

INTRODUCTION TO SPORTS NUTRITION FUNDAMENTALS

AN EXPERT REFRESHER

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Nutrition plays a multifaceted role in supporting athletes' performance, recovery, and overall health. By providing the necessary energy, nutrients, and support for various bodily functions, nutrition helps athletes optimise their performance and achieve their athletic goals.

In the body, energy is derived from the food we eat, primarily through the metabolism of our macronutrients, carbohydrates, fats and protein. Carbohydrates and proteins contain 4 calories per gram, whereas fats are more energy dense at 9 calories per gram. The energy in these foods is used to power various physiological functions, including muscle contraction, nerve impulse transmission, metabolism, and maintenance of body temperature.

Overall, energy is essential to life and is fundamental to all biological processes. In addition, the body needs micronutrients in smaller amounts compared to macronutrients, but they are still essential for various physiological functions and overall health. Inadequate intake of micronutrients can lead to deficiencies, which can have negative effects on health, wellbeing and athletic performance. For an overview of energy balance, macronutrients, and micronutrients, please see up to 'antioxidants' of the 'fuelling performance' paper by Bytomski¹.

ENERGY BALANCE

Energy balance is when the amount of energy we consume is equal to our total energy expenditure. This balance is vital for our body to continue its physiological functions, maintaining health and performance. When we consistently consume more energy than our body needs, the excess energy is stored in the body as fat, and this can lead to weight gain overtime. When we consistently consume insufficient calories for our energy expenditure needs, it can lead to detrimental effects on overall health and

wellbeing, including (but not limited to) having a negative effect on growth, metabolism, immune function, and disease susceptibility.

In sporting terms, insufficient energy availability is otherwise known as 'low energy availability', and it can lead to a condition known as Relative Energy Deficiency in sport, otherwise known as REDs. REDs is a clinically diagnosed condition that was first introduced by the International Olympic Committee (IOC) in

2014. In 2023, the IOC updated their definition of REDs, describing it as:

'A syndrome of impaired physiological and/or psychological functioning experienced by female and male athletes that is caused by exposure to problematic (prolonged and/or severe) low energy availability. The detrimental outcomes include, but are not limited to, decreases in energy metabolism, reproductive function, musculoskeletal health, immunity,

glycogen synthesis and cardiovascular and haematological health, which can all individually and synergistically lead to impaired well-being, increased injury risk and decreased sports performance.'

To read the full IOC Consensus statement on REDs, written by a vast array of the top researchers in this space, including Margo Mountjoy, Kathryn Ackerman and Louise Burke, please see reference 2.

CARBOHYDRATE

Following on from energy balance, research has shown the potential benefits periodising carbohydrates can have on performance, helping you optimise glycogen stores and maximise high intensity work, while also maintaining energy balance on days that require less carbohydrate. As you will see, carbohydrate periodisation doesn't mean no carbohydrate, something that may be

worth highlighting to an audience of non-professional athletes.

It is important to focus on consuming complex carbohydrates from sources such as wholegrains, fruits, vegetables, and legumes, as they provide essential nutrients and fibre for overall health. For further reading on carbohydrate periodisation, please see Anderson *et al's* work³.

HYDRATION

Hydration is highly individual. Water is a major constituent of the body, making up as much as 50 to 70%. Water has many functions including regulating body temperature, removing waste products via urine, transporting nutrients and compounds in the blood, and acting as a lubricant for our joints.

body weight⁵. To maintain a euhydrated (or optimally hydrated) state, individuals must avoid over drinking (hyperhydration) and under drinking (hypohydration). The challenge is to determine how much an individual needs to drink due to the myriad of factors impacting hydration (please see reference 10 for a full overview).

For athletes, dehydration can result in reduced endurance and strength performance and as heat-related illness. Research suggests individuals suffer adverse effects when there is a loss of <2%

For an in-depth overview of daily fluid requirements and sodium intake suggestions before, during and after exercise, please see reference 5 (p.578, daily fluid requirements, p.596, competitive

sport or exercise), written by Lindsey Baker and Asker Jeukendrup, leading scientists in this field.

Athletes should be advised to look out for potential salt loss signs, such as the appearance of visible white lines on their clothing, potentially indicating they may want to consume an electrolyte before and/or during their session in that

environment, especially if exercising for over 2hrs⁷. Ultimately, using the hydration chart is a great way to assess your hydration levels throughout the day, aiming for zones 1-3⁶. For a full review of the sport nutrition guidelines, including hydration, please see the IOC Sport Nutrition Consensus from 2010⁷, written by Ron Maughan and Susan Shirreffs, who have summarised key points.

FIBRE AND GLYCEMIC INDEX (GI)

A diet that incorporates low-GI, high fibre meals is often recommended as part of a healthy diet. However, these foods take the body longer to process and so may lead to gastrointestinal issues if consumed too close to exercise. Everyone's gut sensitivity is different, and the intensity of your workout will also impact the incidence of gastrointestinal issues. As a rule of thumb, consuming a meal high in carbohydrates, with moderate protein, fat and fibre 2-4 hours before your moderate to low intensity training should limit the incidence of gastrointestinal issues. Any exercise 1-2

hours before means less time for digestion; so, options lower in fat and fibre but high in carbohydrate should be prioritised. If exercising at a high intensity within ~ 1 hour, foods higher in GI may help limit the incidence of gastrointestinal issues. This is because when we exercise, our bloodstream is diverted away from the gut and towards the working muscles, meaning the digestion of food is slowed. See reference 8, p508 for a summary of athlete carbohydrate recommendations, including before and during exercise.

REFUEL, REPAIR AND REHYDRATE

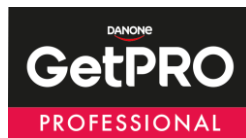
Following exercise, the 3 R's is a useful tool for athletes to think about, with focus on refuelling, repairing, and rehydrating. Again, as you will see highlighted in reference 8, nutrient needs and strategies for meeting them before, during and after

exercise are dependent upon a myriad of factors, and solutions may require experimentation and working with a qualified nutritionist. Athletes should be aware there is no one size fits all.

SUPPLEMENTS

A "food first" approach should be adopted by athletes where practically possible. Both references 7 and 9 provide great resources on the fundamentals of supplements in

sport, with researchers highlighting how supplements may be necessary in specific situations upon factoring all elements. The IOC (reference 7) along with Graham



Close's work (reference 9) have highlighted these factors, including the need for individuals considering supplementation to

consider their efficacy, their cost, their risk to health and performance, and the potential for a positive doping test.

TAKE HOME POINTS

- Insufficient calorie consumption for our energy expenditure can lead to detrimental effects on overall health and well-being, and in sport, it can lead to a clinically diagnosed condition known as Relative Energy Deficiency in sport (REDs).
- Energy needs differ day to day depending on individual goals and activity levels, and athletes of all levels can benefit from periodising carbohydrates.
- Hydration needs vary greatly. Work with athletes to use a hydration chart to assess and respond accordingly.
- In general, athletes are encouraged to consume meals high in carbohydrates with moderate protein, fat and fibre 2-4 hours before moderate to low intensity training. Foods with a higher GI can be prioritised closer to a high-Intensity training.
- Athletes should focus on the three R's when it comes to recovery: Refuel, Repair, and Rehydrate!
- A food first approach should be adopted first where practically possible. If not, athletes can consider a supplement providing it poses no risk to health or performance and is legal.

REFERENCE LIST

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