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### **NED EXPERT REVIEWS**

Join the UK's leading Nutrition-Evidence Database community

### ISSUE 5: DECEMBER 2024 SPORTS NUTRITION & PERFORMANCE





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# 🙏 BANT | EVENTS

### 2025 CALENDAR

### THYROID HEALTH SATURDAY 01 MARCH 2025 IN PERSON, GUILDFORD & VIRTUAL (HYBRID)



### Event Scope Preview

- What are subclinical thyroid disorders and what are clinical thyroid diseases?
- What are the causal factors for dysregulation?
- What are the key differences in thyroid health for specific populations, such as pregnancy, postpartum, paediatric and older adults?
- What nutrition interventions are particularly helpful to consider when supporting clients thyroid health?
- What lifestyle interventions offer most potential benefit?
- What utility can functional testing offer, which tests, and what can be done differently based on the results?
- What are the links between thyroid health, mental health and gut health.

### NEURODIVERSITY SATURDAY 28 JUNE 2025 VIRTUAL EVENT



### **Event Scope Preview**

- How can neurodiversity be understood and considered by nutrition and lifestyle medicine practitioners?
- How are mental health, neurodiversity and disordered eating related, and how are they distinct?
- How can practitioners sensitively identify neurodiverse clients within their intake and onboarding process?
- What can practitioners do differently for the benefit of their 1:1 clients with common types of neurodiversity? Autism, ADHD, ADD?
- What nutritional approaches may be useful for clients with common types of neurodiversity?
- What lifestyle approaches may be useful for clients with common types of neurodiversity?
- What can practitioners do to appeal to and provide benefits to group work clients with common types of neurodiversity?

### NED SCIENCE FORUM TUESDAY 13 MAY 2025 IN PERSON, LONDON



### **Event Scope Preview**

- Keynote presentation from industry expert.
- New Key Questions publication on nutrition and thyroid looking at the science of diet, nutrients, lifestyle and testing to support thyroid health.
- How to make the most of the NED expert reviews.
- What impact does the practice of personalised nutrition have on digestive health – interim data analysis from the BANT member research study.







### LIVER HEALTH & DETOXIFICATION SATURDAY 08 NOVEMBER 2025 VIRTUAL EVENT



### **Event Scope Preview**

- What is MASLD?
- How can liver health be assessed via testing, indicative symptoms and interpretation of results?
- How are we exposed to toxins from the environment, such as bisphenols, mould, phytates, microplastics, heavy metals, glyphosate, in water, air and soil?
- How can exposures be avoided or mitigated?
- How should we think about common medications?
- What dietary approaches support detoxification pathways?
- How do herbs impact detoxification pathways?
- What must be done to ensure awareness of potential drug nutrient interactions?
- What are common gallbladder and bile production and secretion issues?
- What can sweating and sauna, do to stimulate natural detoxification pathways?



Clare Grundel Managing Editor



## WE CLOSE THIS YEAR WITH A NED JOURNAL EDITION FOCUSED ON EXERCISE AND SPORT NUTRITION.

New for this edition is an applied research article from the NED Editor-in-Chief Professor Justin Roberts and the founder of The Centre for Integrative Sports Nutrition Ian Craig. Using a case study to bring things alive, Justin and Ian walk through the research and reflections required to work with sportsmen and women from an integrative perspective.

We then have a series of expert reviews on newly released science, which provide summary overviews of an article and clinical takeaways for you to apply to your own decision making with clients.

We start with a section looking at the role of exercise in metabolic health. HIIT, walking, aerobic, water exercise and more are covered in relation to weight management, fasting and food timing, type 2 diabetes, blood glucose regulation and appetite hormone balance. The second section looks at elite sport nutrition, including the role of targeted supplementation, nutrition education and the importance of digestive health for elite athletes.

The <u>British Association of Nutrition and Lifestyle Medicine (BANT</u>) is a professional membership body for nutrition practitioners, trained in nutrition sciences and the delivery of personalised nutrition services. BANT members are reading and interpreting nutrition and lifestyle sciences such as that found in this NED Journal on a routine basis to inform their clinical decision making. You can find the BANT member practitioner listing <u>here</u>.

The <u>Nutrition Evidence Database</u> is one of the ways that BANT contributes to the evidence-based practice of precision nutrition. BANT is delighted to make this resource open access for all and encourages all healthcare practitioners interested in personalised healthcare to make use of the resource on a regular basis. You can subscribe to receive monthly NED alerts <u>here</u>.

Read previous copies of the NED Journal <u>here</u> which BANT produces and makes available open access to all. BANT aims to bring good nutrition and lifestyle sciences to the forefront of healthcare and is able to do this through its ambition, careful management and the support of sponsors and advertisers. Thanks to the organisations who have supported this edition - <u>The Centre for Integrative Sports Nutrition</u>, <u>VitOrtho</u> and <u>BioNutri</u>.

Get your running shoes on - off we go...

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# SIGN UP

Each month we publish a dedicated Nutrition Evidence alert with our editorial team's pick of the latest research, podcasts, blog posts and expert reviews. Sign up at https://www.nutrition-evidence.com and have the science delivered straight to your inbox. Follow our socials for weekly posts on topics of interest.



### Nutrition Evidence Alert - November 2024 -**Ketogenic Diet**

Ketogenic Diets - What the Research Says From our Expert Review Panel Effects of a Ketogenic Diet on Body Composition in Healthy, Young, Normal-Weight Women: A Randomized Controlled Feeding Trial...



### Nutrition Evidence Alert - October 2024 -**Professional Sport & Exercise**

This month, we have a selection of nutrition and lifestyle science for the elite sportsperson. With a selection of reviews from our expert panel, a new NED Infobite and a reference library of...

# SAVE THE DATE

### JOIN US FOR OUR SECOND NED FORUM AT THE ROYAL SOCIETY OF MEDICINE



SAVE\_the\_DATE

Tuesday 13th May 2025 from 1:30pm till 5:00pm

### NED SCIENCE FORUM

Join us at The Royal Society of Medicine an afternoon of networking, debate and discussion on emerging nutrition science

















# MEET THE NED EDITORIAL BOARD



### EDITOR-IN-CHIEF

### Prof. Justin Roberts, Ph.D, C.Sci, SFHEA, mBANT



Dr Roberts is a Professor of Nutritional Physiology applied to exercise and functional health within the Cambridge Centre for Sport and Exercise Sciences, Anglia Ruskin University. He is a BANT Registered Nutritionist, and Editor-in-Chief for the Nutrition Evidence Database (the only scientific database which specialises in nutrition and lifestyle medicine to support an evidence-based approach to practitioner clinical-decision making).

He has published over 65 peer-reviewed, scientific articles and book chapters, and is a reviewer for numerous academic journals including: European Journal of Clinical Nutrition; International Journal of Sport Nutrition and Exercise Metabolism; Nutrients;

Medicine and Science in Sport and Exercise; Frontiers in Nutrition; and the Journal of the International Society strategies to support gastrointestinal function. Sports Nutrition. His research focuses on nutritional strategies to promote metabolic flexibility and adaptive recovery in relation to exercise, including polyphenol and protein-targeted approaches, along with interests in pre-probiotic and food-based

### EDITORIAL TEAM



### Dr. Michelle Barrow - Editor BSc (Hons), MSc, QTLS, DProf, fBANT

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### Dr Kate Lawrence - Editor, BA(Hons), PhD, FHEA

Senior Lecturer in psychology at St Mary's University. Specialises in nutritional psychology and neurodiversity, with a focus on dietary and microbiome influences on mental health and cognition.



Clare Grundel, Managing Editor MSc, BA (Hons), mBANT

Science and Education Manager, BANT

Registered Nutritional Therapy Practitioner.

# GUEST SPORTS CONTRIBUTOR



**ARTICLE PROVISION** 

lan Craig - MSc, DipCNE, BANT Fellow



lan Craig is the founder of the Centre for Integrative Sports Nutrition (CISN) and course leader of their online postgraduate courses. He is an experienced exercise physiologist, nutritional therapist, NLP practitioner, and an endurance coach. CISN was created to train and mentor exercise and nutrition professionals to nourish an athlete's health and performance through an expansive way of integrative thinking. In 2007 Ian Craig was asked to put together and deliver a postgraduate module called 'The Competitive Athlete' as part of the Centre for Nutrition Education and Lifestyle Management's (CNELM) Masters degree. Ian works with sporting individuals and complex health cases at his Scottish home, and online.

Additionally, Ian co-authored the Struik Lifestyle book Wholesome Nutrition with his natural chef wife, Rachel Jesson, and is currently co-writing the Textbook of Integrative Sport and Exercise Nutrition, to be published by Routledge in 2025.



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intsportsnutrition.com

# MEET THE NED EXPERT REVIEWERS



Our Expert Reviewers work within the nutrition industry in academia, research, clinical practice and wider healthcare, and provide unique and invaluable insights on the latest nutrition research to enable practitioners to apply the science to clinical practice.

Knowledge sharing is a key strategic pillar for the NED editorial team. Not only do the expert reviews get directly published on the NED database, they are further communicated via a series of monthly resources and across our BANT social media channels reaching in excess of 25,000 practitioners and followers.



### **EXPERT REVIEWERS IN THIS ISSUE**

(In order of appearance)



### Chloe Steele

Chloe has an MSc in Personalised Nutrition from the University of Middlesex, and specialises in cardiovascular disease, type 2 diabetes, and anxiety. Chloe started her career at BANT as a member of the Nutrition Evidence Database research team and now has over 5 years experience of research and writing. She has worked in several countries, and is currently in Australia, where she worked for Nutrition Australia and is currently the principal nutritionist for Heart Research Australia. She has published two papers in the Nutrition Medicine Journal, on gut microbiota and collagen. Chloe is a member of BANT and the Nutrition Society of Australia and sits on the editorial board for the Nutrition Medicine Institute in the UK.

### **Kirsty Baxter**

Kirsty is a BANT and Registered Nutritional Therapy Practitioner, who has been in practice since 2016, with a Master of Science in Nutrition (Advanced Research and Practice) and research project on the nutritional therapy approach to harnessing psychological aspects of obesity weight loss. from London South Bank University. She works collaboratively with a wide range of GPs and doctors, giving presentations to support awareness around the nutritional intervention for metabolic conditions.





### Gail Brady

Gail is a Registered Nutritional Therapy Practitioner RCNHC MBANT. She qualified is 2013 from The Institute for Optimum Nutrition in London and has since furthered her studies and completed a Master's of Science (MSc) degree in Advanced Nutrition (Research and Practice). The topic for her MSc dissertation project was menopause and potential diet and lifestyle interventions that my help to prevent weight gain. In clinical practice, Gail specialises in female health and works 1:1 with clients using a Functional Medicine framework. She also runs an online course providing a tool kit for managing perimenopause and menopause.



### Miranda Harris

Miranda is a member of BANT and a CNHC Registered Nutritional Therapy Practitioner with over 10 years clinical experience, specialising in endurance sport. She is a senior lecturer (SFHEA) focusing on research methods, dissertation supervision and sports nutrition on the Nutrition and Lifestyle Medicine MSc course at the University of Worcester. She has recently published in the European Journal of Integrated Medicine and the Journal of Nutrition and Health and is working towards a PhD by publication. She is a keen triathlete training for Ironman.

### Nicky Ester

Nicky received her Masters in Nutrition from University College Cork in Ireland. She also has a diploma in nutritional medicine and has trained as Natural Chef. She brings with her over 20 years' experience of working within the Health and Wellbeing sector, 10 years of which were spent in her own private clinical practice. Throughout her career she has given lectures to help increase the awareness of nutrition and its importance in relation to optimal health and well-being. She is passionate about empowering individuals to understand the role they play in their health in order to create meaningful and lasting change.





### **Daniel Quinones**

Daniel Quinones is a BANT and CNHC Registered Nutritional Therapist. He obtained his nutritional therapy diploma from the College of Naturopathic Medicine and MSc in Personalised Nutrition from CNELM, Middlesex University. Daniel contributes to Nutrition Evidence through his clinical experience working with weight loss clients and research into the drivers of obesity.

### Wilma Kirsten

Wilma has been in clinical practice since 2005. The topic for her MSc dissertation project was "The impact of Coenzyme Q10 deficiency in late-onset Alzheimer's disease in patients who use cholesterol lowering medication". She furthermore obtained two honours science degrees, one in Nutritional Therapy and the other in Molecular Cell Biology and Health Sciences. Wilma specialises in digestive disorders (IBS and IBD), female hormonal well-being (PMS and menopause), and mental health. She has successfully helped hundreds of patients address symptoms of ill health in her clinic. Wilma is furthermore the author of the popular science book, "Ideal Plate Composition - Choose Food to Help You Be Your Best Self".





### Marc Bubbs

Dr. Marc Bubbs is a Naturopathic Doctor, the Director of Performance Nutrition for Canada Basketball and consultant performance nutritionist for a portfolio of professional and Olympic athletes. Marc is the author of the highly-acclaimed and best-selling book PEAK – The New Science of Athletic Performance That Is Revolutionizing Sports which highlights the tactics and strategies of elite athletes and performance staff in pro sport for achieving world-class success. Marc also hosts the Performance Nutrition Podcast, connecting listeners with world-leading experts in human performance, and the short-form podcast PEAK40 which provides tips and strategies for living your best life in midlife.

# INTEGRATIVE THINKING IN A SPORT AND EXERCISE CONTEXT

### **Feature Article**

### THE INTEGRATIVE PERSPECTIVE

Research from any field is only useful when it is contextually relevant to the individual in question, and this appreciation is particularly relevant when human physical performance is on the line. For more than half a century, sport and exercise nutrition science has focused on the quantitative needs of an athlete, including the macronutrient requirements to 'fuel' their chosen endeavours. While these assessments are important to incorporate, especially when relative energy deficiency in sport (REDs) is becoming more prevalent (1), working with an active human being introduces many more variables to our thinking. Such variables include eating patterns, training regimes, recovery and sleep quality, chosen supplements, plus the environment or 'ecosystem' within which they live. From an integrative perspective, we of course should also be mindful of optimal functioning and crosstalk between physiological systems, which can also impact performance and recovery.

Thankfully such human complexities are now being discussed within many scientific communities, but to learn about them, you must read widely. Staying within a certain research modality (in this case sport and exercise nutrition) may lead to stagnancy of thought and insight when working with individual cases, all of which present their own unique challenges.

As a working example, we would like to present you an integrative case: a Masters athlete with clear sporting goals, who (because of her physiological health challenges) would be shortchanged by a traditional quantitative sports nutrition approach. In fact, she very much needs the complex thinking of an integrative practitioner to help her resolve the inflammatory impacts of exercise training on her body, and thereby improve her resultant recovery.



As part of this case we propose a wider integrative thinking paradigm, incorporating knowledge-based quality, evidence and experience-based practice, physiological interconnectedness, and crucially, person-centered contextualisation.

### Introducing Patricia the triathlete

### CASE STUDY

Patricia is an Olympic distance triathlete, hoping to qualify as an age group athlete in the 40-49 category in the coming season. She is married with two children (aged 12 and 9) and works as an administrator in a private care facility for the elderly. Patricia's work patterns are 9 till 5, Monday to Friday, and her parents help with childcare when needed.

Training wise, she completes three training sessions before work plus two longer sessions at the weekend and is guided by an online coach via the Training Peaks software. Although Patricia considers herself 'healthy', her overall symptomatology suggests otherwise. She struggles with her gastrointestinal (GI) system, often feeling bloating after meals, and has occasionally experienced bowel urgency during longer training sessions and races, especially when in the heat.

This GI disruption negatively impacts her ability to train, sometimes causing missed training sessions, plus affects her confidence during long sessions.



Most significantly, each morning after waking, she feels unrested, with stiffness and soreness from previous training sessions, which only alleviates during the movement of exercise or when performing her work duties. Sometimes the muscular soreness lasts for several days, and her average energy levels are quite low. Her doctor has diagnosed her with a mild form of fibromyalgia and prescribed routine non-steroidal anti-inflammatory drugs (NSAIDs), which she doesn't use because, based on previous experience, they aggravate her gut.

Patricia has been advised by her coach to consume a high-carbohydrate (CHO) diet, which mostly includes oat-based breakfasts, sandwiches for lunch, and rice or pasta-based dinners. She consumes a lot of fruit and nuts as snacks, plus relies on energy bars before and after sessions. Additionally, as recommended by her teammates, she used to purchase commercial sports drinks and gels for long training sessions and races, although due to the frequent experience of nausea, she mostly now relies on plain water while training and competing.

### Tasking your Nutritional Therapy knowledge

On the surface, Patricia is a sports nutrition case, but she displays an array of signs and symptoms that are indicative of imbalanced integrative physiology, which nutritional therapy is well suited to work with. From an integrative thinking perspective, we propose that whilst building a nutrition strategy on the 'demands' of the sport may be useful from one perspective, focusing on the functional 'needs' of the person will be more beneficial from a health and performance perspective.

So, if Patricia was your client, ask yourself; what would you do now? (see overleaf for full size)



### ASSESS YOUR KNOWLEDGE

Firstly, assess whether you have a sufficient or aligned knowledgebase, particularly if not familiar with the demands of a particular sport, or if considering a particular nutrition strategy. What more information do you need to begin working with her? For example, considering row 1 in Figure 1: do you know enough about master's triathlon requirements; do you know enough about GI complaints and how this links with the stresses of endurance exercise; do you know enough about fibromyalgia?



From an integrative perspective, if we only base our clinical reasoning from a limited resource mindset (i.e. based on reading a few abstracts or one or two articles), our view may well be biased or incomplete. For example, consider if you read an article about a particular supplement that might be useful for gut health, and results from the study were positive. Would you consider using that supplement? Now what if you read another paper, more specific to exercise/triathlon, using the same supplement, and the results were negative?

As a practitioner, not only do you need to be 'well read' (and this also begs the question how much is enough?), but you also need to be able to critically evaluate the specific details from research to inform your thinking. Just reading an abstract or a headline isn't good enough, and of course we should also be mindful of the source/quality of the material we read to avoid pseudoscience or personal opinions.

As a practitioner, the goal therefore should be to demonstrate sound (non-biased) evidence-based reasoning, leading to clear translational messages, which can be practically applied in the context of the client. Stop for a moment and ask if you do this?



If we only approach this case from a traditional sport and exercise nutrition quantitative approach (e.g. 60% of calories from CHO, 15% protein, 25% fat - 2), would this be enough for Patricia to improve her health and performance? Potentially yes. However, she is already on a high-CHO diet, as advised by her coach, but chances are that these recommendations have exacerbated her gut issues, especially if attention was not placed on food quality. We need to ask the question: what may have caused or could be contributing to her GI imbalance and systemic inflammation in the first place?

Q

### Row 2

### WHAT FURTHER INFO IS NEEDED?

Extending this line of thought, and returning to the flow chart, what further information do you need? Considering row 2, testing could be a consideration, but what would be contextually relevant to test? GI health and function would clearly be a priority here, plus some insight to mitochondrial (energetic) function. Fibromyalgia (fibro) is just a set of symptoms, with multiple potential triggers and mediators: in addition to gut and mitochondrial functioning (3,4), Patricia's neurochemistry (e.g. serotonin levels)



and hypothalamus-pituitary (HP) axes functioning could be considered (5). However, as with all things, cost often becomes the limitation, particularly for the client. Therefore, any supporting data/tests needs to be: i) meaningful, ii) reliable and accurate. Practitioners should also be mindful of working with reputable diagnostic companies that can demonstrate adherence to good clinical practices, and robust lab procedures.

### Row 3

### **EXPERIENCE & OBSERVATION SKILLS**

This is where your prior experience and observation skills, along with learning from other practitioners, comes into play. You are unlikely to have worked with another case that exactly replicates this one, but you may, for example, have experienced stressed corporate clients with similar fibromyalgia symptoms: in those cases, nutritional (dietary and supplemental) support of GI and mitochondrial function, along with stress management strategies, had often worked well.

Additionally, your colleague who specialises more in sport and exercise nutrition, has shared her inflammatory management strategies with you, which seems to shorten her clients' recovery times.

Thirdly, you subscribe to a popular sports nutrition podcast, which has started featuring case discussions on GI health and inflammatory patterns in athletes. These 'observational' inputs, combined with relevant reading from row 1, should provide you with sufficient 'evidencebased practice' and 'experience-based practice' to be able to formulate initial intervention suggestions for Patricia. Of course, this is only the start of your interaction with her: you need to monitor her progress and adjust the strategy as required to keep her moving towards her end goal of triathlon qualification (which requires improved integrative health).



### Row 4

### AN EFFECTIVE TEAM APPROACH

No matter how good a practitioner you are, a team approach is generally more effective than a lone voice - if you all agree on the overall approach that should be taken with the client. The obvious inclusion in this case is Patricia's coach, who believes that a traditional high-CHO diet is best for endurance training. He/she would benefit from the same nutrition education that Patricia receives from you, which is personalised to her. Based on her triathlon goals, and viewed in isolation, her training load is not unduly high, but the fact is that Patricia's body is an overwhelmed state, so she could benefit from a planned period of low-volume low-intensity training, combined with some restorative movement, such as yoga or Tai Chi. Patricia is also in a family environment (ecosystem), so inviting her husband into one or more of her sessions with you, could benefit her progress. It would help him to understand why she is struggling health-wise, and he may even be persuaded to take on some of the cooking duties! Chances are that Patricia would progress well with such an integrative approach, but it's always worth anticipating your own scope of practice and when it's appropriate to refer on.



**Practical take Home Messages** 

### ALWAYS HELPFUL TO CONSIDER...

- When it comes to sports nutrition cases, a traditional 'food as fuel' approach could be limiting, and even disruptive, to certain individual athletes.
- Awareness of wider integrative practices can help you develop and sharpen your own practitioner skills. This includes reading widely from highquality sources and learning how to be critical and balanced in your 'evidence-based approach'. You also need to be mindful of translational (academic observation into applied practice) thinking (e.g. 6).
- Learn to sharpen your 'experience-based practice' in addition to building a comprehensive understanding of body systems-based crosstalk, which can impact athlete recovery and performance.
- Integrative thinking includes seeing the bigger picture, which may involve other professionals or those within the client's 'ecosystem', who could impact the overall success of the case.

### **OUR SPORTS SPECIALISTS**

**Ian Craig**, Nutritional Therapist and Founder of the Centre for Integrative Sports Nutrition **Professor Justin Roberts**, NED Editor-in-Chief

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# R E A L H E A L H H л S O EXERCIA METAC





# HIIT VS SPRINT TRAINING EFFECTS



### EIGHT WEEKS OF HIGH-INTENSITY INTERVAL VS. SPRINT INTERVAL TRAINING EFFECTS ON OVERWEIGHT AND OBESE ADOLESCENTS CARRIED OUT DURING THE COOL-DOWN PERIOD OF PHYSICAL EDUCATION CLASSES: RANDOMIZED CONTROLLED TRIAL

González-Gálvez, N ; Soler-Marín, A ; Abelleira-Lamela, T ; Abenza-Cano, L ; Mateo-Orcajada, A ; Vaquero-Cristóbal, R Frontiers in public health. 2024;12:1394328

### INTRODUCTION:

- High intensity interval training (HIIT) has been shown to increase cardiovascular fitness, however its effectiveness on body composition and cardiometabolic risk factors remains unclear.
- Effects may be due to the intensity at which the exercise is performed, duration of the exercise, and the rest interval.
- This randomised control trial (RCT) aimed to determine the effects of both HIIT, and an exercise known as sprint interval training (SIT), which is performed at higher intensities for shorter durations, on body composition and cardiometabolic factors.

### **METHOD:**

- This was an RCT in 45 adolescents with either overweight or obesity.
- Participants were split into SIT (n=15), HIIT (n=15), or control (n=15) and individuals in the SIT and HIIT group performed exercises twice a week for 8 weeks.
- Body composition, blood pressure (BP), pulse rate (PR), and cardiorespiratory fitness were assessed.
- Cardiorespiratory fitness was assessed using the Course-Navette test.
- SIT exercises were less than 60 seconds at maximum intensity and 6 sets were completed for a total of 12 minutes.
- HIIT exercises were longer than 60 seconds at close to maximum and 3 sets were completed for a total of 12 mins.

### **RESULTS:**

- Individuals in the SIT and HIIT groups showed improvements in fat mass (P=0.005 and P=0.003 respectively) and trunk fat mass (P=0.001 and p=0.005 respectively).
- In addition only individuals in the HIIT group also showed improved lean mass (P=0.001) BP (P=0.013), systolic BP (P=0.044), diastolic BP (P=0.019), cholesterol:high density lipoprotein (HDL) ratio (P=0.003), low density lipoprotein (LDL) cholesterol (P=0.019), HDL (P=0.019), and cardiorespiratory fitness (P=0.002).
- Improvements in BP and LDL were greater in the HIIT group compared to the SIT group (P=0.04 and P=<0.05 respectively).</li>
- No differences in enjoyment were seen following either SIT or HIIT exercises.



### TAKE HOME MESSAGE:

- The cardiovascular fitness and health outcomes may be improved in adolescents with overweight and obesity following a 12-minute HIIT programme twice a week for 8 weeks.
- Adolescents who undergo a SIT exercise programme for 12 minutes twice a week for 8 weeks may find it has limited benefits to their cardiovascular fitness but may improve body composition.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Exercise to improve body composition doesn't need to be performed for extended periods of time.
- If individuals only have a short amount of time to exercise, then to improve cardiovascular outcomes and cardiorespiratory fitness a high intensity workout needs to be performed at least twice a week for 8 weeks.

### ? considerations for future research:

• Further research could include an adult population to see how these two exercise regimes affect them.

### CONCLUSIONS:

HIIT exercises improved more health-related outcomes than SIT exercises, although both did decrease fat mass.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

### PAGE SEVENTEEN | HIIT VERSUS SPRINT TRAINING EFFECTS ON OBESITY

# WALKING FOR HEART FAILURE



### LIFESTYLE WALKING INTERVENTION FOR PATIENTS WITH HEART FAILURE WITH REDUCED EJECTION FRACTION: THE WATCHFUL TRIAL

Vetrovsky, T ; Siranec, M ; Frybova, T ; et al. Circulation. 2024;149(3):177-188

### **INTRODUCTION:**

- Heart failure with reduced ejection fraction (HFrEF) can be life limiting.
- Whilst structured cardiac programmes are of benefit, limitations such as accessibility and time constraints affect adherence.
- Lifestyle physical activity is an alternative approach to increase activity levels integrated into daily life (e.g. walking).
- This study aimed to determine whether a lifestyle walking intervention could improve functional capacity in individuals with HRrEF.

### **METHOD:**

- This was a 6-month randomised control trial of adults with stable HFrEF (left ventricular ejection fraction < 40%).
- 202 Individuals were randomised to one of two groups: either physical activity (PA (n=101), which included behaviour change techniques to encourage daily walking; or control, which included usual care and education about the health benefits of exercise.
- The primary outcome was the number of metres walked during the 6 months between groups.
- Secondary outcomes were average daily step count, minutes of moderate and vigorous PA, and measures of Nterminal pro-B-type natriuretic peptide, high sensitivity C-reactive protein, left ventricular ejection fraction, patient reported outcomes, anthropometric measures and Meta-Analysis Global Group in Chronic Heart Failure risk score.

### **RESULTS:**

- No differences were observed between the two groups in the primary outcome (mean 7.4 meters [95% CI, -8.0 to 22.7]; P=0.345, n=186).
- However, the PA group did increase their physical activity by 25%.
- Daily step count (+1420 [95% CI, 749 to 2091] significance not given) and amount of moderate to vigorous daily exercise over the control group (+8.2 minutes [95% CI, 3.0 to 13.3] significance not given).
- No differences were seen between the two groups in any of the other secondary outcomes.



### TAKE HOME MESSAGE:

 Increasing physical activity in the form of walking from a lifestyle perspective did not effect functional outcomes of HFrEF.

### CLINICAL PRACTICE APPLICATIONS:

- Walking is considered a practical way to increase physical activity in individuals with HFrEF.
- Consideration is needed to which practical exercise may have more pertinent functional/clinical benefits.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- Understanding is needed on whether it is simply walking that has no effect on HFrEF.
- Other forms of accessible exercise should be assessed for functional outcomes. For example, home based strength and conditioning exercises may produce different results.

### **CONCLUSIONS:**

• It was concluded that although the lifestyle intervention increased participation in daily physical activity, this did not translate into functional benefits.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

### PAGE NINETEEN | WALKING THERAPY FOR HEART FAILURE

# LEPTIN LEVELS AND FASTING



### REDUCTION OF LEPTIN LEVELS DURING ACUTE EXERCISE IS DEPENDENT ON FASTING BUT NOT ON CALORIC RESTRICTION DURING CHRONIC EXERCISE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Fontana, A ; Vieira, JG ; Vianna, JM ; Bichowska, M ; Krzysztofik, M ; Wilk, M ; Reis, VM PloS one. 2023;18(11):e0288730

### INTRODUCTION:

- Leptin is a peptide hormone produced in the adipose tissue that is responsible for the regulation of appetite, neuroendocrine function, and energy homeostasis.
- High levels of leptin have been associated with poorer health outcomes such as obesity and people with obesity may struggle to decrease their leptin levels due to the occurrence of a state of leptin resistance.
- Exercise may help to reduce leptin levels and this meta-analysis aimed to determine how the dose-response of exercise influences plasma leptin levels during training and/or after training.

### METHOD:

- This was a systematic review and meta-analysis of studies from 2005 to May 2023.
- Studies included were in English, peer reviewed and performed on humans.
- Any type of exercise was included in the review.
- Studies had to evaluate Leptin concentration at rest and soon after exercise and/or after a training period.
- Studies in children and those over 60 years or in menopause were excluded

### **RESULTS:**

- 6471 studies were identified. 25 studies met the inclusion criteria.
- Exercise, and caloric restriction plus exercise, has an acute effect on reducing plasma leptin levels (p = 0.035, n=262 16% female and 84% male).
- Short and long term exercise, and caloric restriction plus exercise has a significant effect on reducing plasma leptin level (p<0.001, n =377 38% female and 62% male).</li>
- Sub-analysis showed that the intensity of exercise had no differing effects on leptin levels in the short-term (high-intensity: p = 0.279; moderate-intensity; p = 0.990; maximal-intensity: p = 0.256).
- Sub-analysis showed that the consumption of a pre workout meal had overall less effect on acute leptin levels (P=0.201) than those who did not eat before had lower acute leptin levels (P=0.003).



### TAKE HOME MESSAGE:

- Leptin resistance and obesity are closely linked.
- For individuals who are obese, undertaking a minimum of 180 minutes of moderate exercise per week may help improve leptin levels.
- However, this may only be one step in the management of obesity.
- Individuals who are obese should always consult a healthcare professional before undertaking any exercise programmes.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Individuals who are overweight or obese may be experiencing leptin resistance.
- The recommendation of exercise to individuals who are obese may reduce leptin levels and aid leptin resistance especially if exercise is performed under fasting conditions.
- 120 minutes of high intensity exercise or 180 minutes of moderate intensity exercise are optimum.
- Leptin resistance is not the only factor involved in the development of obesity.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

• It would be interesting to understand if decreasing leptin levels reduce body weight and if not, what else maybe aiding fat storage.

### **CONCLUSIONS:**

- Acute and chronic exercise reduce leptin levels, however if a pre-exercise meal is consumed then short-term leptin levels showed less effect overall.
- Significant reduction in leptin levels occur when exercise is performed under fasting conditions.
- Exercise intensity has no effect on short or long-term leptin reduction if 180 minutes of moderate intensity and 120 minutes of high-intensity exercise is performed.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# POSTPRANDIAL EXERCISE EFFICACY

### EFFICACY OF POSTPRANDIAL EXERCISE IN MITIGATING GLYCEMIC RESPONSES IN OVERWEIGHT INDIVIDUALS AND INDIVIDUALS WITH OBESITY AND TYPE 2 DIABETES-A SYSTEMATIC REVIEW AND META-ANALYSIS

Kang, J ; Fardman, BM ; Ratamess, NA ; Faigenbaum, AD ; Bush, JA Nutrients. 2023;15(20)

### INTRODUCTION:

- Impaired glucose control after eating is associated with poor health outcomes and the development of type 2 diabetes mellitus (T2DM).
- Exercise has been shown to reduce blood glucose levels.
- As a result, it has been debated whether to recommend exercise after eating for people with T2DM.
- This aimed to determine the effect of postprandial exercise (PPE) on glucose control.

### METHOD:

- This systematic review and meta-analysis of peer reviewed publications only included clinical studies in adults with overweight, obesity or T2DM, and studies in English.
- Children and pregnant women were excluded from the study.

### RESULTS

- 31/1290 studies were included in the final analysis.
- Postprandial exercise was shown to decrease 24 hour mean glucose concentrations compared to control (Hedge's g = -0.328; SE = 0.062; 95% CI = -0.453, -0.203; p < 0.001), with a high level of consistency across studies (I2=0).
- There were no differences between whether subjects performed postprandial high intensity interval exercise (HIIE) or continuous moderate-intensity exercise (CMIE) (Hedge's g = 0.152; SE = 0.104; 95% CI = -0.075, 0.397; p = 0.170).
- Postprandial exercise was shown to be more effective in controlling postprandial hyperglycaemia than exercising before a meal (Hedges' g = -0.271; SE = 0.072; 95% CI = -0.357, -0.085; p < 0.05).</li>
- Sub-analysis showed that exercise for less than 30 minutes duration had a reduced effect on postprandial glucose levels compared to exercise duration of more than 30 minutes (chi-square Q = 4.361, p < 0.05).</li>

### TAKE HOME MESSAGE:

- Individuals living with obesity or who have type 2 diabetes may find it difficult to control their blood sugar levels after a meal.
- However, exercise after a meal can aid the uptake and use of sugar in the body.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Individuals with type 2 diabetes or who are living with obesity may benefit from exercise following a meal to help control blood sugar levels.
- It doesn't matter what form of exercise is performed just if it is at least of moderate intensity for 30 minutes.
- This exercise needs to be performed within an hour of eating.
- This may affect timing and amount of medication needed, which should be monitored.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- Research on the effect of postprandial exercise on weight loss in individuals with type 2 diabetes or who are living with obesity would be of benefit.
- This would help to understand how exercise timing might also affect weight loss.

### **CONCLUSIONS:**

- Exercise following a meal is effective at controlling postprandial hyperglycaemia.
- HIIE and CMIE are equally effective at preventing postprandial hyperglycaemia if at least 30 minutes of exercise is performed.
- Exercise within 60 minutes of eating may be the most effective way to reduce postprandial glucose levels for individuals with T2DM.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# ANALYSIS OF PREDIMED-PLUS



### AN ENERGY-REDUCED MEDITERRANEAN DIET, PHYSICAL ACTIVITY, AND BODY COMPOSITION: AN INTERIM SUBGROUP ANALYSIS OF THE PREDIMED-PLUS RANDOMIZED CLINICAL TRIAL

Konieczna, J ; Ruiz-Canela, M ; Galmes-Panades, AM ; et al. JAMA network open. 2023;6(10):e2337994

### INTRODUCTION:

This study aimed to determine the long-term effects of an energy reduced MedDiet in combination with physical activity on body composition.

### METHOD:

- This is a predetermined 3-year interim analysis of a 6-year single-blind, randomised control trial of 1556 individuals aged 55-75 who are overweight or obese with metabolic syndrome.
- 760 individuals on 30% energy reduced MedDiet with limited processed foods, plus 45 minutes walking 6 days per week and behavioural and motivational support. [Intervention group]
- 761 on standard MedDiet without physical activity. [Control]

### RESULTS

Within group comparisons showed that individuals in the intervention group lost (P value represents baseline vs year 3):

- Total fat mass percentage (1-year vs baseline, -1.14%; 95% Cl, -1.32% to -0.96%; 3-year vs baseline, -0.52%; 95% Cl, -0.71% to -0.33% P=<0.001).</li>
- Absolute visceral fat (1-year vs baseline, -154 g; 95% Cl, -191 to -116 g; 3-year vs baseline, -75.1 g, 95% Cl, -115 to -35.3 g P=<0.001).</li>
- Absolute total fat after 1 year (mean change at 1 year vs baseline, -1677 g; 95% Cl, -1930 to -1424 g) but regained some at year 3 (mean change at 3 years vs baseline, -1018 g; 95% Cl, -1280 to -756 g P=
   <0.001).</li>
- Absolute lean mass (mean change at 1 year vs baseline -300 g; 95% Cl, -439 to -162 g) with further losses at year 3 (-626 g; 95% Cl, -770 to -483 g P=0.001).

Within group comparisons also showed significantly increased:

Total lean mass percentage, which was greater at year 1 than year 3 (1-year vs baseline, 1.07%; 95%Cl, 0.90%-1.25%; 3-year vs baseline, 0.47%; 95% Cl, 0.29%-0.65% P=<0.001).</li>



### TAKE HOME MESSAGE:

The addition of exercise to an energy-reduced diet, which focuses on whole grains, healthy fats, lean protein, and fruits and vegetables can emphasise positive effects on body composition in older adults. However, there is a loss of lean mass associated with this type of diet (contrary to author conclusions) and measures should be taken to monitor and increase protein intake to prevent or limit this loss.

### CLINICAL PRACTICE APPLICATIONS:

- The recommendation of a reduced energy MedDiet in combination with physical activity to older people who are overweight or obese may improve body composition.
- Although lean mass loss slowed between years 1 and 3, other practices should be employed to attenuate the loss of lean mass associated with an energy-reduced MedDiet and ageing.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- The research has not yet concluded but when it does, it will address the incidence of cardiovascular disease along with body composition changes.
- It will also look at long-term effects of the diet to determine longevity.
- Future research could focus on how to limit lean mass loss through the possibility of changing the type of exercise that accompanies the MedDiet.

### **CONCLUSIONS:**

An energy-reduced MedDiet plus exercise emphasised positive changes to body composition compared to

standard MedDiet in older adults who are overweight or have obesity.

- As a result of total fat loss and some lean mass in the intervention group, the lean:fat mass ratio improved and was unchanged in the control group (between group differences (P=<0.001).
- Compared to women, men may find the MedDiet + exercise more beneficial as it was shown that body composition changes were slightly more pronounced in men.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

### PAGE TWENTY FIVE |ANALYSIS OF PREDIMED PLUS CLINICAL TRIAL

# AEROBIC EXERCISE EFFECTS IN T2DM



### EFFECT OF AEROBIC EXERCISE, SLOW DEEP BREATHING AND MINDFULNESS MEDITATION ON CORTISOL AND GLUCOSE LEVELS IN WOMEN WITH TYPE 2 DIABETES MELLITUS: A RANDOMIZED CONTROLLED TRIAL

Obaya, HE ; Abdeen, HA ; Salem, AA ; Shehata, MA ; Aldhahi, MI ; Muka, T ; Marques-Sule, E ; Taha, MM ; Gaber, M ; Atef, H Frontiers in physiology. 2023;14:1186546

### **INTRODUCTION:**

Stress, a key factor for Type 2 diabetes mellitus (T2DM), stimulates the hypothalamus-pituitary-adrenal gland (HPA) and triggers parasympathetic nerve withdrawal, leading to increased circulating cortisol levels and higher levels of blood glucose. Exercise is a key intervention that can modulate the HPA axis and help manage stress.

### **METHOD:**

- Fifty-eight women (aged between 40-50), diagnosed with T2DM for at least 5 years but medically stable with moderate to high stress scores were randomised to either aerobic training (AT) or aerobic exercise combined with slow deep breathing and mindfulness meditation (DMM) training three times weekly over 6-weeks.
- AT group performed aerobic exercise on a treadmill at an intensity of 60%–75% of the maximum heart rate for a total of 40 min, including a 5 minute warm up and 5 min cool down.
- AT + DMM group performed a combination of aerobic exercise as per the AT group followed by a total of 10 minutes of diaphragmatic slow, deep breathing; and mindfulness meditation.

### **RESULTS:**

- Both groups showed a change from baseline in serum cortisol to p<0.0001
- At 6 weeks in the AT + DMM group, the primary outcome of serum cortisol (nmol/L) levels was 12.59 nmol/L [95% CI 4.45-6.52] a decrease of 30.29% and the fasting blood glucose levels (secondary outcome) was 136.37mg/dl (95% CI: 9.19–2.6) a decrease of 14.54%
- In the AT group performing only aerobic exercise decreased serum cortisol levels by 20.16% and FBG levels decreased by 9.97%.

### PAGE TWENTY SIX | AEROBIC EXERCISE, BREATHING & MEDITATION IN T2DM

### TAKE HOME MESSAGE:

• Practitioners could consider slow deep breathing and mindfulness meditation, added to aerobic exercise, as potentially useful components of the T2DM management program for stressed women.

### CLINICAL PRACTICE

 Consider a combined therapy approach with diaphragmatic breathing exercises and aerobic exercises that targets both the endocrine and autonomic nervous systems, as this may have a synergistic effect to assist with maintaining normal blood sugar levels and cortisol levels in individuals with T2DM.

### CONSIDERATIONS FOR FUTURE RESEARCH:

 Future research is needed to determine the most effective combination of therapies for managing both FBG and serum cortisol levels in individuals with T2DM.

### **CONCLUSIONS:**

 This study showed that combining slow deep breathing and mindfulness meditation with aerobic exercise reduced the serum cortisol (p = 0.01) and FBG levels (p = 0.001) in women with T2DM compared to when only aerobic training was performed.





### EXPERT REVIEWER Kirsty Baxter

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# EXERCISE EFFECTS ON APPETITE



### EFFECTS OF EXERCISE TRAINING PROGRAMMES ON FASTING GASTROINTESTINAL APPETITE HORMONES IN ADULTS WITH OVERWEIGHT AND OBESITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

Almesbehi, T ; Harris, L ; McGarty, A ; Alqallaf, S ; Westrop, S ; Edwards, CA ; Dorling, JL ; Malkova, D Appetite. 2023;182:106424

### **INTRODUCTION:**

Overweight and obesity prevalence is increasing globally. Exercise is advocated as an effective preventive and treatment for obesity. However, exercise may affect appetite regulation, and understanding how this functions in people with overweight and obesity is of interest. Notably, the evidence regarding the effects of exercise training on gastrointestinal hormones such as ghrelin, has not been extensively synthesised.

### AIM:

- The aim of this systematic review and meta-analysis was therefore to synthesise the literature describing the effect of
  exercise programmes of >4 weeks' duration from randomised controlled trials (RCT) on the fasting and
  gastrointestinal appetite hormones of adults living with overweight and obesity.
- The review followed PRISMA reporting guidelines and standard systematic review and meta analysis methodology.

### RESULTS

- After screening 13,204 records, nine studies with a total of 707 participants (259 men and 448 women) were identified that fit the pre-defined inclusion criteria and were included in the review.
- Overall, after exercise interventions in comparison to control, there was a reduction in body mass (effect size (d)= -0.22, 95% Cl -0.42 to -0.03, p = 0.03; 7 studies) and BMI (d= -0.31, 95% Cl -0.50 to -0.12, p = 0.001; 8 studies).
- Exercise had no impact on total fasting ghrelin (d = 1.06; 95% CI -0.38 to 2.5; p=0.15; 4 interventions) or fasting acylated ghrelin concentration (d = 0.08; 95% CI -0.31 to 0.47; p=0.68; 7 interventions).
- Fasting anorexigenic peptide YY did not differ between exercise and control (d = -0.16, 95% Cl: -0.62 to 0.31, P = 0.51; 7 interventions).

- Two studies assessed the effects of exercise training on GLP-1 and meta-analyses were not possible. In one study, fasting GLP-1 was higher in the intervention group (p=0.04) though the other study found no difference (P>0.05). Only one study looked at fasting plasma cholecystokinin (CCK), which found no change between exercise and control interventions (p>0.5).
- When looking at the correlation between body mass and appetite hormone changes, weight loss (p<0.05) and BMI reduction (p<0.05) occurring with exercise was positively associated with an increase in total plasma ghrelin (p<0.05); increased ghrelin was associated to reductions in body weight and BMI (both p<0.0001). Further, one study reported a positive correlation of body mass loss and BMI reduction with a reduction in acylated ghrelin (p=0.003 and 0.009, respectively) and negatively with an increase in plasma PYY concentration (p=0.003 and 0.03, respectively).

### TAKE HOME MESSAGE:

- This systematic review and meta-analysis found that exercise training programmes in individuals living with overweight and obesity have no impact on fasting concentrations of total and acylated ghrelin, PYY, GLP-1 and CCK.
- This finding suggests that any increase in appetite and energy intake typical of exercise training, would be related to different factors and not from changes in fasting concentrations of gastrointestinal appetite hormones.

### **Q** CLINICAL PRACTICE APPLICATIONS:

This systematic review suggested that any compensatory increase in energy intake due to exercise training is
unlikely to be related to fasting gastrointestinal appetite hormone changes. Therefore, nutritional therapists
should bear this in mind when consulting with clients and find personalised lifestyle strategies to help people
manage their caloric consumption in relation to exercise training.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- The relation between changes in body mass or BMI and fasting appetite hormones could not be fully explored due to the small number of studies included in this review. Moreover, the results of this review should be interpreted with caution because most studies were underpowered with a high risk of bias, and there was considerable heterogeneity within some meta-analyses. The effect of exercise training on gastrointestinal satiety hormones including ghrelin, PYY, and CCK therefore require further investigation in individuals living with overweight and obesity, in order to reach more substantial conclusions.
- Exercise enhances the coupling between energy intake and energy expenditure after food consumption, where controlled studies are needed to test how postprandial concentrations of gastrointestinal hormones are influenced by exercise training in individuals with overweight and obesity.



### EXPERT REVIEWER Kirsty Baxter

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

### PAGE TWENTY NINE | EXERCISE EFFECTS ON APPETITE HORMONES

# FASTING IN MET. SYNDROME



### A RANDOMIZED CONTROLLED TRIAL OF FASTING AND LIFESTYLE MODIFICATION IN PATIENTS WITH METABOLIC SYNDROME: EFFECTS ON PATIENT-REPORTED OUTCOMES

Jeitler, M ; Lauche, R ; Hohmann, C ; et al. Nutrients. 2022;14(17)

### **INTRODUCTION:**

- Metabolic syndrome (MetS) is a condition characterised by the presence of at least three cardiovascular risk factors such as abdominal obesity, hypertension, insulin resistance, and dyslipidemia.
- The authors refer to epidemiological studies that have identified the role of psychological risk factors such as psychosocial stress, depression and anxiety in patients with MetS and cardiovascular disease.

### **METHOD:**

- This single-blind, bi-centre RCT assessed the effects of fasting followed by a comprehensive lifestyle modification program MICOM (Mind-Body Medicine in Integrative and Complementary Medicine) in 145 participants with Metabolic Syndrome (MetS) (62.8% women; 59.7 ± 9.3 years) randomised to:
- 1. 5-day fasting followed by 10 weeks of lifestyle modification (F + LM; modified DASH diet, exercise, mindfulness; n
   = 73) or
- 2. 10 weeks of lifestyle modification only (LM; n = 72)
- The study duration was 24 weeks occurring from April 2014 to December 2014, with the last follow-up assessment in December 2015. 73 Participants were randomised into an F + LM group and 72 participants into an LM group between the ages of 59 and 60.

### **RESULTS:**

- Outcomes were assessed at weeks 0, 1, 12, and 24, for quality of life (Short-Form 36 Health Survey Questionnaire, SF-36), anxiety/depression (Hospital Anxiety and Depression Scale, HADS), stress (Cohen Perceived Stress Scale, CPSS), mood (Profile of Mood States, POMS), self-efficacy (General Self-Efficacy Scale, GSE), mindfulness (Mindfulness Attention Awareness Scale, MAAS), and selfcompassion (Self-Compassion Scale, SCS).
- At week 1, POMS depression and fatigue scores were significantly lower in F + LM compared to LM.
- At week 12, most self-report outcomes improved in both groups—only POMS vigour was significantly higher in F + LM than in LM. Most of the beneficial effects within the groups persisted at week 24.

### TAKE HOME MESSAGE:

- For clients with Metabolic syndrome a 5-day fast consisting of max. 350 kcal/day, in conjunction with therapies that focus on improved emotional, mental, social, spiritual, and behavioural factors may directly affect health and support improved mood.
- Therapies include mindfulness and specific group training rooted in psycho-neuroendocrinology, and the use of formal meditation and gentle yoga exercises. As well as nutritional education included lectures, cooking workshops, as well as group support.
- Bottom line: The use of complimentary therapies such as mindfulness, yoga and medication in conjunction with nutritional advice and may be effective to support improved mood in clients with Metabolic syndrome.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- This randomised controlled trial highlights fastinginduced mood-modulating effects in the short term (<24 months).</li>
- LM induced several positive effects on quality of life and psychological parameters in participants with MetS.
- The compliance rate for this study was good and there were no adverse effects reported suggesting a potentially effective lifestyle modification intervention for adults with metabolic syndrome.
- The authors did note the extent to which participants adhered to the program by using stress reduction techniques at home was not assessed.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- MBM lifestyle modification intervention led to an improvement of self-efficacy, mindfulness, and self-compassion.
- Further studies to explore explanatory models for the effects of MBM are needed.
- Mediating variables on mindfulness, selfefficacy, and compassion, and the effects on physical and psychological parameters, need to be examined more closely.
- Future studies could use condition-specific questionnaires in addition to generic ones, which have previously been used to facilitate the comparison of the study results with those in the population.



### EXPERT REVIEWER Kirsty Baxter

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# TRE & EXERCISE ON BODY COMP.



### THE EFFECT OF TIME-RESTRICTED EATING COMBINED WITH EXERCISE ON BODY COMPOSITION AND METABOLIC HEALTH: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Dai, Z ; Wan, K ; Miyashita, M ; Ho, RS ; Zheng, C ; Poon, ET ; Wong, SH Advances in nutrition (Bethesda, Md.). 2024;15(8):100262

### INTRODUCTION:

The aim of this study was to investigate the efficacy of a combination of time restricted eating (TRE) and exercise for improving body composition and metabolic health in adults.

### METHOD:

- 19 randomised controlled trials (RCT) with a total population of N=568 adults aged 18-62 years were included.
- 11 RCTs were in males, 6 in females and 2 were mixed sex. The number of participants ranged from 12 to 131 and intervention durations from 4 weeks to 12 months.
- 8 RCTs had unrestricted energy intake (ad libitum) while in 11 RCTs, energy intake was restricted (non-ad libitum).
   All RCTs used control groups following a normal dietary pattern. All groups included exercise.
- Outcome measures included: body mass, fat mass, free fat mass, total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density cholesterol (HDL-C), triglycerides (TG), fasting glucose, inflammatory markers, cytokines and adipokines (insulin-like growth factor 1 (IGF-1), IL-6, TNF-A, leptin and adiponectin).
- Subgroups included: Ad-libitum and non-ad-libitum energy intake within a TRE window, and intervention durations of >4 (moderate-term) or < 4 weeks (short-term).</li>

### **Results:**

- A reduction in body mass (p<0.01) and fat mass (p<0.01) was found in TRE plus exercise groups. Analysis of subgroups found this may only apply for non-ad libitum diet groups (p<0.01) with moderate-term study durations (p<0.01). There was no difference in fat-free mass with intervention duration (p=0.23).</li>
- There was no difference between TRE with exercise and control on fasting glucose and insulin (p=0.35), though
  reductions in fasting glucose were reported in subgroups for non-ad libitum TRE with exercise intervention
  groups (p0.01) with durations of >4 weeks (p=0.04) only.
- There was no difference in lipid profile between groups (p>0.05), though subgroup analysis found reductions in TG in non-ad libitum diet groups (p<0.01) with study durations >4 weeks (p<0.01) only, a reduction in LDL-C for non-ad libitum diet groups (p<0.01) with moderate durations (p<0.01).</li>
- The study also revealed reductions in leptin (p<0.01) but no difference in adiponectin (P=0.11) with the combined strategy of TRE plus exercise.
- Reductions in IGF-1 (p<0.01), IL-6 (p=0.01), TNF-A (p<0.01) were also observed.



### TAKE HOME MESSAGE:

Combining time restricted eating with exercise may be beneficial for managing body weight, fat mass and metabolic health. Further research is needed to confirm these results in specific populations, exercise types and time frames.

### **CLINICAL PRACTICE APPLICATIONS:**

- TRE and exercise may be an effective strategy for reducing body and fat mass and improving metabolic health in adults but likely only with an energy restricted diet for more than 4 weeks
- Fat mass loss may be due to increased fat oxidation stimulated by exercise and the use of fat as a fuel source, however, further research into mechanisms is needed.
- Participant characteristics and metabolic health varied between studies; 11 studies were in physically active males, 5 studies were in overweight or obese females, 1 study in normal weight, active females and 2 studies were mixed sex, 1 of which was in obese individuals, 88% of which were females.
- Exercise types and duration of fasting varied between studies.

### **2** CONSIDERATIONS FOR FUTURE RESEARCH:

- Heterogeneity in participant characteristics, metabolic profiles, exercise types, duration of fasting and timing of meals and control diet types may have influenced the results.
- Further research is needed to confirm these results in specific populations, exercise types and time periods.

### **CONCLUSION:**

This study found that combining TRE with exercise was effective for reducing fat mass and body weight as well as improving lipid profiles and specific metabolic markers in adults. However, further research is needed to confirm these results in specific populations, exercise types and durations.



### EXPERT REVIEWER Gail Brady

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# WATER-BASED EXERCISE



### INFLUENCE OF WATER-BASED EXERCISE ON ENERGY INTAKE, APPETITE, AND APPETITE-RELATED HORMONES IN ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Grigg, MJ ; Thake, CD ; Allgrove, JE ; King, JA ; Thackray, AE ; Stensel, DJ ; Owen, A ; Broom, DR Appetite. 2023;180:106375

### **INTRODUCTION:**

Exercise is effective for weight-management alongside other physical and mental health benefits. Changes in appetiteregulating hormones may affect energy balance, e.g. some exercise may suppress appetite, known as exercise-induced anorexia. This review evaluated differences in energy intake, appetite and appetite-related hormones in land-based versus water-based exercise.

### **METHOD:**

The meta-analysis followed PRISMA guidelines and was registered on PROSPERO. Literature searching resulted in eight studies published between 1991 and 2021, which met the inclusion criteria (water v control), 5 studies (water v land) and 2 studies (water at different temperatures). Risk of Bias was assessed using Cochrane's Risk of Bias for randomised trials.

### **RESULTS:**

Data were analysed in RevMan 5.4.1 using fixed effects, generic inverse variance method on energy intake. High heterogeneity prevented analysis on appetite and appetite-related hormones. Standard deviation was inputted based on estimated values for missing data. Heterogeneity was calculated using the I2 index. Sensitivity analyses were conducted. Statistical significance was set at p<0.05 and analyses based on two-tailed Z tests.

All participants had a healthy BMI, were aged 19-39 and ranged from well-trained to non-exercisers. A single bout of water-based exercise increased ad-libitum energy intake compared to a non-exercise control (mean difference [95% CI]: 330 [118, 542] kJ, P = 0.002) but no difference was identified between water and land-based exercise (78 [-176, 334] kJ, P = 0.55). Cold water exercise (18–20 •C) increased energy intake more than neutral water (27–33 •C) temperature (719 [222, 1215] kJ; P < 0.005). One 12-week study reported cycling and swimming did not alter fasting plasma concentrations of total ghrelin, insulin, leptin or total PYY but contributed to body mass loss 87.3 (5.2) to 85.9 (5.0) kg and 88.9 (4.9) to 86.4 (4.5) kg (P < 0.05) respectively.

### TAKE HOME MESSAGE:

The only type of exercise reporting an increase in energy intake was in water-based activities, where the temperature was between 18-20• C. However, this was only when explored in comparison to a resting control. No difference was reported in energy intake when water-based exercise was compared with land-based exercise. Any form of exercise, whether land or water-based should be considered where appropriate to reduce the risks of sedentary behaviour.

### **Q** CLINICAL PRACTICE APPLICATIONS:

Although this study suggests cold water exercise may cause an increase in energy intake, 95% confidence intervals for individual studies are very large so results should be interpreted cautiously. Those preferring exercise in cold water, should be encouraged, providing they are mindful of the tendency to eat more post-exercise. It is not possible to draw any robust conclusions about the ratings of hunger in response to different types of exercise due to limited data. However, according to the review, five studies demonstrated that hunger was suppressed more than control prior at the start of water-based exercise, and during and immediately after exercise.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- Most participants were of healthy weight and physically active, however since appetite signals may be dysregulated in obesity, including all weight categories and different activity levels may generate a more comprehensive overview. Further research recommendations include:
- Measuring the effects of water- based activities on appetite, appetite related hormones and energy intake at different time points following exercise in order to provide recommendations for effective weight management strategies and in a range of different temperatures.
- Using a 'no exercise' water immersion control. Evidence suggests that immersion in cold water alone may increase energy expenditure
- Evaluating the effect of a water-based activity, such as swimming performed in a 'fasted' and 'non-fasted' state to investigate the impact on appetite, appetite related hormones and energy intake.

### **CONCLUSIONS:**

Despite limitations, this review may provide preliminary evidence on energy intake and appetite for water-based activities. If weight management is a primary focus, then water temperature needs to be considered, particularly if sub 20•C .



### EXPERT REVIEWER Miranda Harris

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# METABOLIC HEALTH & SCIENCE TAKEAWAYS

### NED INFOBITES & CLINICAL RESOURCES

Not yet discovered our one page science summaries? Our NED InfoBites are designed to provide quick overviews of some of the latest research available on particular health issues and nutrition topics. Designed as a one-page clinical handout, the NED InfoBites unite our editorial team's pick of the research and provide a plain-language summary suitable for sharing with nutrition clients. Download the latest InfoBites on Metabolic Health <u>here</u>.

Additionally, BANT has developed a dedicated range of resources to support practitioners and help educate on common symptoms, biological processes, and dietary and lifestyle approaches. These are suitable to share with clients in clinical consultations and group programmes.



### **CLIENT-FRIENDLY GUIDES:**

Providing practitioners with health resources and client-friendly educational materials to support their clinical recommendations.



# S P S H Ш

**7 REVIEWS** 



# NUTRITION EDUCATION



### THE EFFECT OF NUTRITION EDUCATION SESSIONS ON ENERGY AVAILABILITY, BODY COMPOSITION, EATING ATTITUDE AND SPORTS NUTRITION KNOWLEDGE IN YOUNG FEMALE ENDURANCE ATHLETES

Tektunalı Akman, C ; Gönen Aydın, C ; Ersoy, G Frontiers in public health. 2024;12:1289448

### INTRODUCTION:

- The primary aim of this study was to assess the impact of nutrition education on energy availability, body composition, eating attitudes, and sports nutrition knowledge among young female endurance athletes.
- Given the risk of inadequate energy intake among these athletes, this study uniquely investigated whether targeted educational interventions could improve these parameters and, ultimately, promote overall health in this population.

### METHOD:

- 45 participants were allocated to an intervention group and 38 to the control group.
- The intervention group had six- weekly face-to-face 1-hour nutrition education sessions and a booklet from a dietitian. Control group received no education.
- Both groups completed measures at baseline and 6 months later, including the Low Energy Availability in Athletes Questionnaire (LEAF-Q), Eating Attitude Test (EAT-26) and Sports Nutrition Knowledge Questionnaire (SNKQ). Nutrient intake and energy expenditure were assessed from 3-day food and exercise logs. An electrical bioimpedance analyser measured body composition.

### **RESULTS:**

- The LEAF-Q scores for the experimental group significantly decreased from 8.57 ± 4.36 before the intervention to 6.82 ± 3.72 after the intervention (p=0.01). This suggests that the nutrition intervention was effective in improving factors related to low energy availability in female athletes.
- A similar effect was seen in the SNKQ with scores increasing from baseline to post-intervention, 29.18± 8.60 and 35.29 ± 7.17,(p=0.01). This suggests knowledge of sports nutrition was successfully increased by the intervention.
- No differences were seen in the EAT-26 scores post-intervention (F 1,81) =0.21, p=0.65 highlighting that attitude towards eating remained the same in both groups.

### TAKE HOME MESSAGE:

- Targeted nutrition education can significantly improve both energy balance and sports nutrition knowledge
- Attitudes towards eating may require additional or different interventions to see significant improvements.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Nutrition education can effectively improve energy availability and sports nutrition knowledge in young female endurance athletes. This is crucial for enhancing their performance and long-term health. However, as attitudes towards eating may not shift as easily, addressing disordered eating or unhealthy eating behaviours requires additional, specialised strategies.
- To effectively improve eating attitudes in this population a different approach may be required. For example, psychological counselling, self-regulation techniques, or mindful eating practices.
- This group would benefit from regular monitoring to ensure that nutrition education is not just improving knowledge, but also encouraging healthy, sustainable eating habits.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- Due to self-reporting for LEA there is a potential bias for overestimating its prevalence. Future studies could look at ways in which this bias is reduced through using for example wearable technology to assess energy expenditure, as well as food measurement apps that accurately measure portion size.
- Given the similarity in the EAT-26 score between groups, psychological methods that can be employed to shift eating attitudes should be considered to improve results in future research.

### CONCLUSIONS:

- Female athletes often lack nutritional knowledge, increasing the risk of insufficient energy intake and nutrient deficiencies.
- This educational intervention improved nutrition knowledge and energy availability, emphasising the importance of educating young athletes for better health and performance.
- However, psychological factors related to eating attitudes remained unaddressed. Collaborating with families and coaches to reduce body shape pressures could further support athletes in maintaining appropriate diets for their sport.

# **B**

### EXPERT REVIEWER Nicky Ester

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# QUERCETIN FOR MUSCLE DAMAGE



### QUERCETIN SUPPLEMENTATION PROMOTES RECOVERY AFTER EXERCISE-INDUCED MUSCLE DAMAGE: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

Rojano-Ortega, D ; Peña-Amaro, J ; Berral-Aguilar, AJ ; Berral-de la Rosa, FJ Biology of sport. 2023;40(3):813-825

### INTRODUCTION:

- Quercetin (Q) is a flavonoid found in apples, onions, berries, tomatoes, red grapes, leafy greens and tea. Due to its antioxidant capacity, quercetin has demonstrated antioxidative, anti-inflammatory, anti-mutagenic, and anticarcinogenic properties.
- Intense physical exercise may lead to an increase in reactive oxygen species, oxidative stress and exercise induced muscle damage (EIMD). This systematic review and meta-analysis aimed to determine the effect of Q supplementation on EIMD including muscle soreness, inflammation, antioxidant capacity and oxidative stress after intense exercise.

### **METHOD:**

- This systematic review and meta-analysis was designed according to PRISMA guidelines.
- The studies were assessed using the Cochrane Collaboration risk of bias tool.
- 13 studies were included: 12 of the studies were randomised placebo-controlled trials; 6 of the studies had a parallel group design; 7 of the studies had a cross-over design.
- There were a total of 249 participants.
- 12 of the studies used a dose 1000 mg of Q per day.
- Supplementation duration ranged from a single dose 3h prior to exercise to 6 weeks of daily supplementation.

### **RESULTS:**

- Q led to a significant reduction in perceived muscle soreness 0/24 h post exercise (SMD: -1.33; 95% CI: [-2.57, -0.09]; p = 0.03).
- Q resulted in a significant reduction in creatine kinase levels 24/48 h post exercise (SMD: -1.15; 95% CI: [-2.09, -0.21]; p = 0.02).
- Q resulted in reduced oxidative stress following exercise (SMD: -0.92; 95% CI: [-1.73, 0.11]; p = 0.03).
- Q supplementation did not significantly impact antioxidant activity following exercise, despite a trend towards significance (SMD: 0.26; 95% CI: [-0.02, 0.54]; p = 0.06).
- There were no significant between-group differences in IL-6 concentrations post-exercise (SMD: -0.09; 95% CI: [-0.42, 0.23]; p = 0.58).

### TAKE HOME MESSAGE:

• Quercetin at 1000mg per day for up to 6 weeks may support exercise recovery by reducing EIMD, oxidative stress and muscle soreness.

### **Q** CLINICAL PRACTICE APPLICATIONS:

• Supplementing with 1000mg of quercetin per day for up to 6 weeks may support exercise recovery by reducing muscle soreness, muscle damage and oxidative stress in both sedentary and well trained healthy young men.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- The exercise protocol to induce muscle damage varied across the studies resulting in different levels of muscle damage. Further studies utilising a uniform protocol to induce muscle damage may help to determine quercetin's effect on exercise recovery. Also assessment of histamine release and impact on muscle soreness/damage markers would be beneficial.
- Most of the studies included healthy young male participants. Further studies including female, highly trained athletes and older subjects would be useful to determine the effects of quercetin supplementation on exercise recovery in those populations.
- The study durations were up to 6 weeks. Longer studies are needed to identify the long-term benefits of quercetin supplementation for exercise recovery or potential risks.
- Further studies controlling for diet and dietary polyphenols may identify a potential synergistic relationship between Q and other polyphenols and reduce study bias.

### **CONCLUSIONS:**

• This meta-analysis highlighted the potential for Q to support muscle recovery, reduce muscle damage and soreness and reduce oxidative stress following exercise.



### **EXPERT REVIEWER** Daniel Quinones

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# EFFECT OF JUICE ON GUT BARRIER



### EFFECT OF SUGAR- AND POLYPHENOL-RICH, DILUTED CLOUDY APPLE JUICE ON THE INTESTINAL BARRIER AFTER MODERATE ENDURANCE EXERCISE AND IN ULTRA-MARATHON RUNNERS.

Valder, S ; Staltner, R ; Bizjak, DA ; Esatbeyoglu, T ; Herdegen, V ; Köpsel, M ; Kostov, T ; Bergheim, I ; Diel, P Nutrients. 2024;16(9)

### INTRODUCTION:

The purpose of this randomised, double-blinded, partial crossover trial was to assess the effect of sugars in their natural matrix (diluted apple juice) or in water, versus water only, on the intestinal barrier (IB) during (A) moderate endurance exercise and (B) Ultra-marathon runners.

### METHOD STUDY A:

From a total enrolment of n=24, n=17 healthy, non-smoking, non-endurance, local club runners (n = 17; 14 male; 3 female) completed a 1-h endurance run at 80% of individual anaerobic threshold, which was repeated 3 times to test the response to post-exercise drinks, consumed immediately after the run and within 5 minutes of: 500 ml water, placebo (matched sugary control), or test drink (diluted 60% apple juice). Six specifically timed interval blood samples were analysed for the following intestinal barrier (IB) markers: bacterial endotoxin, interleukin 6 (IL-6), cluster of differentiation (CD14), and intestinal fatty acid-binding protein (iFABP). A 14-day washout period separated the testing of each drink.

### METHOD STUDY B:

From a total enrolment of n=30, n=10 ultra-marathoners completed the ultra-marathon. Immediately post-run they
ingested the allocated beverage (water, n = 3; placebo n = 3; test drink n = 4). 4 Blood samples were taken at defined
time intervals (120 and 180 minutes post-exercise) for assessment.

### **RESULTS:**

- Study A Data revealed increases in bacterial endotoxin and iFABP, (p<0.05) and a trend to increased CD14 (p = 0.05) and IL-6 (p = 0.07) with 1-hour running. The different beverages had little effect on the IB markers post-exercise: after 180 mins, placebo had less endotoxin than water and the test drink higher CD14 than placebo (both p<0.05).</li>
- Study B Data revealed increases in both bacterial endotoxin and IL-6 (p < 0.05), the latter being 20-fold more compared to the activity in study A. 180-Minutes post marathon, bacterial endotoxin values decreased irrespective of drink choice, but the differences in resulting value at 180 min were only statistically significant between placebo vs water (p < 0.05).</li>

### PAGE FORTY TWO |SUGAR & POLYPHENOL-RICH JUICE ON INTESTINAL BARRIER



### TAKE HOME MESSAGE:

- Athletes have distinct nutritional needs based on their sport and level of training, in particular nutrient absorption, energy production, and time to recovery.
- Specific care with regards to intestinal barrier function should be taken given its impact on nutrient absorption and assimilation.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Endurance exercise appears to have a marked effect on intestinal permeability and bespoke nutritional support to address potential damage to the intestinal barrier should be included in an athlete's training programme.
- Addressing chronic inflammation should similarly be considered given the negative effects on intestinal barrier function and long-term health outcomes.
- Given the outcome of this limited study it seems that post-exercise hydration options for moderate endurance exercise can include any of the three drink options.

### **?**CONSIDERATIONS FOR FUTURE RESEARCH:

- The results of this study were based on very small cohorts and larger populations are therefore needed to confirm these preliminary findings.
- Standardisation of diet for longer periods prior to trial is furthermore needed to ascertain participant response to various post-exercise drinks based on intestinal barrier function.
- Assessment of intestinal barrier function for an extended time period prior to trials may offer insight into individual response to specific drinks.

### **CONCLUSIONS:**

Endurance exercise, even when moderate, may increase IB markers. Of note, however, was a natural reduction in serum endotoxin and inflammatory marker IL-6 180 minutes post ultra-marathon, irrespective of which one of the three specific beverages was consumed. Furthermore, the effect of the test drink was similar to that of water.

# **E**

### EXPERT REVIEWER Wilma Kirsten

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# POLYPHENOLS & ENDURANCE



### POLYPHENOL SUPPLEMENTATION BOOSTS AEROBIC ENDURANCE IN ATHLETES: SYSTEMATIC REVIEW

Cao, G ; Zuo, J ; Wu, B ; Wu, Y Frontiers in physiology. 2024;15:1369174

### INTRODUCTION:

Extreme exercise can lead to oxidative stress in the body, which can affect muscle function and impact training and performance in athletes. Polyphenols present in plants have antioxidant properties and have emerged as potential candidates to improve exercise performance. They also promote antioxidant defences and nuclear factor erythroid 2-related factor 2 (Nrf2) signalling, which is involved in mitochondrial biogenesis. Finally, they may also alter vascular function through promoting endothelial nitric oxide synthesis, which leads to vasodilation and increased blood flow. This systematic review aimed to summarise the current research on the effects of polyphenols on endurance exercise performance.

### **METHOD:**

- The inclusion criteria involved randomised control trials on healthy athletes and sports people who were supplemented with polyphenols and compared to a placebo group both before and after tests of athletic or sports performance.
- No meta-analysis was conducted.

### **Results:**

- 11 studies with 220 participants were included in the systematic review. 164 were recreational and 56 professional athletes.
- Polyphenols assessed were grape seed extract, green tea extract, olive fruit water phytocomplex, Montmorency cherry powder, carob pods, Haskap berries, Vinitrox<sup>™</sup> (polyphenols from grape and apple), Cardiose®, and grape juice.
- Substantial improvements were seen in the time taken to complete an exercise and fatigue times.
- Mixed results were seen in time to peak power output, endurance running distance, power output, exercise intensity, rate of perceived exertion, and speed.
- Improvements were seen in flow mediated dilation and tissue oxygenation index, but only one trial was found that assessed each of these.
- Heart rate and blood pressure showed no improvements with polyphenols and mixed results were seen with VO2, VCO2 lactate level, and carbohydrate oxidation.
- Prolonged use of polyphenols were shown to promote whole body fat oxidation.
- No improvements were seen in measures of antioxidant levels but only one study looked at these.
- Long-term rather than acute polyphenol supplementation was more beneficial.



### TAKE HOME MESSAGE:

- Polyphenols may have specific benefits on exercise performance and metabolism in both performance and recreational athletes.
- It is important to understand that this is only seen at specific doses for sustained periods of time and compliance is essential for results.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Practitioners may like to consider the recommendation of long-term polyphenol supplementation to healthy athletes to improve aerobic endurance and promote fat oxidation.
- 208mg of polyphenols and flavonoids in a 14.4mg per
  40g in a soluble form may have optimal effects.
- However, there may be limited effects on recovery times.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

 Further research could determine exercise specific dosage recommendations.

### CONCLUSIONS:

• Polyphenols improved aerobic endurance and exercise performance. However, there is insufficient evidence to support their use for improvements to several physiological and metabolic measures.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

# MELATONIN ON PERFORMANCE



### IMPACT OF MELATONIN SUPPLEMENTATION ON SPORTS PERFORMANCE AND CIRCULATING BIOMARKERS IN HIGHLY TRAINED ATHLETES: A SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS

Celorrio San Miguel, AM ; Roche, E ; Herranz-López, M ; Celorrio San Miguel, M ; Mielgo-Ayuso, J ; Fernández-Lázaro, D Nutrients. 2024;16(7)

### **INTRODUCTION:**

- High-intensity exercise can disrupt inflammatory and immune processes within the body resulting in inflammation, poor immune function, and poor recovery.
- Melatonin is a neurohormone that has anti-inflammatory and antioxidant properties, and has the potential to be of benefit to recovery following strenuous exercise.
- This systematic review of randomised control trials aimed to determine the effect of melatonin on sports performance and circulating health biomarkers.

### **METHOD:**

- This was a systematic review of randomised control trials (RCTs).
- The study followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines.
- Studies that were included looked at the use of melatonin by trained sports professional and athletes.

### **RESULTS:**

- 21 RCTs were included in the review.
- Melatonin doses ranged from 5mg to 100mg in the studies.
- Melatonin was administered either acutely or for periods of 3 to 30 days pre and post exercise.
- None of the studies were rated low risk of bias.
- Seven studies had a high risk of bias.
- There was a high degree of heterogeneity, which prevented a meta-analysis being performed.
- The study showed that melatonin supplementation had some effect on white blood cell count levels and immunoglobulins but results were conflicting.
- Moderate effects were seen on blood glucose, cholesterol, triglycerides, and phospholipids but did not affect high density lipoprotein or low-density lipoprotein.

- Moderate effects were seen on blood glucose, cholesterol, triglycerides, and phospholipids but did not affect high density lipoprotein or low-density lipoprotein.
- Improvements were seen in antioxidant status and inflammation.
- Reversal of kidney and liver damage was reported following supplementation.
- Promising effects were seen on sports performance with some studies reporting improvements in aerobic capacity, agility, and sprint performance.
- No effects were apparent on hormonal response of cortisol, testosterone, or growth hormone.
- No adverse effects were seen following melatonin supplementation.



### TAKE HOME MESSAGE:

Diet and lifestyle modifications should always be made first to ensure that athletes have sufficient melatonin levels.

Adequate light exposure at appropriate times and specific foods which contain melatonin may help. During periods of intense training, supplementation may be needed to reach adequate levels and to aid recovery.

### $\mathbf{Q}$ CLINICAL PRACTICE APPLICATIONS:

- Sufficient melatonin levels may be necessary in highly trained athletes.
- This may limit inflammation and oxidative stress and help prevent tissue damage and aid recovery.
- During periods of intense training or when quick recovery is needed, melatonin supplementation may be of benefit.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- More studies on the mechanisms through which melatonin may be supporting athletic performance and preventing liver and kidney damage are needed.
- Studies on the effects of melatonin on mitochondrial function may be of benefit.

### CONCLUSIONS:

- Melatonin supplementation may mitigate some of the damaging effects of extreme exercise.
- However, it is unclear as to how this might occur.



### EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: B: Systematic reviews including RCTs of limited number

# PROBIOTICS ON PERFORMANCE



### IMPACT OF PROBIOTICS ON THE PERFORMANCE OF ENDURANCE ATHLETES: A SYSTEMATIC REVIEW

Díaz-Jiménez, J ; Sánchez-Sánchez, E ; Ordoñez, FJ ; Rosety, I ; Díaz, AJ ; Rosety-Rodriguez, M ; Rosety, MÁ ; Brenes, F International journal of environmental research and public health. 2021;18(21)

### SUMMARY REVIEW:

- There is current interest in the potential therapeutic benefits of probiotic strategies to support training and in-race performance for endurance athletes.
- Probiotic supplements are typically used by endurance athletes to limit or prevent upper respiratory tract infections (URTIs), reduce oxidative stress, support the immune system and modulate gastrointestinal function.
- Based on a limited number of articles sourced in this review (n=26), only 9 met the underlying quality and inclusion criteria. This highlights an important need for further research to be undertaken in this area.



### **RESULTS:**

- The review highlighted that different preparations, number of bacterial colony-forming units (CFUs), species type, timecourse and study objectives makes it difficult to determine fundamental conclusions on the efficacy of probiotics.
- That said, papers reviewed indicated the potential for a 55% increase in anti-inflammatory cytokines, reduced prevalence of URTIs, reduced Epstein-Barr and cytomegalovirus citrate antibodies, and improved recovery times.
- Probiotic supplementation likely enhances microbiota diversity and may indirectly support increased training load, and performance maintenance through immune defence. However, there were no indications that endurance performance was specifically enhanced.

### TAKE HOME MESSAGE:

- Endurance athletes may take probiotic supplements to support immune or GI health or for other reasons
- Currently there is little evidence that probiotics directly or specifically enhance athletic performance
- Probiotic supplementation potentially impacts on immune health particularly during intensive training and may facilitate muscle recovery or maintain performance
- Whilst probiotics may reduced GI symptom frequency and severity, further research is clearly warranted

### **Q** CLINICAL PRACTICE APPLICATIONS:

- Most of the papers reviewed used formulae containing either Lactobacillus spp. (e.g. Plantarum, Acidophilus, Casei Shirota) or Bifidobacterium spp. (e.g. animalis subsp., bifidum, lactis, longum subsp.) or combinations. There was little mention of prebiotic or symbiotic strategies.
- Any impact of probiotics on exercise performance is likely to relate to both immune modulation and/or mechanisms leading to reduced muscle damage.
- Surprisingly, there was only partial mention of the use of probiotics for GI support and several notable papers were not included in the review. That said, the authors did note that with increased prevalence of exercise-induced gastrointestinal symptoms with endurance sport due to acute GI hypoperfusion and localised ischemia, acute probiotic strategies have resulted in reduced GI symptom frequency and severity in athletes.
- Importantly no adverse events following probiotic supplementation in endurance athletes were reported.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- Clearly further research is warranted in terms of probiotic strain specific benefits both in training and in-race event effectiveness.
- The authors reported that there were no studies found on the effect of probiotics on hormonal or nervous systems in endurance athletes.
- Further research is needed to consider the impact of acute versus chronic probiotic use on intestinal metabolites, especially considering recent interactions between specific bacterial strains and short-chain fatty acid production being associated with performance.



### EXPERT REVIEWER Prof. Justin Roberts

CONFLICTS OF INTEREST: None
• EVIDENCE CATEGORY: B: Systematic reviews including RCTs of limited number

# NITRATE ON MUSCLE POWER



### EFFECT OF DIETARY NITRATE ON HUMAN MUSCLE POWER: A SYSTEMATIC REVIEW AND INDIVIDUAL PARTICIPANT DATA META-ANALYSIS

Coggan, AR ; Baranauskas, MN ; Hinrichs, RJ ; Liu, Z ; Carter, SJ Journal of the International Society of Sports Nutrition. 2021;18(1):66

### SUMMARY REVIEW:

- In 2007, researchers uncovered the ingestion of dietary nitrates reduced the oxygen cost of submaximal exercise, and since, over 100 studies have examined the effects of nitrates on endurance performance.
- With regards to the impact of nitrates on maximal force output, only trivial results had been previously found.

### RESULTS

- This review study found that while nitrates do not impact force development, they do demonstrate primary effect on the speed of muscle contraction (i.e. muscular power is the product of force x speed).
- The reviews primary finding was that nitrate intake can significantly enhance muscular power, regardless of subject age or sex.



### PAGE FIFTY | DIETARY NITRATE ON HUMAN MUSCLE POWER

### TAKE HOME MESSAGE:

- This meta-analysis lends quantitative support to previous narrative reviews that nitrate supplementation can enhance maximal power output.
- These findings are highly relevant to team and strength sport athletes, who may not otherwise be supplementing with nitrates.
- These findings are also highly relevant for older populations, where risk of falls and fractures are high and can lead to significant adverse effects on health and quality of life.

### **Q** CLINICAL PRACTICE APPLICATIONS:

- These new findings highlight the ability of dietary nitrates to improve neuromuscular power production is highly relevant for team sport athletes, due to the explosive nature of these sports with constant accelerations and decelerations during training and competition.
- In the general population, falls and fractures amongst older adults significantly reduces quality of life and costs the healthcare system hundreds of millions of pounds to treat.
- Improved contractile properties of muscle, most notably speed of contraction, may offer protection to older adults as well as the benefit of additional nitric oxide (NO) to support vascular health as well.
- The typical intake of dietary nitrates in the general population is about 31-185mg/day in Europe and 40-100mg/day in North America. Most studies use doses between 300-600mg of dietary nitrates. Increasing dietary or supplemental intake is key to achieving the neuromuscular effect.

### **?** CONSIDERATIONS FOR FUTURE RESEARCH:

- The results of the present meta-analysis clearly demonstrate that dietary nitrates increases muscle power in humans, but the mechanism responsible for this effect is still unclear.
- There are notable differences between rodent and human metabolism of dietary nitrates, therefore the biochemical mechanism by which nitrate intake improves human muscle power requires additional study.



### EXPERT REVIEWER Marc Bubbs

CONFLICTS OF INTEREST: None EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

### PAGE FIFTY ONE | DIETARY NITRATE ON HUMAN MUSCLE POWER

# ELITE SPORT SCIENCE TAKEAWAYS

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