted considering the factors “exercise training” and “sex”. Results: The height of CMJ showed differences (pp Discussion: Physical exercise more than sex explain strength

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differences in older adults, confirming the benefits of being physically active. Strength and Rate of force development have shown to preserve functional capacities and contribute to quality of life in the elderly, notwithstanding both capacities are not conditioned by sex and physical exercise training in the same way, maybe due to higher neuromuscular demands in the CMJ test. According to these differences, both test (CMJ and 5STS) should be included in the elderly's functional assessment batteries. In addition, the rate of force development should become a main target in the women physical exercise training programs.

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## TRAINING AND PERFORMANCE

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### Título/Title:

Effect of instability on power and execution speed in push-up

### Resumen/Abstract:

Introduction: Strength training using devices that induce different degrees of instability is a very common practice in many contexts, with benefits attributed to it in prevention, rehabilitation and general health [1,2]. Several studies have found a progressive decrease in power as the degree of instability increases [3]. The purpose of this study was to compare the effect of different degrees of instability on the power and speed of execution in push-up exercise in trained and untrained people. Method The maximum power , mean power (PA), maximum velocity (VM), mean propulsive velocity (VA) of push-up were analyzed in 44 subjects, 24 untrained ( $176.38 \pm 5.35$  cm,  $76.38 \pm 6.85$  kg,  $2.5 \pm 1.5$  months experience) and 20 trained ( $178.45 \pm 5.91$  cm,  $83.4 \pm 21.56$  kg,  $15.5 \pm 5.3$  months experience), in six conditions of increasing instability: 1) stable, 2) suspension device: rings, 3) monopodal, 4) suspension device: TRX®, 5) with hands on Bosu® and 6) with hands on TRX® and feet on Bosu®. Results The group of trained subjects obtained values much higher than those of untrained subjects in all the conditions and parameters analyzed (p Discussion In tune with previous studies [4-5], instability had a negative influence on the power and speed of push-up execution. However, this influence depends to a large extent on training experience and the degree of instability, being minimal in subjects trained in slightly unstable situations. This suggests that the degree of instability should be adapted to the experience of the

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subjects and that a slight degree of instability could pose a challenge to stability while allowing training with high values of power and speed in trained subjects.

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**Título/Title:**

Effects of caffeine supplementation on countermovement jump performance in Olympic-level boxers: Preliminary results

**Resumen/Abstract:**

**Introduction:** Vertical jump measured through countermovement jump, is an indicator of lower limbs muscular power [1]. Caffeine (CAFF) supplementation has been considered an ergogenic aid in endurance sport modalities [2]. Moreover, since CAFF increases motor unit recruitment and muscular contraction, it has been also proposed as an ergogenic aid in combat modalities [3]. **Objective:** Determine the effects of caffeine supplementation on CMJ performance in Olympic-level boxers. **Methods:** Five healthy male athletes, members of the Spanish Boxing National Olympic Team (age:  $22.4 \pm 1.94$  years, height:  $1.71 \pm 0.08$  m, body-mass:  $67.52 \pm 10.45$  kg, body mass index:  $22.74 \pm 1.35$   $\text{kg}\cdot\text{m}^{-2}$ ), participated in the study. In a randomized double-blind, placebo-controlled, counterbalanced, crossover design, the athletes completed 2 identical assessment sessions (i.e. CMJ performance on a force platform) at the same time slot ( $\pm 0.5$  hours) after the intake of

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CAFF (6 mg·kg<sup>-1</sup>) or placebo. Mean differences between measurements was determined using a paired samples t-test. Pairwise comparisons significance was assessed by calculating Hedges' g Effect Size (ES). Results: CAFF improved jump height (+3.1 cm, p = 0.02; ES = 0.76), and enhanced the time of the eccentric (-0.13 s, p = 0.08; ES = 0.94), and concentric CMJ phases (+0.04 s, p = 0.17; ES = 0.56). Discussion: In this preliminary data in Olympic-level boxers it seems that CAFF improves CMJ height. Our results agree with those of previous studies in Jiu-jitsu athletes [4]. Further, the analysis of CMJ eccentric and concentric phases suggest an enhancement of the stretch-shortening cycle. These effects of CAFF could be mediated by enhanced motor neuron transmission and by increased activity of the sodium-potassium pump [5]. Practical Application: It seems that CAFF at an ergogenic dose (6 mg·kg<sup>-1</sup>) would improve lower limb muscular power in high-performance boxers.

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**Título/Title:**

Efecto agudo de la hipertermia sobre la fuerza máxima en sujetos entrenados

**Resumen/Abstract:**

Introducción: existe un gran interés por el conocimiento de la relación entre el calor y la fuerza, así como de sus posibles beneficios, aunque actualmente no se ha investigado demasiado. Es conocido que la exposición al calor puede propiciar un entorno adecuado para aumentar la fuerza [1]. La exposición a altas temperaturas puede inducir una mayor activación de la proteína diana de rapamicina en mamíferos la cual tiene un papel importante en el anabolismo muscular [2]. Así pues, el objetivo del estudio fue analizar el posible efecto de la exposición a calor ( $100\pm2^\circ$ ) sobre la fuerza muscular en un test indirecto de fuerza máxima en sujetos entrenados. Material y métodos: veinte sujetos varones entrenados con mas de seis meses de experiencia en el entrenamiento de fuerza ( $1,78 \pm 0,09$  m;  $80,26 \pm 12,44$  kg;  $7,23\pm1,34$  horas de entrenamiento/semana) participaron en el estudio. Los participantes firmaron un consentimiento informado bajo la regulación de las directrices éticas dictadas en la declaración de Helsinki de la Asociación Médica Mundial para la investigación con seres humanos. Los sujetos fueron evaluados en dos ocasiones separados en 3 semanas, realizando una evaluación previa sin hipertermia aguda y otra evaluación con hipertermia aguda ( $100\pm2^\circ$ ) en las cuales los sujetos se exponían a altas temperaturas durante 12 minutos en una sauna. En ambas evaluaciones se obtuvieron datos de la composición corporal, valor estimado de 1RM en prensa inclinada de

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piernas mediante la ecuación de Brzycki [3] y percepción del esfuerzo. Resultados: se observaron cambios muy significativos en los valores de RM, RM relativo ( $p<0,01$ ) y cambios significativos en RM relativo muscular, percepción del esfuerzo ( $p<0,05$ ), en comparación con los valores sin hipertermia. Discusión: la exposición aguda a altas temperaturas aumentó con creces los valores de fuerza evaluados mediante un test indirecto de resistencia máxima. Este hecho puede ser interesante para entrenadores y deportistas de modalidades de levantamiento de peso, como halterofilia y powerlifting.

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**Título/Title:**

Acute effect of exercise session on the kinetics recovery of heart rate variability in young athletes

**Resumen/Abstract:**

INTRODUCTION Heart Rate Variability represents variations between consecutive heart beats (beat to beat or R-R intervals) and has long been used in stratification of the risk of sudden cardiac death and diabetic autonomic neuropathy. In recent years, HRV's frequency and time domain indices have also gained increasing interest in sports science (1). The aim of this study was to analyze the kinetics of HRV 72 hours after performing an acute exercise that induces DOMS. METHODS A descriptive study was conducted in which 41 healthy and athlete's males participated, who performed the eccentric exercise protocol described by Howatson (2) to induce DOMS. The analysis of the HRV was carried out before, immediately after, and at 24, 48 and 72 hours after the acute exercise, using the Ambit3 monitor (Suunto, Amer Sports, Strava, Finland). The NN intervals were analyzed using Kubios HRV software (version 3.1.0) to measure standard deviation of all NN intervals (SDNN) as a metric of a total variability and ratio of the

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low to high frequency power (HF/LF) as a metric of sympathovagal balance. For the statistical analysis the non-parametric tests of Friedman and Wilcoxon were applied, adjusting with the Bonferroni test (SPSS v.21, IBM, EEUU) RESULTS SDNN decreased after the acute exercise session ( $p <0,001$ ), recovering its initial values at 24 hours after the intervention. In addition, the variability exceeded the initial values at 72 hours ( $p <0,003$ ). HF/LF ratio reflects an increase in sympathetic activity after exercise ( $p<0,007$ ) to recover the vagal sympathetic balance at 24 hours DISCUSSION The behavior of the HRV indicates that at 24 hours after an acute exercise the autonomic nervous system recovers the initial baseline values, presenting a higher HRV at 72 hours, which could be reflecting a neuromuscular adaptation that is assumed by the DOMS process. (3) Pratical aplications: The determination of HRV to athletes is a non-invasive technique that could give coaches accurate information on when the athlete is recovered for a new session, avoiding overtraining episodes that decrease the performance of athletes.

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**Título/Title:**

Effects of a sleep hygiene intervention on sleep patterns in young gymnasts

**Resumen/Abstract:**

**INTRODUCTION** Scientific evidence has suggested that sleep patterns may influence sports performance [1]. Nonetheless, intervention research on this topic is limited. The aim of this study was to analyze the effects of a sleep hygiene intervention on sleep quantity and quality of young gymnasts. **METHODS** Twenty gymnasts were allocated in either control group or experimental group (n=10). Following a familiarization period, an 8-week intervention was applied. The intervention consisted of reading infographics weekly plus a complementary talk of sleep hygiene every 2 weeks. Sleep duration was self-reported by the participants and sleep quality was measured through the Pittsburgh Sleep Quality Index (PSQI) questionnaire [2]. The study protocol complied with the Declaration of Helsinki for Human Experimentation and was approved by the ethics committee at the institutional review board. Written informed consent was obtained from each participant and their parents/legal tutors in advance. **RESULTS** Improvements in sleep quality were found (3.1 vs. 5.3; p<0.001) at experimental group after the intervention. However, no changes were found in sleep quantity. **DISCUSSION** Improvements in sleep quality were found (3.1 vs. 5.3; p<0.001) at experimental group after the intervention. However, no changes were found in sleep

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quantity. CONCLUSIONS Eight-week sleep hygiene interventions may improve sleep quality of young gymnasts.

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### **Póster sesión 3/*Poster session 3***

**Sábado, 14 de diciembre de 2019 / Saturday, December 14 / 11:30 AM**

#### **WOMEN AND SPORT 3**

**1**

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##### **Título/Title:**

Análisis de los factores de rendimiento en el hockey sobre hielo.  
Planificación y periodización en la mujer deportista

##### **Resumen/Abstract:**

El ciclo menstrual es el proceso que prepara al útero de la mujer para el embarazo de forma periódica mientras somete al organismo a una serie de fluctuaciones hormonales. Dichas fluctuaciones tienen una serie de consecuencias tanto físicas como psíquicas, las cuales afectan de una manera u otra a estos aspectos. Objetivo: analizar cómo afectan las distintas fases del ciclo menstrual al rendimiento físico a las jugadoras de hockey hielo. En primer lugar, se ha comparado la potencia media excéntrica y concéntrica respecto a las diferentes fases del ciclo menstrual; en segundo lugar, se ha evaluado el programa de intervención de preparación física periodizado respecto al ciclo menstrual; en tercer lugar, se ha analizado si la periodización de la preparación física influye en el estado de ánimo respecto a la no periodización; finalmente se ha planteado una propuesta de trabajo respecto a los cambios hormonales y psicológicos que experimenta la mujer durante su ciclo menstrual. Método: 11 jugadoras del equipo Milenio Club Patín de Logroño . Las mediciones que se analizaron fueron, en primer lugar, la potencia media Isocinética en sentadilla con

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la maquina Flywheel Training Desmotec. En segundo lugar, se analizaron variables tanto dentro como fuera del hielo. Dichas variables fueron: test off-ice (composición corporal, dorsiflexión del tobillo, fuerza máxima, agilidad, resistencia, flexibilidad), test on-ice (sprint 30 metros hacia delante y hacia atrás, agilidad 30 metros con puck y sin puck, giros de delante-atrás y de detrás-adelante, salidas y frenadas de línea roja-azul con puck y sin puck). En tercer lugar, se analizó el estado anímico tanto al grupo control como al experimental mediante el Test de POMS. Resultados: test de potencia media isocinética indicaron que la potencia media en la acción concéntrica y excéntrica son menores durante la fase lútea que la fase folicular (33% y 35% respectivamente). En la variable Off-Ice, el GE incrementó su rendimiento en la dorsiflexión de tobillo, salto vertical, agilidad, resistencia muscular y flexibilidad respecto al GC. En la variable On-Ice presenta mínimas mejoras en todas las pruebas. Por último, el test de POMS en el GE los ítems positivos son mayores en la Fase Ovulatoria, disminuyendo en la Fase SPM, mientras que los ítems negativos no disminuyen de manera tan destacada. Conclusión: una periodización del entrenamiento en base al ciclo menstrual y al estado de anímico puede optimizar las ganancias musculares y el rendimiento.

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**Título/Title:**

A repeated bout of eccentric exercise does not affect muscle soreness in well-trained eumenorrheic females

**Resumen/Abstract:**

**Introduction:** Previous muscle damage enhances a protective effect in subsequent training sessions, especially in those trained individuals engaged in eccentric exercise [1,2]. This effect has not been studied in women considering their menstrual cycle. Therefore, the aim of this study was to evaluate the repeated bout effect of an eccentric exercise on delayed onset muscle soreness (DOMS) in eumenorrheic females. **Material and methods:** 19 resistance trained women ( $28.6 \pm 5.9$  years,  $163.4 \pm 6.1$  cm,  $59.6 \pm 5.8$  kg), performed an eccentric exercise session consisted of  $10 \times 10$  back squats, in the early follicular, late follicular and mid-luteal phases of their menstrual cycle, previously counterbalanced and randomized. DOMS was evaluated with a visual scale from 0 (no pain at all) to 10 (unbearable pain) prior to and post-exercise in each phase, while performing an unweighted squat. A repeated measures ANOVA was performed to compare DOMS among the first, second and third exercise sessions. The clinical relevance of findings was also analysed. **Results:** No differences in DOMS ( $F_{2,36} = 0.556$ ;  $p = 0.578$ ) were observed among first ( $2.1 \pm 0.3$ ), second ( $1.7 \pm 0.2$ ) and third ( $1.8 \pm 0.2$ ) sessions. Additionally, a low effect size (ES) was observed [ $0.20$  ( $0.58$ )] and clinical inference indicated that DOMS could be only 50% possibly higher in the first bout. **Discussion:**

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In conclusion, the RBE does not seem to affect DOMS in well-trained eumenorrheic women as the low ES obtained is not meaningful enough to confirm a protective effect of a secondary bout of exercise. A previous study with younger women indicated higher DOMS in the second bout [3] maybe due to hormonal influences or different exercise modalities. Nevertheless, the training status of participants could explain the lack of differences among sessions [2], but further research is needed to clarify the RBE. This finding could be interesting for coaches, as subsequent bouts of an eccentric squats workout that could belong to any females' training session seems not to affect DOMS.

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**Título/Title:**

Efecto de la electroestimulación global en la fuerza de mujeres mayores: estudio experimental

**Resumen/Abstract:**

**INTRODUCCIÓN** La Electroestimulación global ha experimentado un auge considerable en los últimos años. Sin embargo, su efectividad está en controversia, (1). Por otro lado, en la actualidad el sedentarismo está muy arraigado en la población europea, principalmente en los mayores, quienes más necesitan mantenerse en movimiento, pero muestran menor predisposición a tener un estilo de vida activo (Kaushal, Langlois, Hagger, & Bherer, 2019). Por ello se realizó un estudio experimental que analizara el impacto de la EMSG en la fuerza de las mujeres mayores. **MÉTODO** Treinta y cuatro mujeres sanas sedentarias de entre 55 y 69 años siguieron un diseño experimental pre-post test y post test 2. Ambos grupos realizaron un programa de entrenamiento de fuerza con cargas externas. El grupo experimental llevó superpuesta la EMSG durante su ejercitación. Se analizó la fuerza de piernas y brazos a las 10 semanas y pasados 6 meses por medio de los test “Chair Stand Test” y “Arm Curl Test”. **RESULTADOS** Al finalizar la intervención ambos grupos mejoraron los niveles de fuerza a las 10 semanas ( $p < 0.05$ ). No se observaron interacciones significativas grupo\*tiempo ( $p > 0.05$ ). **CONCLUSIONES** La EMSG tiene un efecto positivo sobre la fuerza de las mujeres mayores que no es mayor al obtenido con el entrenamiento tradicional.

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PALABRAS CLAVE Electroestimulación global, entrenamiento de fuerza, mayores CONFLICTO DE INTERESES

Los autores no tienen ningún conflicto de intereses

INDICADORES DE CUALIDAD DEL TRABAJO Este trabajo forma parte de la tesis doctoral “Efectos de la electroestimulación global en la salud y el rendimiento” realizada por Álvaro de Pano Rodríguez y dirigida por Joaquín Reverter Masia. Está financiado por la Universitat de Lleida mediante una beca de Promoción de la Investigación. .

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**Título/Title:**

Efecto de seis meses de desentrenamiento tras un programa multicomponente en mujeres mayores

**Resumen/Abstract:**

Introducción: La práctica de ejercicio físico regular tiene múltiples beneficios en personas mayores pero debido a las características de esta población, suelen ocurrir periodos de tiempo en los que la misma se ve interrumpida [1]. Durante ese tiempo las adaptaciones adquiridas empiezan a perderse de forma gradual. Son pocos los estudios que han estudiado el impacto de una etapa de desentrenamiento tras la realización de un programa multicomponente [1,2]. El objetivo del presente trabajo fue investigar el efecto de un periodo de desentrenamiento de seis meses en la fuerza del tren inferior y la movilidad funcional en mujeres mayores. Métodos: La muestra se conformó por mujeres participantes en un programa de entrenamiento multicomponente . Tras finalizar el programa, se evaluó la fuerza del tren inferior y su movilidad funcional mediante el 30-Seconds Chair Stands (30SCS) y el 8-foot Up and Go (8FUG), respectivamente. Las evaluaciones fueron repetidas seis meses después, sin asistir al programa. Se analizó la normalidad de la muestra mediante el test de Sapiro Wilk. Para analizar las diferencias entre la primera y la segunda evaluación se empleó el test T de Student. Se consideró el nivel de significatividad estadística en p Resultados: Un total de 62 mujeres (edad media  $\pm$  DE =  $78.33 \pm 6.5$  años; rango 67-92) fueron analizadas. Los resultados promedio de la primera evaluación en el 30SCS fueron

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$14.6 \pm 2.8$  repeticiones, frente a las  $13.88 \pm 2.8$  de la segunda. Respecto al 8FUG, los valores previos fueron un promedio de  $5.2 \pm 0.8$  segundos y  $5.7 \pm 1.1$  tras el seguimiento. En ambas variables se hallaron involuciones estadísticamente significativas ( $p$ ) Discusión: Existe un empeoramiento significativo de las variables analizadas lo que va acorde con los resultados obtenidos en otros estudios [1,2], independientemente de la duración del periodo de desentrenamiento analizado o del nivel de función física previo al cese del ejercicio físico. Por ello es necesario concienciar a los mayores del impacto negativo que tiene el abandono de la práctica regular de ejercicio físico.

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## TRAINING AND PERFORMANCE 2

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### Título/Title:

Changes in body composition after 8 weeks of two velocity based resistance training: 20vs40% loss

### Resumen/Abstract:

INTRODUCTION Two resistance training programs showed that 40% velocity loss-based (40VL) training (40% more repetitions) increased cross-sectional area in Vastus Lateralis and Vastus Intermedius compared with a 20% velocity loss-based (20VL) training(1). A greater training volume in 40VL promotes hypertrophy adaptations which are enhancing with a dose-response relationship(2). We aimed to study the changes in body composition (fat and lean mass) after performing a RT-program at 40VL or 20VL. METHODS 26 young men ( $21.8 \pm 2.3$  yrs) were randomly recruited to three groups: 20VL (n=9), 40VL (n=8) and Control (n=9). Participants performed 8-week RT-program using barbell back squat exercise controlling mean propulsive velocity. Body mass (BM), lean mass (LM) and fat mass (FM) were measured using a multifrequency bioimpedance previously validated (TANITA-MC780MA) following these considerations: i) to refrain from vigorous

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exercise 24h before, ii) to avoid alcoholic or energy drinks 24h before, iii) to be in a fasting state for 8h. Repeated-measures-ANOVA and Bonferroni post hoc comparisons were performed. RESULTS For 20VL, no differences were found before and after the RT-program in BM (69,  $69.6 \pm 3.7$  vs.  $69.3 \pm 3.8$ kg), LM ( $55.7 \pm 2.1$  vs.  $56.1 \pm 2.1$ kg), and legs-LM ( $19.5 \pm 0.7$  vs.  $19.8 \pm 0.7$ kg); however, FM and legs-FM were significantly reduced after the RT-program ( $10.9 \pm 2.0$  vs.  $10.18 \pm 2.1$ kg,  $p < 0.01$ ; and  $3.3 \pm 0.6$  VS  $3.1 \pm 0.6$ kg,  $p < 0.05$ ; respectively). For 40VL, no differences were found in any analysed variables (BM:  $74.7 \pm 3.9$  vs.  $75.1 \pm 4.0$ kg, LM:  $58.3 \pm 6.6$  vs.  $58.8 \pm 6.0$ kg, legs-LM:  $20.6 \pm 0.7$  vs.  $20.7 \pm 0.7$ kg, FM:  $13.3 \pm 2.2$  vs.  $13.2 \pm 2.2$ kg, legs-FM:  $3.9 \pm 1.2$  vs.  $3.76 \pm 1.3$ kg); similarly to the Control group (BM:  $78.0 \pm 3.7$  vs.  $77.3 \pm 3.8$ kg, LM:  $61.0 \pm 8.0$  vs.  $60.5 \pm 8.0$ kg, legs-LM:  $21.4 \pm 0.7$  vs.  $21.2 \pm 0.7$ kg, FM:  $13.7 \pm 2.0$  vs.  $13.6 \pm 2.1$ kg, legs-FM:  $4.1 \pm 2.8$  vs.  $4.1 \pm 2.9$ kg). No differences were found between groups before and after RT-program. DISCUSSION Our results showed a reduction of FM and legs-FM after an 8-week RT-program only in 20VL, without differences in 40VL and controls. This could be explained by two factors: i) insufficient energy balance in 40VL, despite participants were asked to avoid changes in nutritional habits, and ii) lower physical activity-ratio based in a high residual-fatigue of 40VL.

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**Título/Title:**

Rate of perceived exertion (RPE) method for quantifying training loads during an eccentric- overload squat exercise

**Resumen/Abstract:**

**Introduction:** Rate of perceived exertion scale has been proposed and validated as an effective tool to monitoring traditional resistance training (1). The advantages of eccentric-overload (EO) training is the greater larger overload in the eccentric phase and the fact that the resistance can be adapted throughout the entire range of movement in the concentric phase (2). Various studies have evidenced positive adaptations in performance with this method type of training (3). We aim to compare the mean concentric power and RPE of the muscle fatigue on the YoYo-Squat exercise. **Methods:** Nineteen semi-professional soccer players (mean (SD) age =  $22.16 \pm 2.09$  years; height =  $1.77 \pm 8.21$  m; body weight =  $73.21 \pm 8.15$  kg). Participants underwent 3-sets of an EO-squat incremental test using a fly-wheel machine (Eccopower Training Force®, Byomedic System) equipped with a rotatory encoder. RPE was used in order to assess the muscle fatigue of the lower limbs at the end of each set. The study protocol complied with the Declaration of Helsinki for Human Experimentation and was approved by the ethics committee at the institutional review board. **Results:** Significant associations between RPE and mean power at all

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levels of inertia were shown (Low inertia:  $\rho = -0.50$ ;  $p = 0.03$ . Intermediate inertia:  $\rho = -0.58$ ;  $p = 0.01$ . High inertia:  $\rho = -0.50$ ;  $p = 0.03$ ). Discussion: RPE may be a useful tool to monitoring concentric power at EO-squat iso-inertial exercise. Despite high correlations between RPE and mean power, an individualized “power-load profile” should be obtained to prescribe intensity appropriately.

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**Título/Title:**

Relación entre distintos test con sobrecarga excéntrica y test de cambio de dirección

**Resumen/Abstract:**

**Introducción y objetivos:** En el deporte intermitente, se requiere acelerar, decelerar y acelerar de nuevo en otra dirección . La habilidad de cambio de dirección (COD) puede anular la rapidez de un oponente y lograr ventajas sobre el terreno de juego. Tradicionalmente, se ha estudiado la relación entre los test de COD con otros de velocidad, fuerza, antropometría... Sin embargo, solo algunos trabajos han investigado la relación entre sobrecarga excéntrica y COD, pese a que las contracciones excéntricas produzcan mayor fuerza y conlleven un menor gasto energético para la misma activación (de Hoyo, Pradas, Sanudo y Carrasco, 2014). El objetivo de este trabajo es estudiar la posible relación entre COD y distintas variables de rendimiento, especialmente las derivadas de un test con sobrecarga excéntrica.

**Material y métodos:** Dieciséis participantes físicamente entrenados pertenecientes a diversos deportes intermitentes participaron voluntariamente en este estudio. Las mediciones tuvieron lugar en tres días separados por al menos cuarenta y ocho horas. El primer día realizaron el test de RM en sentadilla, y familiarización con el dispositivo isoinercial Kbox. El segundo día se registró el mejor de dos intentos en los test de agilidad 505 y T-Test con una plataforma de contacto Tapeswitch Signal Mat, y se realizó una segunda sesión de familiarización. Por último, el tercer día tuvo lugar un registro del pico de potencia, potencia media y sobrecarga excéntrica con el dispositivo Kbox y el software Smartcoach, utilizando intercias de 0.025 y 0.075 kilogramos por metro cuadrado.

**Resultados:** Tras realizar una prueba

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K-S, tuvo lugar una correlación bivariada entre los test de sobrecarga excéntrica y test de agilidad, estableciendo  $p<0.05$ . Posteriormente se realizó una prueba T obteniendo significación estadística con la carga de 0.025 y T505 hacia el lado dominante, por ello se continuó el análisis utilizando dicha variable y se dividió la muestra en dos grupos. Aquellos deportistas que tenían mejores valores de pico de potencia excéntrica con dicha carga realizaban menores tiempos en T-Test hacia lado dominante (ES: 0.9) y no dominante (ES: 0.59) y en T505 dominante (ES: 1.22) y no dominante (0.81) atendiendo al criterio de Cohen. Conclusiones: 1- Existen correlaciones moderadas entre pico de potencia excéntrico y el T505 hacia el lado dominante, lo cual coincide con Spiteri y col. (2015). 2- Deportistas con mayor potencia excéntrica son más rápidos en T505 hacia lado dominante. 3- Se realizarán posteriores análisis para predecir el rendimiento en COD.

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**Título/Title:**

Effectiveness of a sleep hygiene intervention on vertical jump height of young gymnasts

**Resumen/Abstract:**

**INTRODUCTION** Previous studies have indicated a positive relationship between sleep patterns and several sport performance parameters, nonetheless how an improvement of sleep could influence on sport performance remains inconclusive [1]. The aim of the present study was to analyze the effects of a sleep hygiene intervention on vertical jump height in young gymnasts. **METHODS** The participants were allocated in two groups: control group and experimental group (n=10). After a familiarization protocol, the intervention last for 8 weeks. The experimental group read infographics weekly and received a complementary talk every 2 weeks. Vertical jump height (VJH) of squat jump (SJ) and countermovement jump (CMJ) were registered with a contact mat (Chronojump®) [2]. The study protocol complied with the Declaration of Helsinki for Human Experimentation and was approved by the ethics committee at the institutional review board. Written informed consent was obtained from each participant and their parents/legal tutors in advance. **RESULTS** An improvement of VJH of the CMJ (23.2 vs. 20.1; p=0.016) was observed after the intervention at experimental group. However, non-significant differences were found at the VJH of the SJ. **DISCUSSION** These results are in line with previous scientific evidence that highlights the influence of sleep on sports performance in young athletes [1]. In fact, a study by Mah et al [3] investigated the effect of sleep extension showing an improvement of

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sprint time, free throw and 3-point shooting accuracy and reaction time of college basketball players after the intervention. A similar study by Schwartz and Simon [4] found a better serving accuracy in a non-competition setting of college varsity tennis players. CONCLUSIONS An 8-week of sleep hygiene intervention could improve the VJH of CMJ in young gymnasts. The enhancing-sport-performance training programs should consider sleep as a key factor.

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**Título/Title:**

Assessment of upper-limbs' symmetry in water fitness exercises

**Resumen/Abstract:**

Introduction: Asymmetries can lead to muscular imbalances or deficits in strength during some activities [1]. However, little is known while performing water fitness exercises. This study aimed to assess the upper-limbs' asymmetry in water fitness exercises. Methods: Thirty-two subjects performed the horizontal adduction (HA) and the rocking horse with horizontal adduction (RHAdd) over an incremental protocol, starting between 105 and 150 b·min<sup>-1</sup>. A differential pressure sensor system (Aquanex, 4.1, STR, USA) was used to collect the propulsive forces (PF) on dominant (D) and non-dominant (ND) upper-limb. Symmetric Index (SI, %) was estimated and interpreted as proposed by Robinson, Herzog and Nigg [2]. Results: A symmetric motion was found for the HA at 105 ( $10.94 \pm 7.43\%$ ), 120 ( $10.77 \pm 7.54\%$ ) and 135 b·min<sup>-1</sup> ( $9.57 \pm 5.50\%$ ), except at 150 b·min<sup>-1</sup> ( $11.95 \pm 7.44\%$ ). The RHAdd elicited an asymmetric motion at the majority of the selected cadences (RH105 -  $12.76 \pm 9.91\%$ ; RH120 -  $14.84 \pm 9.15\%$ ; RH150 -  $14.64 \pm 10.54\%$ ), except for the 135 b·min<sup>-1</sup> ( $10.63 \pm 8.00\%$ ). DHA was the largest at 105 (68.75 %) and 120 b·min<sup>-1</sup> (59.38 %). At 135 and 150 b·min<sup>-1</sup> the trend was for a similar amount of force for both sides (DHA - 50 %; NDHA - 50 %). The RHAdd had a greater PF applied in DRH at 105 (56.25 %), 135 (59.38 %) and 150 b·min<sup>-1</sup> (53.13%), whereas 120 b·min<sup>-1</sup> seems recruited more the NDRH (56.25 %). Discussion: Exercises involving multiple hops led to asymmetries when comparing

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with static positions (e.g. HA). Most actions were asymmetric except for the 135 b·min<sup>-1</sup> cadence that elicits symmetric motion in both exercises. Faster cadences elicited a larger percentage of the total subjects that applied more PF in DRH, while the same pattern was found in lower cadences for DHA. Water fitness instructors should consider the 135 b·min<sup>-1</sup> cadence as a key to the development of strength.

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2. Robinson, R; Herzog, W.; Nigg, B. Use of force platform variables to quantify the effects of chiropractic manipulation on gait symmetry. *J Manipulative Physiol Ther* 1987 10, 172-176.

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## **EXERCISE ON PATHOLOGY AND INJURIES**

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Valencia.

### **Título/Title:**

Descripción de la condición física y la calidad de vida en adultos con  
fibrosis quística

### **Resumen/Abstract:**

Introducción: La fibrosis quística es la enfermedad genética potencialmente fatal más común entre niños caucásicos, pese a la gravedad, gracias a los avances que ha habido en los últimos años en el diagnóstico, ha aumentado la esperanza de vida y esto hace necesario analizar su condición física (CF) en las distintas etapas que pueden atravesar en la edad adulta. Objetivo: Describir los niveles de fuerza muscular del tren inferior, la capacidad cardiorrespiratoria y la calidad de vida (CV) de sujetos adultos con FQ en tres etapas diferentes de la enfermedad. Material y Método. Las variables de este estudio descriptivo fueron: la fuerza muscular de las extremidades inferiores, medida a través del test “Chair Stand Test” (repeticiones/minuto)[1]; la capacidad cardiorrespiratoria fue analizada a través de un test de esfuerzo incremental en tapiz rodante con análisis de gases, valorando el consumo de oxígeno pico (VO<sub>2</sub>pico) alcanzado (ml·kg<sup>-1</sup>·min<sup>-1</sup>); y la CV, analizada utilizando el test “Cystic Fibrosis Questionnaire-Revised” (CFQ-R)[2]. La muestra se clasificó en tres grupos: grupo 1) espera de trasplante; grupo 2) post-trasplante; grupo 3) volumen espiratorio

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forzado (FEV) menor a 60%. El programa estadístico utilizado para valorar los resultados fue el “Statistical Programme Social Science” (SPSS-19). Los datos se presentan con media y desviación estándar. Resultados. 14 pacientes (71% mujeres) cumplieron los criterios de inclusión de este estudio. La media de edad fue de  $36 \pm 1$  años. Las características de los pacientes por grupos fueron: grupo 1 [n4; edad(años)  $37 \pm 7$ ; VO<sub>2</sub>pico(ml·kg<sup>-1</sup>·min<sup>-1</sup>)  $27,5 \pm 5,2$ ; fuerza(repeticiones) 21±6; dimensión física CV(%) 62,5±14,8]; grupo 2 [n5; edad(años)  $38 \pm 7$ ; VO<sub>2</sub>pico(ml·kg<sup>-1</sup>·min<sup>-1</sup>)  $27,2 \pm 4,9$ ; fuerza(repeticiones) 24±6; dimensión física CV(%) 82,5±25,9]; grupo 3 [n5; edad(años)  $33 \pm 12$ ; VO<sub>2</sub>pico(ml·kg<sup>-1</sup>·min<sup>-1</sup>)  $32,8 \pm 7,8$ ; fuerza(repeticiones) 24,6; dimensión física CV(%) 66,7±24,2]. Discusión. El grupo de pacientes con FQ con un FEV menor a 60% obtuvo resultados ligeramente superiores que el resto de los grupos analizados. Sheppard E et al. concluyeron que el test funcional utilizado que valora la fuerza muscular se puede aplicar con éxito en ámbito clínico [1]. Aplicación práctica: Tras los resultados obtenidos sería de gran interés poder hacer un estudio controlado aleatorizado aplicando un programa de entrenamiento y valorar sus efectos.

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**Título/Title:**

Effects of the 8-week resistance training programme with elastic bands  
for people with multiple sclerosis

**Resumen/Abstract:**

**Background:** The Multiple Sclerosis is one of the diseases that affect the central nervous system (CNS). Due to CNS involvement there is a deterioration of muscle function that leads to fatigue and decreases ambulatory capacity, having a great impact on the quality of life [1].  
**Objetive:** The purpose of this study was to evaluate the impact of 8-week resistance training program, based on the use of elastic bands, in the quality of life of people with MS.  
**Methods:** Sixteen adults individuals (Male= 4 and Female=12; Age:  $43.3 \pm 7.9$  yrs; Weight: $62.52 \pm 8.42$  Kg; Height: $166.92 \pm 7.54$  cm) participated in the study and were randomized into two groups: Resistance Group (RG, n=10) and Control Group (CG, n=6). The RG carried out a resistance-training program with elastic bands in three weekly sessions during a total of 8-weeks, which consisted of 8 exercises divided into 3 sets with 8 repetitions, with two minutes of rest between sets. In the pre-intervention and post-intervention analysis, the subjects completed two questionnaires to measure the degree of disability and quality of life. The SF36 and Self-Reported Neurological Disability (SRND) questionnaires were used. Additionally, the level of strength in upper limbs, lower limbs and the whole-body isometric muscle strength were measured with a hand dynamometer [2], app PowerLift [3], measuring

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the speed of squat execution without weight and a handheld pull gauge [4], respectively. Results: The RG showed greater upper and lower limb strength with values of 27% and 18% ( $p<0.05$ ) respectively after the application of the program and an improvement in the quality of life of 15% ( $p<0.05$ ) of the sample, comparing the results of the SF36 questionnaire with those obtained at the beginning of the intervention. Conclusions: An 8-week resistance program in people with MS showed significant improvements in both the level of strength and quality of life. Practical Application: The application of a resistance program in patients with multiple sclerosis could be a preventive as well as a treatment tool. The benefits of this program are based on improving the quality of life of the patients by reducing the effects of alterations such as wandering and fatigue generated by the progression of this disease on the CNS.

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**Título/Title:**

Analysis of the relationship between the f0 variable and hamstring injury in semi-professional soccer players

**Resumen/Abstract:**

**Introduction:** Hamstring injuries are the most prevalent diagnostic in soccer. His incessant high incidence and recurrence rates indicate that the main causes have not yet been fully identified. Horizontal P - F - V Profiles have previously been used in hamstring injuries rehabilitation, but the association between the F0 variable and the risk of suffering hamstring injury has never been investigated. **Purpose:** The aim of this study is to investigate the relationship between the F0 variable and the risk of suffering hamstring injury in soccer players. **Methods:** The fifteen semi – professional football player's PFV Horizontal Profile from the 3rd Spanish soccer division were tested once a month for four months and the F0 values, changes and fluctuations were analysed, in addition to a record of the hamstring injury incidence. **Results:** Statistical analysis (T-Student test) revealed that there is a relationship between subjects who had F0 values below the team average and hamstring injury occurrence ( $p < 0.05$ ). **Conclusions:** The results of our four-month research indicate that there is a significant relationship between players who had F0 values below the team average and the substantial possibility of having hamstring injury.

**Keywords:** Hamstring injury; soccer; sprinting acceleration; horizontal P – F – V profile; F0 variable

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**Título/Title:**

30m-sprint differences in professional football players with and without an injury history: preliminary results

**Resumen/Abstract:**

**Introduction:** Hamstring injury is the most frequent musculoskeletal pathology in the lower limbs during sprint [1] and sports that require continuous accelerations and decelerations [2]. **Objective:** Determine the differences on 30m-sprint in female professional football players with and without lower limbs injury history. **Methods:** 8 healthy female professional football players , participated in the study. They were divided into 4 groups according to previous injuries in hamstrings and/or quadriceps femoris muscles. Athletes completed 1 session consisted in two attempts of the 30m-sprint test and it was analyzed with the application MySprint [3]. Mean differences between groups was determined using a one-way analysis of variance. **Results:** There were no significant differences between groups in any variable ( $p > 0.05$ ). We observed a positive trend in the time to achieve the maximal speed (7.83 s) in the Control Group (CG) and the Hamstring Group (HG), versus the Hamstring+Quadriceps Group (HQG) (8.34 s). **Discussion:** Our results agree with those of previous studies in female professional football players [4]. We observed similar mean speed in the four groups, however we found a 6.5% higher time to achieve the maximal speed, and a 6.5% and 8.4 % lower initial force and peak power respectively in the HQG versus the CG and HG. This could be explained because the HQG developed a 7.6% higher initial velocity and had a 25% lower decrease in the rate of force developed. Then, it seems that the mean speed of the 30m- sprint test is not conclusive, as

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it can be compensated with other parameters to achieve an adequate result (i.e. before the injury). Practical Application: MySprint may be useful to detect alterations in the Force-Velocity (F-V) profile related to a higher injury risk and/or a poor recovery.

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## **NOTAS / NOTES**

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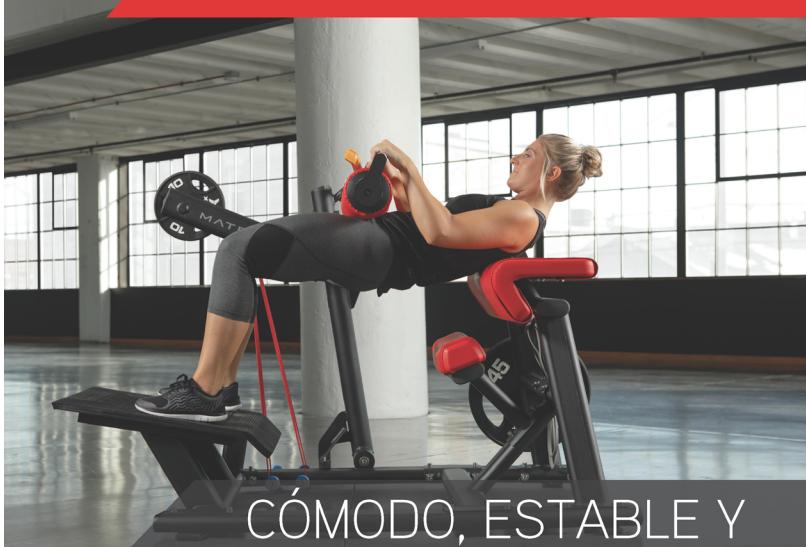
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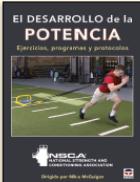
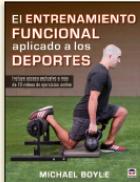
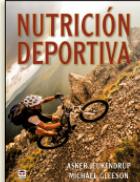
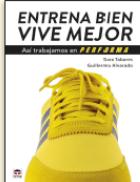
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