BCA

TRAIN SMART, ACHIEVE MORE

Nutrition Guide

Breakaway Coaching and Analytics

- Macronutrients
- Micronutrients
- Hydration
- Strategies

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Introduction

Nutrition is an important element to any training programme or sport. This guide provides an overview of the nutritional requirements per macronutrient (carbohydrates, proteins, and fats) and sport, with some nutritional strategies to help you maximise your recovery and performance.

With BCA plans you also get additional recourses within the link to the training guides. For nutrition the additional rescores is a spreadsheet that once fill out provides you with how much of what you should be eating.

Requirements

Every sport has different nutritional requirements due to their differing demands. As a result, see the below subheadings for the recommended requirements per macronutrient (carbohydrate [CHO], protein [PRO] and Fats) and sport. This also includes macronutrients consumption, pre, during and post competition.

Carbohydrates

Endurance performance is fuelled pronominally by carbohydrates and fats. The higher intensity a workout or competition the more carbohydrates are needed. Athletes require twice the amount of CHOs per day than the average person. Consumption ranges **between 6-12 g/kg of body weight/day.** However, the range changes depending on the intensity, duration, and frequency of training.

Table 1: Energy Requirements

Time	Frequency	CHO
30-60 mins/day	3-4 times per week	3-5 g/kg/day
2-3 hours/day	5-6 times per week	5-8 g/kg/day
3-6 hours/day	5-7 times per week	8-12 g/kg/day

Prior Exercise

Furthermore, CHO intake prior exercise is aimed at increasing muscle glycogen stores. Eating 200-300 grams, 2-4 hours before training is considered the ideal amount of energy. During this meal, a low GI (Glycaemic Index – how quickly the energy from food is released into the blood stream – a low GI food is slow releasing, while high GI food is releases quickly) food or complex CHO is best for energy stores.

However, eating 3- 4 hours prior to exercise is not always practical. As a result, 15- 30 grams 15-30 minutes preceding exercise in the form of a simple CHO (high GI or quick release) is also beneficial. Although, this strategy increases the probability of hypoglycaemia due to a rapid decline in blood glucose levels, 15-30 minutes after the beginning of exercise. On the other hand, for an event/training < 60 minutes, 1-4 grams/kg of body weight, 3-4 hours prior exercise, is appropriate.

Progressively, there is an upper limit to CHO stores in the context of improving performance. Anything above 12 g/kg of body weight/day results in no additional performance gains, however, may result in weight gain as the body stores 3 grams of water per gram of glycogen.

In addition, a reported issue in athletes training/racing 4 hours or longer in a single bout of physical activity is exercise-induced gastrointestinal syndrome (EIGS). This is more prevalent in women and younger athletes and, symptoms may include regurgitation, heartburn, nausea, vomiting, faecal urgency and diarrhoea. EIGS can be prevented/reduced by consuming little to no fibre prior exercise.

During Exercise

Alternatively, adequate CHO needs to be consumed during exercise to maintain energy balance. However, the amount varies depending on duration of exercise. Training/events ranging from 30 to 75 minutes do not require CHO when exercising. However, the mouth rising technique is applicable (see strategies section). Any exercise 45 minutes or less does not require any intake of energy.

Training between 60 and 120 minutes, 30 grams/hour of exercise or 0.7 g/kg of body weight/hour is the required amount to prevent glycogen depletion. This must be in the form of a simple carbohydrates (or high GI). When temperature is high, or weather is humid, energy expenditure increases as should CHO intake while exercising.

Exercise between 2-3 hours 60-90 grams is considered optimum. Consumption should be every 15 – 20 minutes (little and often) throughout the bout of exercise. Similarly, this must be in the form of a simple carbohydrates (or high GI). High amounts of fructose (the sugars that are in fruits) are not recommended as it can cause EIGS.

Any exercise lasting 2.5 hours or longer requires 90 grams or more throughout. Glycaemic Index changes however, first 2/3 of exercise consume low GI foods (complex CHO). While in the final third consume high GI foods.

< 75 minutes	1-2 hours	2-3 hours	2.5 hours >
• Mouth Rinsing • Small amounts	•30g or 0.7g/kg/hr • High GI	• 60-90g/hr • High GI	• 90g/h • High to Low GI

Post Exercise

Following a bout of exercise, the muscles remain highly absorptive, therefore aim to consume a high GI CHO within 20 minutes post exercise to enhance the recovery process. Intake ranges between 0.6-1.5g/kg BW, the longer the workout the higher the amount. Thereafter, every two hours post exercise (for the next 6 hours = 3 meals) intake ranges between 1.0-1.5 of a low GI CHO per meal (or 100 grams per meal).

< 20 minutes post training
- 0.6 – 1.5 g/kg

Every 2 hours
- 1.0 – 1.5 g/kg or 100g

Proteins

Athletes need double the amount of protein compared to a sedentary person; due to the strain the body is placed under when training. Similar to carbohydrates the quantity ranges depending on the volume and intensity of training.

However, age is also an important factor due to muscle mass declining after 35 years of age. A sedentary person requires 0.8 g/kilo of body weight, were as an athlete range **between 1.3-1.8 g/kg of body weight.** This does not include dietary supplementation of protein (e.g., protein shakes). Furthermore, strength/resistance training athletes require higher dosages of protein ranging between 1.8-2.0g/kg of body weight.

Table 2: Energy Requirements

Time	Description	PRO
Older Individuals	35 + years of age	1.0-1.2 g/kg/day
Moderate Training	3-5 times per week	1.0-1.5 g/kg/day
High Intensity	High Intensity Interval Training	1.5-2.0 g/kg/day
Resistance Training	Strength training athletes	1.8-2.0 g/kg/day

Proteins contain amino acids which fall into two categories, essential and nonessential. There are 10 essential amino acids, and they are not produced by the body naturally. Conversely, there are the 11 non-essential amino acids are produced by the body naturally. With the below equation you can calculate your protein intake:

Female requirements = 0.8 x Body weight (kg) = 00.0g of protein/day
Male requirements = 0.8 x Body Weight (kg) = 00.0g of protein/day

Proteins can also be ranked on the Glycaemic Index in the same way carbohydrates are. Below, the protein requirements have be considered on a prior, during and post exercise basis.

Prior Exercise

Less is known regarding protein intake prior exercise. However, it is recommended 0.15-.025 g/kg of body weight is taken 2-4 hours prior exercise with the suggested amount of CHO. An example meal to replicate the recommendations would be porridge with an array of nuts as protein.

During Exercise

Evidence with respects to protein intake during exercise is limited. On the other hand, some studies have suggested a ratio of 3-4:1 (CHO:PRO) when exercising can have benefit. These benefits include promoting increased muscle glycogen stores and reducing muscle damage (particularly when resistance training). Within exercise protein can increase muscle synthesis by up to 48%.

Post Exercise

The primary goal post exercise is replenishing depleted muscle glycogen stores and replacing fluid loss through electrolyte drinks. However, protein still plays a vital role in longer term recovery. Within the 20-minute window post exercise consumption of a low GI protein results in a longer lasting muscle synthesis. Meaning any further protein consumed will result in better adaptions. The recommended amount is 0.2-0.5 g/kg BW 20 minutes post exercise. Which is followed by 0.25 grams/kilo of body weight/per meal every 2 hours for the subsequent 6 hours.

< 20 minutes post training
- 0.3 – 0.5 g/kg

Every 2 hours
- 0.3 – 0.5 g/kg

More

Accordingly, Leucine (an essential amino acid) has shown to active protein synthesis (meaning switch on the process that begins repairing muscles). Foods's high in Leucine include soybeans and peanuts (and best immediately post training). Additionally, there is an upper limit when protein does not enhance recovery any further (40 grams per meal). It should also be noted that animal proteins are considered a carcinogenic by the WHO, therefore consumption in excess may increase risk of cardiovascular disease and negatively affect blood flow.

Lipids

Lipids (or fats) store large amounts of energy in the body. Within the white adipose tissue 108,000 kcal of energy are stored and per gram of energy fats contain 9 kcal. Lipids also store essential fat-soluble vitamins (A, D, E, K) while providing the hormone leptin – which delivers a balance by inhibiting hunger (Ghrelin – the hunger hormone – is realised form the stomach).

Current literature surrounding athletes required fat intake is limited and does not differ much from a sedentary person recommended amount. However, depending on fitness goals and sport generally fat intake should be between 20-35% of total energy intake. On the other hand, fat intake should not drop below 20% of total energy intake to maintain ingestion of fat-soluble vitamins.

Furthermore, high fats diets are typically not recommended for athletes as high fats diets result in less carbohydrate availability. Although, elite athletes training 40 hours/week can increase fat intake up to 50%. Nevertheless, this should come from unsaturated fats such as peanut butter or avocadoes.

Furthermore, some athletes may need to change their weight in preparation for competition. Recommended fat intake during this phase of training is 0.5-1.0 g/kg body weight/per day.

Table 3: Energy Requirements

Time	Description	FATS
Sedentary	-	30-35% per day
Athletes	-	25-35% per day
Ultra-Endurance	6 > hour events	35% + per day

Hydration

Between 40-70% of the body is made up of water. 60% of the body's water content is intracellular fluid and 65-75% of muscles are made up of water. When exercising water is lost from skin (sweat) and lungs (water vapor). In addition, a reduction in the bodies water content of 2% can result in decreased performance. Whereas a 5% drop in water content can negativity influence performance by 30%.

Prior Exercise

The aim of hydration before exercise is to prevent hypohydration (the process of fluids not being replaced). As hypohydration can impair short but high intensity (5 – 30 minutes) and long but low intensity workouts. Furthermore, for each percent loss in body weight results in a 2.9% decline in maximal oxygen consumption. To prevent this decline in performance, consume 5-10 ml/kg of body weight of water 4 hours before exercise. If urine is not produced (or high in concentration) prior exercise an added 3- 5 ml/kg of body weight should be consumed 2 hours before exercise.

During Exercise

Typically, relying on thirst to know when to drink is considered too late to replaced loss fluid and prevent performance decline. However, studies have shown relying on thirst can maximise performance. As a result, when time trialling or running, etc. listening to when your body need fluids is critical. Furthermore, a general guide for during exercise intake is 0.5-2 L/hour, with frequent intake between 5-20 minutes (or 150- 200 ml ever 5-20 minutes).

Post Exercise

A post recovery meal with foods high in sodium aids in replacing lost electrolytes from sweat. Examples include sunflower seeds and navy beans. Recommended fluid intake post exercise is 1.5 L of fluid per kg of body weight lost.

Table 4: Energy Requirements

Before	During	After
5-10mL/kg	0.5-2 L/hour	1.5 L per kg BW lost

Sport Drinks

The sport industry advertises multiple different sport drinks – between brand and type of drink. Sport drinks fall into three categories, hypotonic, isotonic, and hypertonic. All of which serve a different purpose and benefits.

Hypotonic

Hypotonic drinks are typically low in CHO (< 4 grams per 100ml) therefore, are not useful for replacing glycogen stores. However, they are very useful for replacing sweat loss and rapid re-hydration as hypotonic drinks have a very quick absorption rate through osmosis. Hypotonic drinks are recommended for hot environments or exercise lasting 60 > minutes.

Isotonic

The most common sports drink – isotonic – have the second highest amount of CHO (4-8 grams CHO per 100ml). Consequently, isotonic drinks are best for short but high intensity workouts, when the body is reliant on CHO for energy. However, isotonic drinks release slowly into the blood stream, as a result it is advised consumption before a short high intensity workout is optimal.

Hypertonic

Hypertonic sports drinks have the highest CHO content of 10 grams CHO per 100ml. These drinks are less common as they do not provide adequate hydration for long bouts of exercise or exercise in the heat. For best use, consume hypertonic drinks within the 20-minute window post exercise.

Water

Using the below equation calculate the amount of water required per day:

Litres = 0.5 / 10 x (body weight in kg) = **00.0 L** of water per day

Micronutrients

Athletes are more prone to illness due to weakened immune systems post training. In addition, athletes on average get six colds per year which is twice as much as a sedentary person. However, studies have shown athletes who get ill the least win the most. Both vitamins and minerals contribute to the prevention of illness.

Vitamins

There are two types of vitamins, fat soluble (A, D and K) and water soluble (C and B), both of which are important to increasing cellular function. Current guidelines suggest additional supplementation of vitamins is not necessary if diet is adequate (Vitamin C intake = 75 – 90mg per day). However, during a period of high-volume training or weight loss, supplementation may be necessary.

Furthermore, many athletic populations do not consume enough vitamin D and are deficient. A deficiency in vitamin D means only 10-15% of calcium consumed can be aborted. Current guidelines are 15 micrograms per day; however, vitamin D is a fat-soluble vitamin and should not be consumed in excess. Examples of foods high in Vitamin C and D include, mushrooms, spinach, broccoli etc.

Minerals

Minerals are divided into two groups: trace minerals (< 100 mg per day) and major minerals (100 mg > per day) which make up 4% of are body mass. Minerals are essential for bone structure, function of cardiac rhythm and muscle contraction. For athletes, the most important minerals are considered calcium (particularly in women) and magnesium. Calcium requirements range from 1000-1200 mg per day which will improve bone health and prevent the onset of osteoporosis.

Examples of foods high in calcium include sesame seeds. On the other hand, magnesium increases the function of muscle and liver glycogen formation, in turn increasing performance. An added benefit includes optimising neuromuscular function. Magnesium requirements range from 320-420 mg per day, Examples of foods high in magnesium include legumes and bananas.

Nutrition Strategies

Each sport has unique demands which require different strategies. The following section cover different approaches with the aim of enhancing performance

Fat Utilization

The average endurance athlete has a FatMax (the exercise intensity fat oxidisation peaks) at 63% of V02 max. However, fats are believed to be a crucial fuel source during the final leg of an IRONMAN therefore increasing an individual's FatMax would enhance performance. The

sleep-low was concept introduced in 2016 and increased fat metabolism and performance. The sleep-low method involves completing a High Intensity Interval Training (HIIT) workout in the evening 17:00 >. During and post the evening workout do not consume any carbohydrates, allowing the body to fast overnight. The following morning compete an endurance workout (60 minutes @ low zone 2) with no carbohydrate till post workout. For best application complete during the accumulation phase between 1-4 times a week.

Table 5: Sleep Low

15:00	19:00	22:00	09:00	12:00
Normal Diet	Low CHO	Sleep	Low CHO	Normal Diet
Pre-Workout	HIIT	CHO Fasting	Endurance	Post Workout

After 6 hours of submaximal exercise the contribution to energy production is mainly from fat, as CHO oxidation fall to 20%. Further reinstating the need for increased fat metabolism.

Carbohydrate Loading

The body can store 2012 Kcal of CHO in the body, 1600 Kcal is stored in the muscles (400g), 400 Kcal in the liver (100g) and 12 Kcal in blood plasma (3g). As a result, for competitions lasting longer than 90 minutes, carbohydrate loading is recommended to prevent glycogen depletion (events < 90 minutes CHO loading is not necessary). CHO loading can increase performance by 2-3% if the correct technique is applied.

The aim of CHO loading is to increase muscle glycogen stores, allowing the body to exercise for longer. A modified CHO loading strategy begins 4 days before competition and includes a 9% increase in CHO intake (or 10g/kg of BW).

Table 6: Carbohydrate Loading – Modified Regimen							
ET **Day 1** 60-65%	Taper **Day 2** 60-65%	Taper **Day 3** 60-65%	Taper **Day 4** 70%	Taper **Day 5** 70%	Taper **Day 6** 70%	Taper **Day 7** 70%	Comp.

ET = Endurance Training, the percentage refers to percent of CHO in diet.

However, the consumption of high GI foods day prior the competition has been shown to increase performance – CHO intake 10g/kg of BW. This process increased muscle glycogen content from 95 to 180 mmol.kg. The example in the above table demonstrates a normal diet can be consumed 1 to 4 days back from competition. Thereafter, CHO intake should increase up to 75% of overall diet.

However, CHO intake further than 600g per day may only result in minor performance advantages and may lead to weight gain. On the other, consumption of high GI CHO (70% of intake) the day prior the competition may have a small (but positive) effect on performance for events < 90 minutes.

Mouth Rising

As previously mentioned, CHO intake during exercise < 90 minutes may not be necessary. However, CHO can still increase performance without addition intake. A technique known as mouth rising can result in an increased performance of 2.7%. Oral receptors activate reward-related regions of the brain - anterior cingulate cortex - when exposed to glycogen.

Consequently, a recommended strategy is mouth rising for 5 seconds with a CHO beverage every 10-15 minutes for exercise less the 90 minutes (note this technique does not work if beverage is just water).

The advantages to this include increased power output and no addition weight is taken on board. However, this can be problematic as spiting every 15 minutes may not be practical. Contrastingly, if this technique is carried out, please brush teeth, and rise mouth out with water post exercise.

Weight Loss

Weight loss can be a complex process as there are many variables that affect/inhibit one's ability to reduce their body mass. However, with the manipulation of the macronutrient intake it is possible to maintain energy balance and loss weight.

Protein

Increased protein intake is often associate with weight loss. Indeed, there is good evident to back up this belief - even in athletes. As mentioned previously, the guidelines for endurance athletes regarding protein intake are 0.25 grams/kilo of body weight/per meal.

However, when losing weight, it seems increasing this to, 1.8 -2.7 g/kg of body weight/day. Or roughly 35% of overall energy intake aids the weight loss process while, fats remain at 25% meaning CHO intake drops to 3-4g/kg of BW/day or 40%).

In contrast, this would not be recommended when training volume is high. As the lack of CHO would hinder performance. However, on training days that are highly strength based or active recovery workouts this strategy would be recommended In addition, the sleep low technique also promotes fat loss while maintaining lean body weight (body weight without fat ~ the muscles).

Furthermore, a weight loss rate should not exceed 0.5 kg per week as this would compromise essential nutrients needed for training. At rate of 0.25 kg per week is considered sustainable for weight loss maintenance.