

SPORTS NUTRITION FUNDAMENTALS TO IMPROVE PERFORMANCE

Evidence-based sport science and
medicine guidance for developing athletes



These resources have been compiled based on the expertise and experiences of practitioners working with our GB Olympic and Paralympic programmes, across the Home Country Sports Institutes, together with other expert opinions and current literature findings.

The aim is to bring the most appropriate and useful knowledge being applied at the top end of British sports to the athletes, parents and coaches who are currently at an earlier stage of their development journeys.

We are confident that if this guidance is followed from an early point in an athlete's career, as well as by those supporting them, positive habits will be formed that will actively contribute to the athlete achieving a great deal of success, both in and out of competitive sport.

This sports nutrition fundamentals resource aims to complement our other more practical resource titled 'An Athlete's Guide to Basic Food Prep and Cooking', which is also freely available.

Editable and presentable versions of these resources are available on a case-by-case basis; if you'd like to request these please email us at talent.matters@eis2win.co.uk.

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Unleash the power of food

Food and fluids have a profound effect on the body, affecting all physiological processes, from the way the brain works through to how muscles respond to training. Even small adjustments to nutrition can lead to significant changes in health, training and performance.

The concept of balance suggests there is no perfect diet. Unless medically justified, no foods need to be avoided all together, as everything can be included in moderation. Athletes should focus on having a varied and balanced diet and a healthy relationship with food.

Optimum nutrition can:



Help maintain consistent high levels of training and competition performances



Enhance recovery from both training and competition



Ensure sufficient energy availability for all physiological processes, and helps avoid non-functional over-reaching



Support the achievement of body mass and composition associated with optimal performance



Support a healthy immune system to prevent illness and reduce duration and severity of symptoms



Support cognitive function to optimise reaction times, focus, the learning of new skills and mood / motivation



While there is no such thing as a magic diet or food, there are many ways in which eating well can allow athletes at all levels of performance to achieve the specific goals of their training and competition programs. It makes no sense to train hard and ignore the benefits that follow from good food choices.”

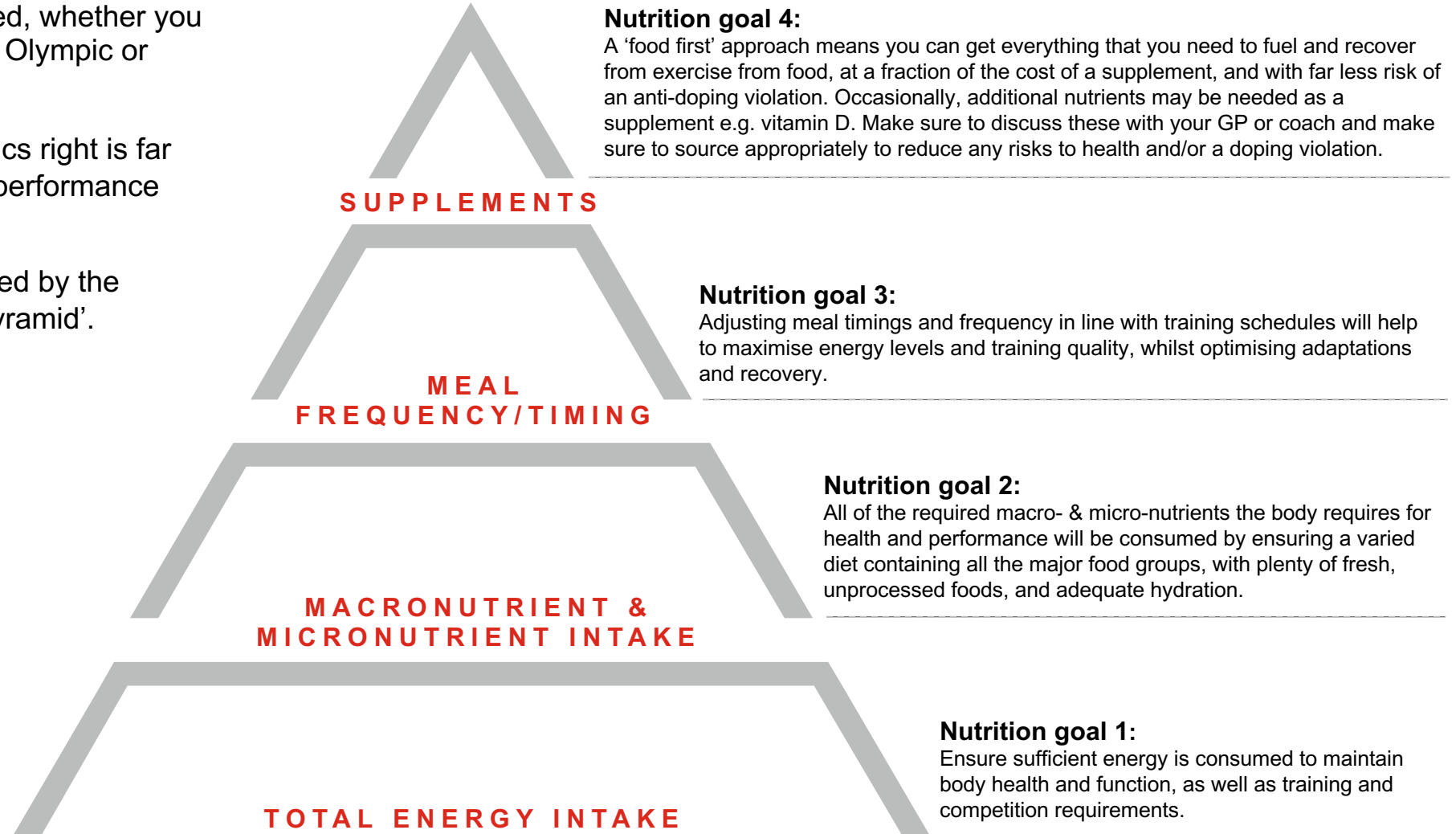
International Olympic Committee ‘Nutrition for Athletes’ 2012

Food first pyramid

A 'food first' approach is always advised, whether you are new to competitive sport or are an Olympic or Paralympic champion!

The impact of getting the nutrition basics right is far greater than seeking quick-wins from performance enhancing supplements.

This approach to nutrition is represented by the size of the segment in the 'food first pyramid'.





ENERGY

Energy

Energy is obtained from the foods we eat and fluids we drink, and is measured in units of kilocalories (kcal) or kilojoules (kJ). We all require energy to:

Sustain organ health and function (basal metabolic rate)

Grow and develop

Digest and absorb the food we consume

Perform daily tasks and sustain training demands

Energy is only obtained from the ‘macronutrients’ carbohydrates, protein, fat and alcohol, but ‘micronutrients’ e.g. vitamins and minerals, are essential to generate usable energy.

Determining how much energy is needed is difficult, as it is dictated by many factors, such as:

Basal metabolic rate

Muscle mass and bone mass

General daily activity levels (e.g. cleaning / gardening / walking)

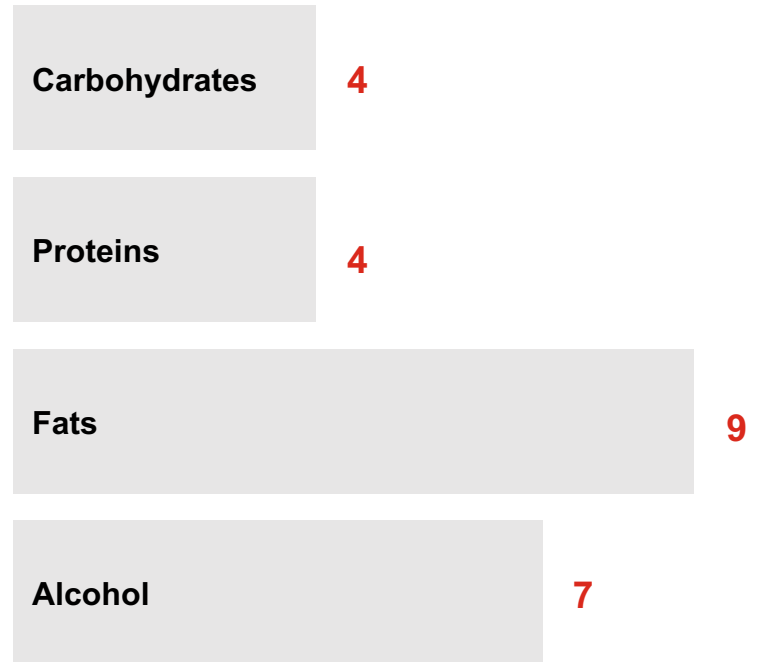
Exercise intensity and duration

Energy requirements vary greatly from person to person and will naturally vary from day to day depending on training and activity levels. Therefore, there is no **one** kcal intake suitable for **all** individuals.

There is also no **one** daily energy intake for an individual e.g. a double training session on a Monday & Wednesday requires a greater energy intake than a single training session on a Tuesday and a rest day on a Sunday.

MACRONUTRIENTS

Calories per gram (kcal/g)



Not all macronutrients provide the same amount of calories per gram of food.

Energy & body mass

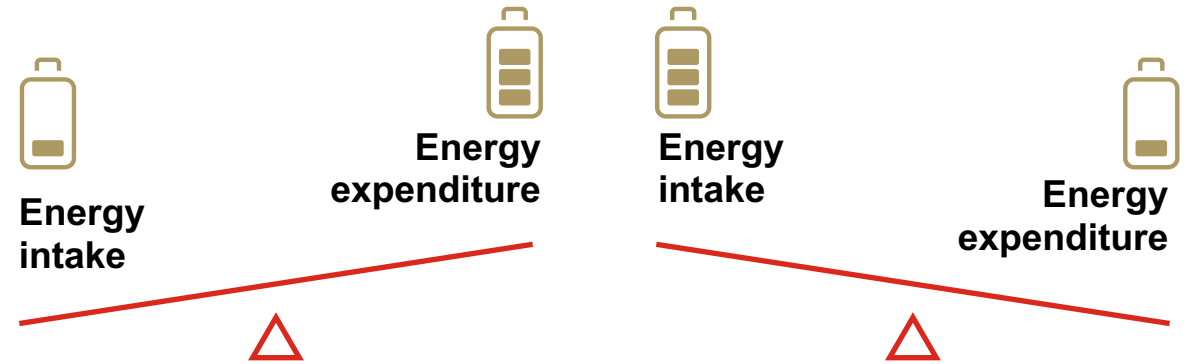
Energy balance = energy Intake – energy expenditure

ENERGY BALANCE AND STABLE BODY MASS



If looking to remain at the current weight, the correct amount of energy is being consumed.

ENERGY IMBALANCE CHANGING BODY MASS



When energy intake exceeds energy expenditure, body mass increases.

When energy intake is less than energy expenditure, body mass decreases.

Energy intake: all food and drink consumed.

Energy expenditure: basal metabolic rate, training and competition demands, activities of daily living, and the energy required to digest food.

Note that body mass can fluctuate daily due to changes in hydration, muscle fuelling, gut weight and in females, the menstrual cycle.

Low energy availability

When energy intake is less than the energy needed by the body, an **energy deficit** is created and there is a **low energy availability**

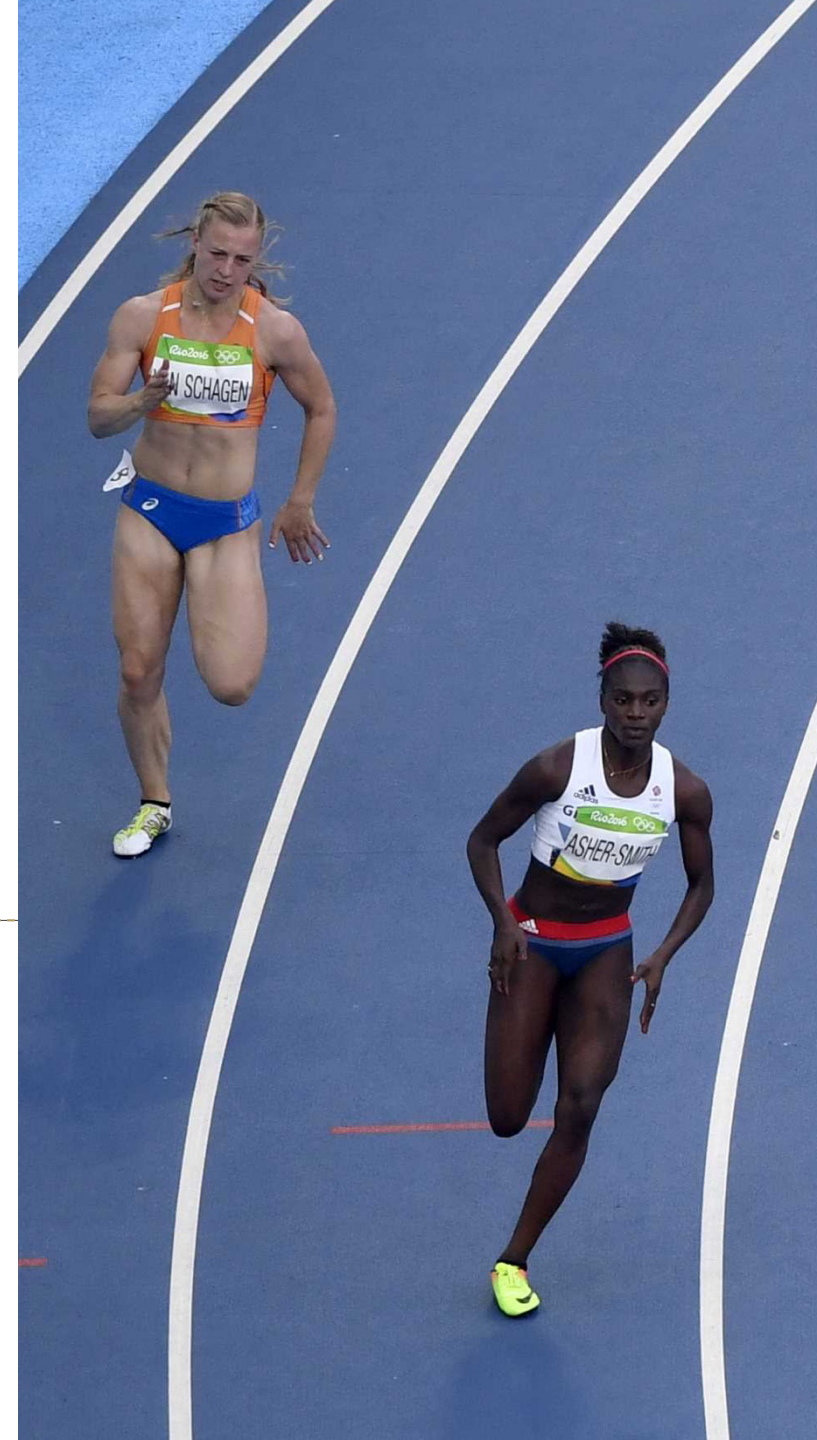
- If this is done in a controlled, nutritionally planned manner, for a performance goal, this will result in a safe and effective reduction in body mass.
- **HOWEVER**, if this is done inadvertently, over prolonged periods, without appropriate nutrition planning, this will result in **low energy availability & compromised diet quality**, which can have a number of potentially serious health and performance implications.

There are three main situations where low energy availability may arise:

Inadvertent: an increase in training volume / intensity without dietary adjustments and/or unintentional reduction in energy intake e.g. loss of appetite or awareness of energy requirements.

Intentional: restricted eating for weight control or loss of body fat.

Disordered eating or eating disorders.



Low energy availability

Signs and symptoms of short-term energy deficiency:

- Low energy levels
- Poor mood and concentration
- Increased risk of injury
- Increased risk of illness

Signs and symptoms of prolonged energy deficiency:

- Decline in performance / training
- Difficulty focusing
- Bone related injury(s)
- Repeated and / or prolonged illness periods
- Loss of menstrual cycle in females
- Reduction in body mass

In addition, prolonged energy deficiency in athletes can be described as a condition called Relative Energy Deficiency in Sport (RED-S), and there are some potentially serious consequences for both short and long-term health; see the BASEM Health4Performance resource for some useful guidance on RED-S: <http://health4performance.co.uk/>.

Please also see our [RECOVERY STRATEGIES](#) and [MINIMISING YOUR RISK OF ILLNESS](#) resources.



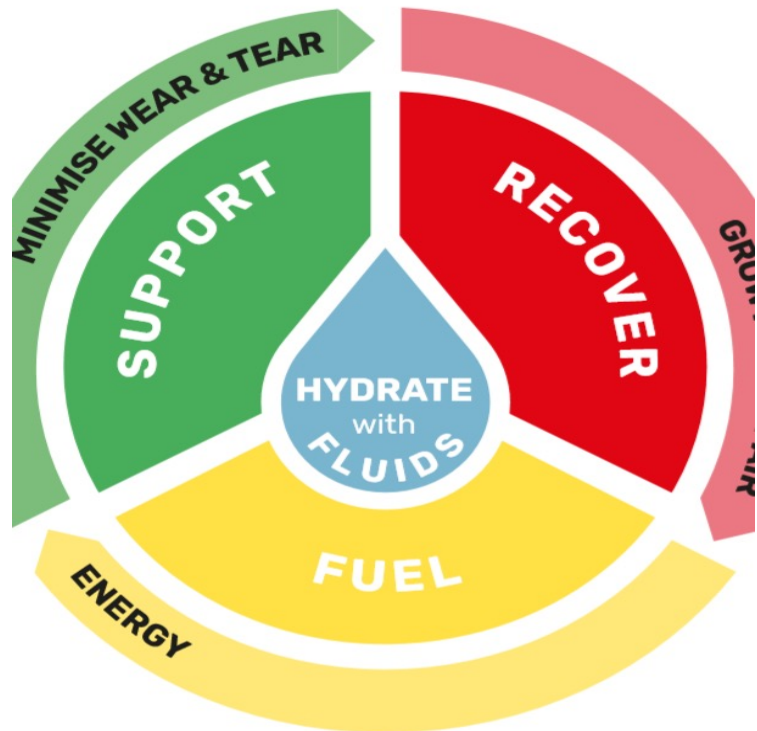


PERFORMANCE
MEAL WHEEL

Performance meal wheel

Eating a varied diet helps to ensure consumption of the daily amounts of macronutrients (carbohydrates, proteins and fats) and micronutrients (vitamins and minerals) needed to achieve healthy bodily functions.

Each balanced meal ensures: 1/3 plate contains **FUEL** foods, 1/3 plate contains **RECOVER** foods, 1/3 plate contains **SUPPORT** foods, and a fluid source to **HYDRATE**



Support: Fruit & vegetables

Green	Spinach, broccoli, kale, watercress, cabbage
Orange	Carrots, sweet potato, cantaloupe, mangoes, butternut squash
Yellow	Citrus fruits, peppers
Red	Tomato, watermelon, pink grapefruit, red apples, red onions, pomegranates
Purple	Berries, grapes, raisins, aubergine, plums, beetroot
White	Onions, garlic, shallots, leeks, banana, cucumber, celery, mushrooms

Fuel: Carbohydrates

Whole-grains	Cereal, pasta, rice, cous cous, quinoa, bulgar wheat
Potatoes	Baked, new, mashed, steamed, boiled, sweet potato
Breads	Bread, pita, rolls, wraps, English muffins, crumpets
Snacks	Malt loaf, currant buns, oat bars, dried fruit, fruit & nut bars

Recover: Protein & healthy fats

Poultry	Chicken, turkey
Red meat	Beef, lamb, lean mince
Fish	Cod, haddock, tuna, prawns, salmon, mackerel
Vegetarian alternatives	Quorn, tofu, tempeh
Milk & dairy	Milk, yoghurts, milkshakes, cheese, cottage cheese
Beans & pulses	Kidney beans, baked beans, lentils, chickpeas, edamame beans
Nuts & seeds	Nuts, seeds, peanut butter



Fuel foods – carbohydrates

Carbohydrates are an important fuel source for both the muscles and brain. The higher the intensity and longer the duration of exercise, the more carbohydrates are needed to maintain performance and prevent fatigue. Carbohydrate is stored in limited supplies as **glycogen** in the muscles and liver, enough for approx. 90 minutes of moderate intensity exercise.

Carbohydrates come in various forms, including **starches** such as potatoes, pasta, bread, and **simple sugars**, such as sucrose found in sugar, lactose in milk and fructose in many foods, including fruits and vegetables. Not all carbohydrates are equal in terms of nutrient profiles, rate of absorption in the gut and impact on the body!

Dietary fibre is the edible parts of plants and is an essential nutrient for the normal functioning of the gut. Choose high fibre or 'brown' options away from training (e.g. porridge, brown pasta, brown basmati rice). There may be times where low fibre options may be beneficial (e.g. during training and recovery around competitions).

Due to the daily variance in energy requirements, rather than adopting a high carbohydrate intake everyday, a **“smart” carbohydrate diet** would instead be recommended (i.e. adjusting carbohydrate intake on a day to day, session by session basis to match the demands of the training and competition programme).

**3-5g/kg
per day**

Training load: Low
Low intensity, training taper or skill based activities

**5-7g/kg
per day**

Training load: Moderate.
Moderate exercise programme e.g. 1 hour per day

**6-10g/kg
per day**

Training intensity: High
Endurance programme e.g. 1-3 hours per day of mod-high intensity exercise

**8-12g/kg
Per day**

Training intensity: Very high
Extreme endurance e.g. at least 4-5 hours per day of mod-high intensity exercise






Increase portion size of these foods before high volume/ intensity training e.g. to half a plate



Decrease portion size on a rest day or low intensity/ volume day e.g. to quarter of a plate



Fuel foods – carbohydrates

Type of Carbohydrate	Description	Examples	Use for athletes
Nutrient-rich carbohydrates 	Foods and drinks that provide carbohydrate but also contain other nutrients such as protein, fibre, vitamins, minerals and antioxidants.	Breads, cereals and grains (pasta, oats, rice, quinoa, couscous, wholegrains etc), starchy vegetables (potato, squash etc), beans, pulses, lentils and low fat dairy products (milk, yoghurt).	Should form the basis of the athletes' daily diet with quantity adjusted to training / competition demands. Provides additional fibre, essential fats, protein, vitamins and minerals.
Nutrient-poor carbohydrates 	Foods and drinks that are sources of carbohydrate but provide very little or no other nutrients.	All sugars (sucrose, glucose, dextrose, honey, maple syrup etc), refined grains e.g. white bread, Rice Krispies, full sugar fizzy drinks, energy drinks, carbohydrate gels and drinks, sweets, lollies.	These should not form a major part of an athlete's daily diet. However, as these options are quickly absorbed some may be suitable carbohydrate sources in and around training and competition.
High-fat carbohydrate 	Foods that contain carbohydrate but are also high in fat and often lacking in vitamins, minerals and fibre.	Cakes, crisps, chocolate, biscuits, pastries.	Foods that should only be consumed occasionally, and not before, during or after training and competition. Should be limited in athletes trying to manage their body mass.



Recover foods - proteins

Recover foods play a key role in **growth, repair and recovery** of muscles, tissues and organs. Regular intake of recover foods throughout the day in meals and snacks is important to provide the body with a regular supply of protein and other vital nutrients such as iron and essential fats.

Protein is the major macronutrient involved in **building and repairing** muscle, bone and skin. Protein is made up of building blocks called amino acids and the body is constantly in a state of building and breaking down muscle proteins. There are eight 'essential amino acids' that cannot be synthesised in our bodies and can only be obtained from the diet.

Protein intake each day should be the same whether you are doing a gym session, conditioning training, or having a recovery day. This protein should be **spread out** over the day in meals, snacks and before bed as well as before and after training. It is also beneficial to consume a slow releasing **protein before bed** (e.g. milk, yoghurt or cottage cheese) as it stimulates muscle recovery over night.



Aim to have **1.6-2g/kg** body weight of protein **per day** e.g. a 70kg athlete would aim for 112 – 140g daily





This might increase to 2.5g/kg body weight if looking to gain weight and support muscle growth, or to support muscle maintenance in times of injury or weight loss



Protein should be spread out over the day in meals, snacks and before bed. Aim for a minimum of 20-30g per portion (0.3g/kg body mass) protein every 3-4 hours



Recover foods - proteins

Type of Protein	10 g protein	15 g protein	20 g protein	30g protein
<p>Animal sources are 'complete proteins' as they contain all the "essential" amino acids, which are needed for protein synthesis.</p> 			<ul style="list-style-type: none"> 1 small breast (75 g) chicken or turkey breast 3 slices (75 g) beef, lamb, pork 3 medium (180 g) eggs 1 large fillet (150 g) fish 1 large tin (100 g) tinned fish 3 tbsp (150 g) prawns 6 tbsp (200 g) Greek yoghurt 1 pint (568 mL) milk 1 small tub (300 g) cottage cheese 	<ul style="list-style-type: none"> 1 medium breast (112 g) chicken or turkey breast 4.5 slices (112 g) beef, lamb, pork 4.5 medium (270 g) eggs 1 ½ large fillet (225 g) fish 1 ½ large tin (150 g) tinned fish 4.5 tbsp (225 g) prawns 9 tbsp (300 g) Greek yoghurt 1 ½ pint (852 mL) milk 1 large tub (450 g) cottage cheese
<p>Plant. Most plant proteins have only some of the "essential" amino acids, so need to be combined in order to become a 'complete' protein.</p> 	<ul style="list-style-type: none"> 50g nuts/ seeds 2 slices (200 g) bread 1 large glass (200 mL) soya milk (fortified) 6 tbsp (200 g) soya yoghurt (fortified) 	<ul style="list-style-type: none"> Half a tin of beans (200 g) 150 g edamame/soya beans 160 g tofu 180 g lentils 	<ul style="list-style-type: none"> 100 g Tempeh 150 g Quorn 	<ul style="list-style-type: none"> 180 g tempeh & 30 g peanuts 170 g quorn & 100 g black beans 180g edamame bean & 100g quinoa & 30g sunflower seeds



Recover foods - healthy fats

Fats are important nutrients in the diet. Not only do they provide energy, but they are required for cell growth, producing hormones and the absorption of fat soluble vitamins (A, D, E and K).

The type of fats consumed in the diet are important.

Aim to regularly include mono and poly-unsaturated fats in your diet to support health and recovery. Oily fish are a great source of polyunsaturated fats called omega 3's. These play an important role in managing inflammation in the body, brain function and the development of your central nervous system.

Aim to limit the amount of saturated and trans fats in your diet as they are found in energy dense food that are low in nutrition and can increase your risk of long term health conditions. Choose low fat options where possible e.g. extra-lean beef mince or low fat cheese, and remove visible fat on cuts of meat e.g. pork chop

Type of fat & sources in foods

Monounsaturated

Avocados, olives, olive oil, rapeseed oil, almonds, cashews, hazelnuts, peanuts, pistachios, spreads made from these nuts.



Polyunsaturated

Oily fish, corn oil, sesame oil, soya oil and spreads made from these oils; flaxseed, pine nuts, sesame seeds, chia seeds, sunflower seeds, walnuts.



Saturated

Processed meats like sausages, chorizo, salami, hot dogs; fatty meat; hard cheeses including cheddar; whole milk and cream; butter, lard, ghee, suet, palm oil, coconut oil.



Trans

Fried foods, takeaways, snacks like biscuits, cakes, pastries; hard margarines





Support foods - fruit & veg

This group includes all fruits and vegetables and are important to supply most of the micronutrients (vitamins, minerals, antioxidants, phytonutrients) the body needs to function.

These foods support a range of functions in the body: recovery from training and competition, immune health, and brain function, to name a few. Most athletes are well able to meet the recommended intakes for vitamins and minerals by eating a varied and balanced diet including a high intake of fruit and vegetables.

80 g provides 1 portion of fruit / veg:

2 small fruit
e.g. kiwi,
satsuma, plum

1 medium fruit
e.g. apple,
pear, banana

1 slice large fruit
e.g. melon,
pineapple

Handful berries
or grapes

2 spears
broccoli or
cauliflower

3 tbsp
cooked veg

1 small bowl
soup or salad

¼ big tin beans



7+ portions every day.
Include a variety of
different colours.



Support foods - fruit & veg

Practical tips to increase fruit and veg intake:



Eat a rainbow. The different colours will provide different micronutrients



Aim for 1 portion of green veg and 2 additional colours on every plate



Frozen fruit and veg has equal nutritional benefit as fresh



Steaming vegetables ensures they retain their nutritional content



Increase fruit and veg intake in times of illness, hard training, and increased stress



Smoothies and soups are a great way to increase fruit and veg intake



Try adding beans to stews, extra veg to omelettes or having a bowl of soup with a main meal



Tinned fruit and vegetables can be just as nutritious as fresh options



Hydration

Water has many important roles in the body and is required to maintain blood volume and regulate body temperature.

Practical tips for staying hydrated:

Always carry a large water bottle and refill regularly



Drink a large glass of water with each meal



Choose fluid options / flavours that you like as you are more likely to drink more



Set reminders on your phone to drink throughout the day



Monitor urine; colour, smell, frequency, quantity
(see next page for details)



Rehydrate after training to replace fluid lost through sweat
(see next page for details)



Homemade isotonic sports drink:

OPTION 1: 200 mL ordinary fruit squash + 800 mL water + a pinch salt

OPTION 2: 500 mL fruit Juice e.g. pineapple juice + 500 mL water + a pinch salt

Top tip: dissolve the pinch of salt in a small amount of warm water first before adding to you drink





Understanding your hydration status

Your urine should be plentiful and its colour should be in the well hydrated zone. If not, start drinking immediately.



Why?

Fluid losses as low as 2% of body weight can have a significant impact on exercise performance. Negative effects of dehydration include:

- Fatigue
- Reduced concentration & reaction times
- Compromised immune system
- Reduced adaptation to training

When?

Start each training session fully hydrated. Check the colour of your morning urine for a quick indication. If your urine colour is greater than 7 on the above chart, you are probably dehydrated and need to increase your fluid intake immediately. If your urine is often dark, make sure you increase your fluid intake in future.

Rehydration is more effective when fluids are drunk over several hours, rather than immediately after exercise all at once.

How much?

Fluid requirements will be different for each athlete.

Weigh yourself (ideally wearing underwear only, to avoid confusion from sweat soaked clothes) before and after training sessions. For each 1 kg lost in body weight replace with 1.5 kg of fluid (make sure you also deduct the weight of any fluid / food ingested during the session).

This is even more important when training or competing in hot and humid environments.

What to drink?

Water is good, but not always the best choice for athletes.

Look for drinks which contain sodium (salt), the major electrolyte, as this helps the body retain the fluid you drink, thereby assisting hydration. These are often called 'isotonic' sports drinks, and are usually effective for rehydration. See previous slide for homemade recipe.

If in doubt, seek the advice of a qualified and experienced sports nutritionist.

Weight loss (kg)	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0
Volume to drink (mL)	375	750	1125	1500	1875	2250	2625	3000



TRAINING AND COMPETITION NUTRITION

Fuelling for training

Experiment on rest days, as they provide the opportunity to try new foods and recipes. Take advantage of the extra time to learn some new cooking skills or batch cook for busy training days.

Pre-training nutrition:

- Adequate fuelling and hydration at the start of training
- Avoid both hunger and fullness with discomfort
- Minimise gastrointestinal distress by consuming foods low in fat, fibre and spice
- Consume last meal 2-4 h prior to the session, then top up fuel levels 1-2 h before if needed

High fuel day:

- Increase fuel foods to half the plate at meals pre- and post-training, and increase fuel foods in pre- and post-training snacks
- Fuel and hydrate appropriately during the training session
- Include both protein and carbohydrates during recovery

Moderate fuel day:

- Follow the performance meal wheel at main meals
- Include carbohydrates in pre- and post-training snacks, but reduce carbohydrates in snacks away from training
- Keep protein consistent throughout the day

Low fuel day:

- Follow the performance meal wheel at main meals
- Consider reducing the number of snacks throughout the day, but keep protein intake consistent
- Increase fruit and vegetable intake



Fuelling for competitions

24 h pre-competition day

- Plan and practice your competition day nutrition and fluid intake beforehand in training.
- If competing intensely for more than 1.5 h and there is limited ability to eat during the competition, it may be beneficial to 'carb-load' for the 24 h pre-competition.

What

- Aim to consume 6-10 g carbohydrate per kg of body weight in the 24 h before competitions
- Spread this across 5-6 meals and snacks
- Base all meals on carbohydrate sources

Examples

Low fibre carbohydrate options e.g. refined cereals like Rice Krispies or Cornflakes, low fibre cereal bars, white bread, white rice, white pasta, fruit juice, honey, sugar, jam, rice pudding, scotch pancakes, rice cakes



Fuelling for competitions

Competition day

- Top up carbohydrate stores before competing.
- Never try anything new on competition day, including supplements.
- Avoid spicy or high fat foods which may irritate the gut.
- Stay hydrated; sip fluids regularly. Liquid sources of carbohydrate can boost intake if struggling to meet requirements, e.g. squash, sports drinks, fruit juice, smoothies.
- If nervous and unable to eat, then choose easy to digest energy dense options or liquid meal e.g. Rice krispies / cornflakes and milk, scrambled eggs on toast, oat, fruit and yoghurt smoothie, greek yoghurt, honey and dried fruit

Time	What	Examples
2-4 h before	<ul style="list-style-type: none"> • Balanced meal (see Performance Meal Wheel) • Increase portion size of fuel foods before competitions of high intensity or long during (e.g. to half a plate) • Reduce intake of recover / support foods if struggling to eat 	Porridge with yoghurt, bircher muesli, potato omelette, eggs and beans on toast, chicken with rice and vegetables, oat, fruit and milk smoothie
1-2 h before	<ul style="list-style-type: none"> • 30-60 g of carbohydrate 	30 g carb portion = 1 medium banana, 1 thick slice bread and jam, 2 cereal bars, 1.5 slices of malt loaf, 6 dried apricots / dates, 2 scotch pancakes, 1.5 crumpets, 1 thick slice of banana bread, 500 ml sports drink



Fuelling during training and competition

Aim	Time	What	Examples
Factors to consider: duration, intensity and type of session / race, as well as any body composition aims	0-1 h	Carb intake 0-30 g/hour	30 g carbs = 1 medium banana 1 thick slice bread & jam
	1-1.5 h Sustained high intensity exercise	Carb intake 30 g/hour Consider electrolyte intake	2 cereal bars 1.5 slice malt loaf 6 dried apricots/ dates
Replace sweat losses	1-2.5 h Endurance exercise, including stop / start sports and multiple events within the same day	Carb intake 30-60 g/hour Consider electrolyte intake	2 scotch pancakes 1.5 crumpets
Provide a fuel supply during longer intense sessions			Energy ball 1 thick slice banana bread
Provide some protein to reduce muscle breakdown in events lasting longer than 3 h	2.5+ h Ultra-endurance	Carb intake up to 90 g/hr Multiple sources of carbohydrate (glucose) Mix of solid food and liquid options 20 g easily digestible protein every 3 h Consider electrolyte intake	500 mL sports drink 1-2 carbohydrate gels
			Protein for >3 hours Chicken sandwich







Recovery after training and competition

The focus of a nutrition recovery strategy is to:

- Optimise muscle adaptations through protein intake
- Help repair damaged tissue by supplying protein and antioxidants from colourful fruit / veg and healthy fats
- Restore muscle energy stores with carbohydrates
- Replenish lost fluids from sweat
- Help prepare the body for subsequent training / competition

Recovery is a three phase process:

	Time	What	Examples	
Phase 1	Immediately, within 1 h of exercise (especially if training again within 24 h)	Carbs: 0.5-1 g/kg body mass Protein: 0.3g/kg body mass Fluids: 1.5 x body mass lost in the following 3-4 h	Moderate carb: 500 mL semi skimmed milk 200 g protein yoghurt, banana and honey High carb: 500 mL chocolate milk or milk with Nesquik 200 g Greek yoghurt & granola 100 g chicken sandwich	 
Phase 2	2-3 h after exercise (sooner if no immediate recovery snack)	Balanced recovery meal (see Performance Meal Wheel)	Spaghetti bolognaise Salmon with noodle stir-fry Chilli con carne with rice Chicken fajitas with wraps	
Phase 3	Recovery day	The body takes 24-48 h to recover from a single exercise bout so follow the Performance Meal Wheel on recovery days.		

Example nutrition plan

07:00

Breakfast

Porridge made with 300 mL milk, 55 g jumbo oats, 1 banana, 1 tbsp mixed seeds

Cup of tea with milk

1 pint water

11:00

Post training snack

Latte made with 300 mL milk, homemade peanut butter and fruit flapjack

15:00-17:00

Training

1 L water

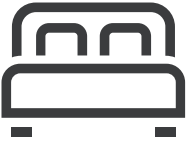
1 L homemade sports drink

2 tbsp dried fruit

19:00

Dinner

Soy, honey and sesame salmon with mixed stir fry vegetables and basmati rice



09:00-11:00

Gym

1 L water

13:00

Lunch

Tuna (72 g) in a mixed vegetable & tomato sauce with wholewheat pasta

1 pint water with sugar free squash

17:00

Post training snack

1 pint ss milk

A banana and

½ tub red grapes

21:00

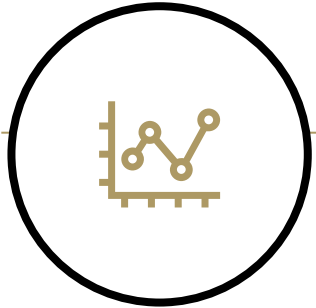
Pre bed protein

200 g high protein Greek yoghurt with 20 g crushed nuts and mixed berries



CHANGING BODY COMPOSITION

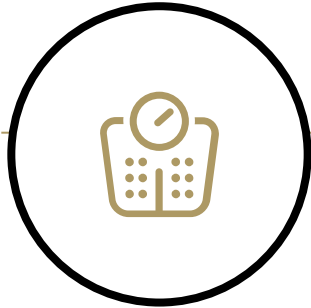
Top 5 strategies to change body composition: gaining muscle and/or losing body fat



Set realistic targets as a medium-term goal rather than something to be achieved by next week. Aim for up to 0.7% body weight change per week for example:

A 50 kg athlete could aim for up to 0.3 kg/week,

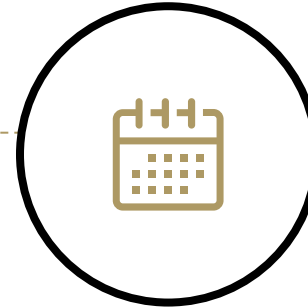
A 80 kg athlete could aim for up to 0.5 kg/week.



Monitor body weight no more than once per week with the same weighing scales (whether looking to increase or decrease body weight).



Choose an appropriate phase of training to achieve this e.g. during the off season or early in a base training phase.



Keeping a food diary of what you eat can also help to pinpoint habits that could be changed.



Seek guidance from a qualified sports nutrition expert for an assessment of current eating patterns and where small changes can be made.

Reducing body fat

Try to create a small energy deficit, around 300-500 kcal per day, by reducing energy intake and/or increasing energy expenditure.

Remember that adequate energy availability is needed for long-term health.

Practical tips:

1

Reduce portion sizes of higher energy and carbohydrate rich foods at meals rather than skipping meals altogether, especially on rest days. Pack meals out with nutrient dense vegetables

2

Switch to lower fat varieties of certain foods (e.g. dairy, mince) and opt to steam / boil / oven bake instead of fry where possible.

3

Reduce intake of low nutrient, energy dense foods and fluids (e.g. biscuits, crisps, pastries, cakes, sweets, sugary drinks, alcohol).

4

Limit alcohol intake or cut it out altogether – it is not an essential part of the diet. In addition, many people lose their good intentions after a few drinks (e.g. eating snack foods, fast foods or other poor food choices).

5

Maintain carbohydrate intake around training to maintain fuel levels for exercise, especially on days when training intensity and quality is important.

6

Maintaining a good spread of protein intake over the day will help to preserve muscle mass as well as to make meals and snacks filling.



Gaining muscle mass

A good quality training programme designed to increase muscle mass is essential, alongside an increased energy intake and some other nutrition factors to optimise the adaptive response.

Try to create a small energy surplus, around 300-500 kcal per day, by increasing energy intake.

Start every training session well fuelled with carbohydrate, well hydrated and recover from every session with both carbohydrate and protein.

Practical tips:

1

Set a pattern of 5-7 meals and snacks during the day, with small manageable increases in portion size

2

Consume a protein rich snack, with a high casein content 30-60 minutes before bed (e.g. milk, Greek yoghurt, cottage cheese)

3

Plan ahead to have suitable foods and drinks available “on the run” (e.g. fruit, milkshakes, beef biltong, tinned fish, oat bars).

4

Drinks such as fruit smoothies, full fat milk, fortified milkshakes and juices are quick and compact to consume.

5

Increase your intake of energy dense foods such as nuts, seeds, nut butters, oily fish, avocados, olive oil, olives etc

6

Compact forms of carbohydrate before and during exercise can add energy to the day as well as fuel the session (e.g. dried fruit, energy balls, oats bars, jam sandwich, sports drinks).





NUTRITION FOR HEALTH

Calcium

Calcium is a mineral and important for healthy bones and teeth, as well as muscle and heart function, so is crucial for athletes.

UK recommended calcium intakes are 800 mg/day for 11-18 y old females, 1000 mg/day for 11-18 y old males, and 700 mg/day for 19-50 y old females and males.

Who are at risk of calcium deficiency?

- Adolescents with higher requirements for growth
- Vegetarians, vegans or those with limited dairy intake
- Anyone with a history of bone injuries
- Female athletes

Consume 4-5 portions of calcium rich foods each day.



The best sources of dietary calcium are dairy products, but suitable plant based options also exist:

**Milk, yoghurt,
cheese**

**Fortified soya
drinks and
yoghurts**

**Green leafy
vegetables**
e.g. spinach, kale,
water cress

**Tofu set in
calcium**

**Nuts, seeds,
dried fruit**
e.g. figs, tahini

Beans
e.g. kidney beans,
baked beans

Tinned fish
e.g. sardines or
salmon

Vitamin D helps the absorption of calcium from food so also ensure optimal vitamin D intake (supplement if necessary).



Iron

Iron is a mineral that plays many important roles in the body, including oxygen delivery to muscles through the blood, energy production, brain development and cognitive performance, and immune health.

Iron cannot be made by the body, so must be obtained from food. UK recommended iron intakes are: 15 mg/day for 11-50 year old females, 11 mg/day for 11-18 year old males, and 9 mg/day for 19-50 year old males.

Who are at risk of iron deficiency?

- Vegetarians, vegans or those with limited meat intake
- All athletes during heavy phases of training
- Females with heavy menstrual bleeding*
- Anyone who trains at altitude



There are two different form of iron which are obtained from food sources:

Haem iron is found only in animal sources and absorbed the most efficiently (absorption ranges from 10-30% of intake),
e.g. beef, lamb, venison, eggs, sardines, shellfish, poultry.

Non-haem iron is found in foods of plant origin, but is not absorbed as well as haem iron (absorption ranges from 4-10%),
e.g. kidney beans, chickpeas, quinoa, fortified cereals, nuts, seeds, green leafy vegetables

Consume a minimum of two portions of red meat weekly and include daily sources of non-haem containing foods. To improve the absorption of non-haem iron consume alongside a rich source of vitamin C (e.g. have a glass of orange juice with breakfast cereal), and avoid consuming with iron inhibiting foods (e.g. tannins in tea and coffee or phytates, found in bran and beans). Caffeine and salt may also inhibit iron absorption.

If you think you might have an iron deficiency, speak to your GP to get a simple blood test in the first instance. Iron supplements should not be taken without medical advice, as excessive iron intake can be detrimental to health.



*Please also see our 'SUPPORTING THE DEVELOPING FEMALE ATHLETE' resource.

Vitamin D

Vitamin D is crucial for many aspects of health and performance, including bone health, muscle function and repair, and immune health (as well as aiding the absorption of calcium, another important micronutrient).

Vitamin D is synthesised in the skin upon exposure to ultraviolet B rays (UVB). 80-90% of our vitamin D requirements are obtained through UVB ray exposure, with only 10-20% coming from dietary sources.

Vitamin D formation in the skin is prevented by sun block and clothing. Therefore, even during the summer months where vitamin D synthesis should be optimal, it often isn't. Please see the 'sun and UV light protection' section within our '[MINIMISING YOUR RISK AND RECOVERING FROM ILLNESS](#)' resource.

Dietary sources of vitamin D:

- Very small quantities of vitamin D are obtained naturally through the foods we eat (e.g. egg yolks, oily fish and mushrooms).
- In addition, some foods are fortified with vitamin D, including milk, yoghurt, cereals and juice.



Athletes at the greatest risk of vitamin D deficiency:

Have dark skin

Live further away from the equator

Train indoors

Wear clothing that covers most or all of their body

Regularly use sunscreen or consciously avoid the sun (which is often essential in order to maintain skin health)

To prevent vitamin D deficiency people living in the UK should safely spend time outdoors and take a daily supplement containing 400 IU (10 micrograms) or 1000 IU x 3 times per week of vitamin D throughout the year (see NICE recommendations for [adults](#) and [children](#)). Some athletes may need a higher dose of vitamin D which should only be advised based on a blood test from your GP. Remember to only use supplements that are batch tested through InformedSport.

The Vegetarian / Vegan Athlete

When following a vegetarian or vegan diet, a certain level of planning is required to ensure your diet is providing all the nutrients required to sustain health and optimise training adaptations.

Additional measures need to be taken to ensure nutrition is not compromised, especially during times when food choices and quality may be less available (e.g. when travelling to some foreign countries).

Include a wide variety of food every day and adapt the performance meal wheel as needed.

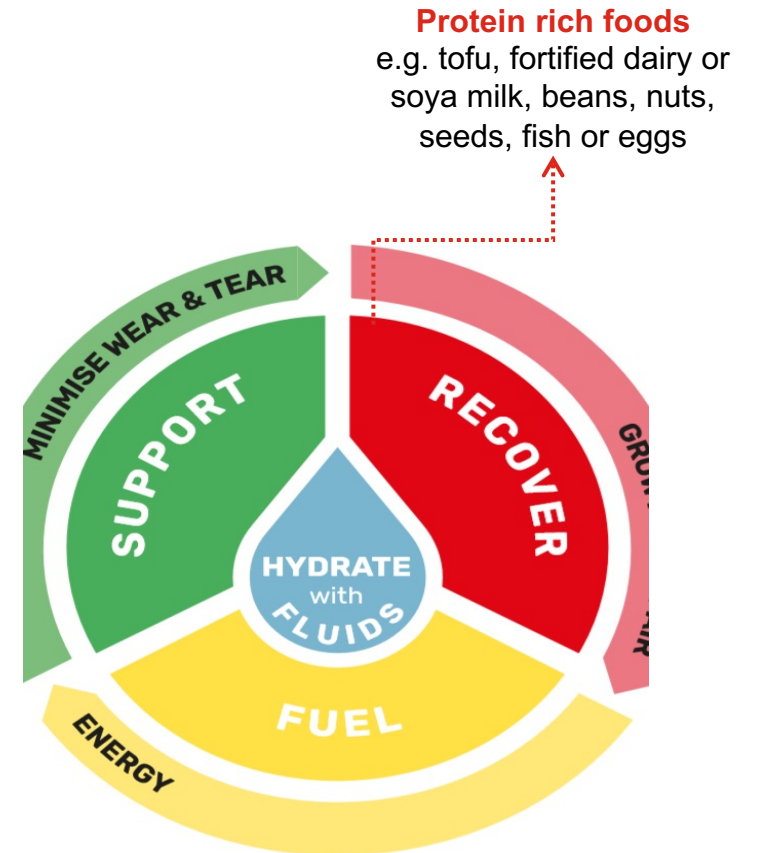
Certain important nutrients are less abundant and not as well absorbed from plant based. Food sources of these nutrients and food combinations need to be planned into the daily diet.

Energy: when energy needs are high, incorporating more low fibre foods can help overcome feelings of fullness often found with high fibre plant based foods e.g. white bread, pasta or noodles

Protein: the anabolic response to a plant based protein is lower than that of animal proteins. The total amount of plant protein required to stimulate muscle protein synthesis is therefore slightly higher. Aim for 0.4 g protein per kg body weight after training, and a total of 2.0-2.2 g protein per kg body weight each day.

B vitamins: these nutrients play key roles in energy metabolism. Certain B vitamins are low or absent from plant foods. B12 can be found in eggs, dairy or fortified cereals and non-dairy alternatives (e.g. Soya products).

Importantly, also pay close attention to the earlier sections on omega 3 fats (within "Recovery Foods"), calcium and iron, to ensure adequate intake of these essential nutrients.





SUPPLEMENTS AND CAFFEINE

Supplements

What is a supplement?

A food, food component, nutrient, or non-food compound that is purposefully ingested in addition to the habitually consumed diet with the aim of achieving a specific health and/or performance benefit.

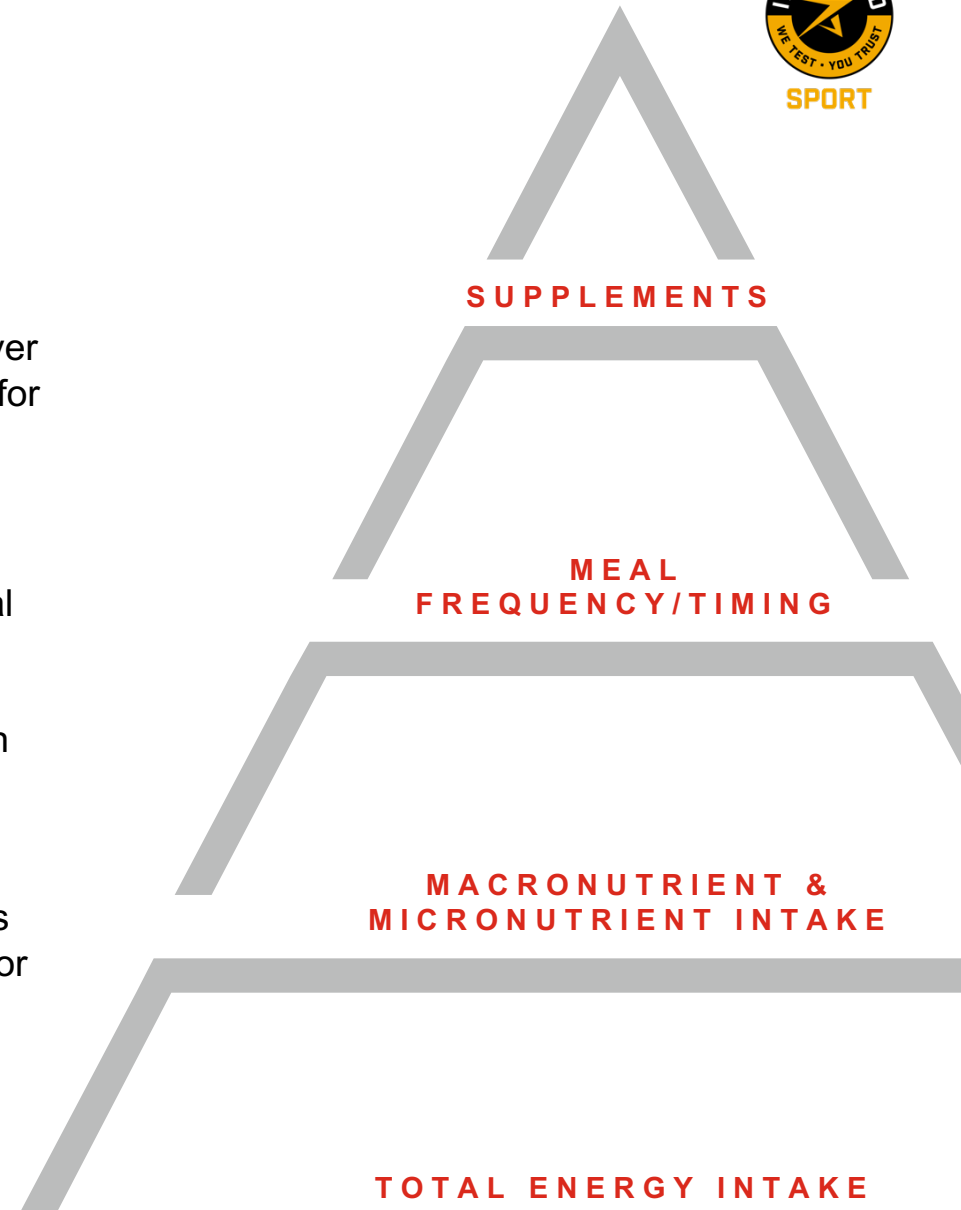
For example:

- Vitamin and mineral supplements e.g. vitamin d
- Sports drinks and hydration products
- Protein supplements
- Carbohydrate / energy products
- Ergogenic aids (e.g. caffeine, creatine, beta alanine, sodium bicarbonate)
- Herbal remedies and botanicals

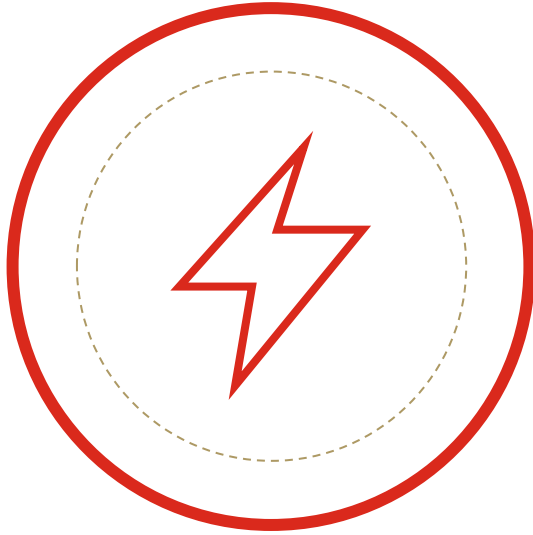
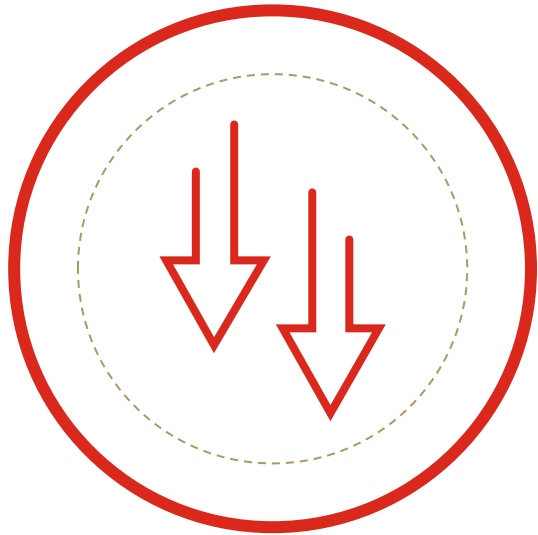
Should athletes use supplements?

A 'food first' approach means you can get everything that you need to fuel and recover from exercise from food without the need for supplements. Following the 'Performance Meal Wheel' can help to make sure your nutritional needs are met.

There can be situations in which additional evidence-based nutrition supplementation may be beneficial to your health or sports performance e.g. vitamin D. Consideration of supplement use should stem from performance/health questions, using a performance backwards approach, and never based on marketing claims. Discuss any supplement use with your GP, coach or SENr qualified nutritionist



Should athletes use supplements?



Assess the need

Consider if you can consume the supplement from food sources. If not, seek advice from a qualified medical or nutrition professional to determine whether you need to use a supplement (see the [Sport and Exercise Nutrition Register](#)).

Assess the risks

If you chose to use a supplement product, only use Informed-Sport batch-tested supplement products to minimise your risks of contamination. Make sure you check the batch numbers prior to use and note down all information e.g. company, brand, products name, expiry date, batch number, search date etc.

Assess the consequences

Remember, presence of a prohibited substance in your body could result in a four year ban from all sport.

Supplement grey areas

Some companies have enhanced the nutritional content of food products with the addition of specific ingredients, causing a 'grey area' for athletes. These items are readily available in supermarkets and can be a problem due to the risks of contamination and inadvertent anti-doping. Be very wary of these foods and/or check ingredient lists, as this area of the market is rapidly growing and evolving. Here are just a few examples where high risk ingredients have been added e.g. non-batch tested whey protein, soya protein krispies, pea protein:

High risk foods to avoid



Safe to consume



Caffeine use in sport

Caffeine is a naturally occurring stimulant found in the leaves, nuts and seeds of several plants, and is present in a range of everyday food and drink products such as coffee, tea, cola and chocolate. It is also added to many sports supplements such as gels, drinks, gums, powder and capsules.

Performance potential

Caffeine acts on the central nervous system and can improve reaction time, concentration and alertness, and changes in perception of fatigue or effort. As such, it can enhance performance in events lasting between 1 minute to 4 hours, though the effects are highly individual, with some people being 'non-responders' (getting zero benefits).

What dose is effective for performance gains?

- Between 1-3 mg caffeine per kg body weight, taken approximately 30-60 minutes before training (so 70-200 mg for a 70 kg athlete).
- Performance benefits do not increase with higher doses than this, though negative side-effects will likely be worsened with higher doses.

Caffeine habituation

Frequent high dose caffeine consumption reduces sensitivity to caffeine, therefore habitual caffeine users may not benefit from caffeine supplementation or may require doses towards the higher end of the range. If using caffeine in an attempt to enhance training, prioritise its use for key sessions only, or it will be less effective.

Food or drink	Serving	Caffeine (mg)
Instant coffee	250 mL	10-170
Brewed coffee	250 mL	40-110
Espresso	1 shot	25-210
Tea	250 mL	10-50
Dark chocolate	60 g	10-50
Cocoa cola	375 mL	50
Red bull energy drink	250 mL	80
Monster Energy Drink	500 mL	160

Caffeine – any risks?

What are the risks?

Small doses of caffeine within the recommended range are generally safe, hence their widespread social use. A caffeine intake below 300 mg/day does not seem to have any adverse health effects for most people. Higher caffeine intakes may have detrimental effects in some athletes for example:

- Increased heart rate or palpitations
- Insomnia and poor sleep patterns (especially if ingested in the afternoon onwards)
- Headaches
- Impairments to fine motor control, alertness and reaction time
- Over-arousal and difficulty concentrating / decision making
- Gastrointestinal discomfort including diarrhoea and vomiting

Care should be taken when caffeine is consumed after 3pm as sleep quality may be affected. Female athletes with low calcium intakes should avoid excessive intakes of caffeine as it can be detrimental to bone health. Minimise use of carbonated drinks with very high caffeine intakes around competition to minimise gut distress (e.g. Coke / Red Bull / Monster).



5 practical nutrition behaviour change strategies

There is a lot of information in this resource, so below are 5 top strategies to support athletes to make practical nutrition behaviour changes:

1: Start small

It can be easy to read the information in these resources and try to overhaul your whole diet, making loads of big changes. However, it is unlikely that these changes will be stuck to long-term. Start by focusing on 2-3 small diet changes that you believe to be a priority for health or performance.



2: Create smart goals

Set small goals for yourself to achieve based on the information in this resource. Ensure that any new changes or food goals you set are Specific, Measurable, Achievable, Realistic and Time-bound (SMART).

For example, I will increase my fruit and vegetable intake by two portions every day for the next two weeks by including one piece of medium fruit (e.g. pear, apple or banana) with my post training mid-morning snack and one bowl of soup or salad with lunch.



3: Habit formation

Building healthy habits can involve putting yourself in situations in which you are more likely to engage in a food behaviour, planning to repeat the behaviour, and attaching a small reward or deterrent to the behaviour. Stacking habits, by attaching a new habit to an existing one (e.g. drinking a pint of water with your breakfast every morning) can also help, as well as exchanging a current habit for a new one (e.g. every Sunday evening you plan your training for the week, why not also plan your meals and snacks too?)



4: Peer-modelling

Parents and coaches are role models for younger athletes so they should practice what they preach. Successful senior athletes can also be hugely influential.



5: Promote trial and error

A process of trial and error is important for athletes to go through with food to learn what foods work well and what food don't suit. Encourage athletes to try new foods or different timings around training, evaluate it afterwards and decide whether to keep it in or leave it out. Patience is important as you might need to trial foods a few times in different situations to find which works out best, for example for a competition day.



FURTHER INFORMATION

GENERAL NUTRITION INFORMATION

BDA Food fact sheets

<https://www.bda.uk.com/food-health/food-facts.html>

SPORTS NUTRITION INFORMATION

BDA food factsheets on sport

<https://www.bda.uk.com/resource/sport-exercise-nutrition.html>

AIS fact sheets <https://www.ais.gov.au/nutrition>

Sports Dietitians Australia factsheets

<https://www.sportsdietitians.com.au/factsheets/>

Team USA sport nutrition factsheets

<https://www.teamusa.org/nutrition>

IOC Nutrition for athletes booklet

<https://www.sportsoracle.com/Nutrition/Resources/>

FIND A QUALIFIED SPORTS NUTRITIONIST

SEnr <http://www.senr.org.uk/>

ANTI-DOPING

[UK Anti-Doping - 100% me](#)

Supports and educates athletes by providing anti-doping advice and guidance, encompassing five key values: hard work, determination, passion, respect and integrity.

[BASES expert statement - inadvertent doping in sport](#)

Outlines the most common ways that athletes and support personnel inadvertently commit anti-doping rule violations, including contaminated supplements and foods, and gives suggestions to minimise these risks.

[Informed-Sport](#)

A global quality assurance program for sports nutrition products. Every batch of a supplement product and/or raw material that bears the Informed-Sport logo has been tested for banned substances. Athletes are advised to use the search function and cross reference the tested batches listed on the product pages with the batches they are consuming.

[Global Drug Reference Online \(Global DRO\)](#)

Provides athletes and support personnel with information about the prohibited status of specific medications based on the current World Anti-Doping Agency Prohibited List. Global DRO does not contain information on, or that applies to, any dietary supplements, and can only be used for specific information on products sold in the UK, Canada, the US, Japan, Australia and Switzerland.

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