

CHAPTER 5

5.1 Diet and Performance

A. Diet

In nutrition, diet is the sum of food consumed by a person or other organism. The word diet often implies the use of specific intake of nutrition for health or weight-management reasons.

A particular diet may be chosen to seek weight loss or weight gain. Changing a subject's dietary intake, or "going on a diet", can change the energy balance and increase or decrease the amount of fat stored by the body. Some foods are specifically recommended, or even altered, for conformity to the requirements of a particular diet.

Planning the food pattern and making the action plan for nutritional way can make a healthy lifestyle. Many of them wrongly understand the word diet, it means reducing the calorie intake; actually, it's wrong. Diet means planned and controlled food consumption according the need of a person. It may be falls under in different categories.

- a. Maintaining the proper weight
- b. Increasing/ decreasing the calories intake
- c. Diet for health issues

In any occasion, the person should not disturb their BMR bcoz, it will cause severe health problems in later stages while planning for diet concentrate on few points are must for better result.

- Calorie need of a person
- Nature of lifestyle

- Food alternate
- Number of servings and time management
- Adequate varieties to avoid boredom
- Must avoid appetite after consuming it.

And another category is consuming food for sports performance. In this category the mode or nature of sports will decide the food chart preparation. Maximum depends on duration/distance covering event of sports and energy release by working muscles. Mainly it divides into following types: Blood glucose – short distance/ Short time, Glucose and Glycogen – Middle Distance/ Speed Endurance, Fat metabolism – Long Distance/ Pure Endurance, Kerbs Cycle- Strength based activity/ Strength or Strength Endurance effects of each nutrient is explained with its benefits detailed.

B. Balanced Diet

A balanced diet needs to contain foods from all the main food groups in the correct proportions to provide the body with optimum nutrition. Components of a healthy balanced diet:

1. Dairy - This includes cheese, milk and yogurt. Dairy foods are usually high in saturated fat so to reduce fat and calories it is best to choose low fat or fat free varieties. Dairy is essential in the diet to provide calcium for strong bones as well as protein and vitamin D.

2. Protein - This is the main protein containing food group and includes lean meat and poultry with visible fat and skin removed, as well as fish, beans, lentils, peas, nuts and seeds, eggs and soy

proteins such as tofu and tempeh. Meat and poultry are high in iron, whilst legumes are a rich source of fibre and eggs provide a multitude of vitamins and minerals. Fish should be included regularly, particularly oily fish high in omega three fatty acids such as salmon and sardines. Cooking methods should be low fat such as grilling, poaching, dry frying or steaming to minimize extra fat added during the cooking process.

3. Fruit - Fruit is virtually fat free, low in calories, high in fibre and very nutritious. Aim to include a variety of fruits to get a wide range of vitamins and minerals.

4. Vegetables - These generally contain the least calories and the most vitamins and minerals, hence they are an excellent option for filling up on. Make sure to include a wide variety in meals as different vegetables are rich in different vitamins.

5. Grains - This group is the major carbohydrate source in a balanced diet and includes bread, cereals, pasta and rice. Try to choose whole-grain varieties as these are higher in fibre and contain more B vitamins than white versions. Enriched cereals and breads, for example with iron, calcium or omega 3 can also be a good way to add some extra nutrition in diet.

6. Fats and Oils- Whilst some fat is necessary in our diets for the body to function correctly, it is important that these are the right types of fats. Saturated and trans fats should be minimized as these are unhealthy for the heart. Other good sources of unsaturated fats include nuts, avocado and fish.

How to achieve Balanced Diet

- At the core of a balanced diet are foods that are low in unnecessary fats and sugars and high in vitamins, minerals, and other nutrients. The following food groups are essential parts of a balanced diet.
- Food should also be made up of the correct number of calories to maintain a healthy weight and be low in processed foods.
- Calorie intake should also be balanced with physical activity and sedentary activities such as watching TV should be reduced.

C. Types of Diet

The word **diet** comes from Old French *diète* and Medieval Latin *dieta* meaning "a daily food allowance". The Latin word *diaeta* and Greek word *diaita* mean "a way of life, a regimen". A diet can be described as a set course of eating and drinking in which the kind and amount of food one should eat is been planned out.

i. The Zone Diet

The Zone Diet aims for a nutritional balance of 40% carbohydrates, 30% fats, and 30% protein each time we eat. The focus is also on controlling insulin levels, which result in more successful weight loss and **body weight** control.

The Zone Diet encourages the consumption of good quality carbohydrates - unrefined carbohydrates, and fats, such as olive oil, avocado, and nuts.

ii. Atkins Diet

The Atkins Diet, or Atkins Nutritional Approach, focuses on controlling the levels of insulin in our bodies through diet. In case of consuming large amounts of refined carbohydrates our insulin levels will rise rapidly, and then fall rapidly. Rising insulin levels will trigger our bodies to store as much of the energy we eat as possible - it will also make it less likely that our bodies use stored fat as a source of energy.

Most people on the Atkins Diet will consume a higher proportion of proteins than they normally do.

iii. Vegetarian Diet

There are various types of vegetarian: Lacto vegetarian, Fruitarian vegetarian, Lacto- vegetarian, Living food diet vegetarian and Semi-vegetarian.

The majority of vegetarians are lacto vegetarians, in other words they do not eat animal-based foods, except for eggs, dairy, and honey.

Studies over the last few years have shown that vegetarians have a lower body weight, suffer less from diseases, and generally have a longer life expectancy than people who eat meat.

iv. Vegan Diet

Veganism is more of a way of life and a philosophy than a diet. A vegan does not eat anything that is animal based, including eggs, dairy, and honey. Vegans do not generally adopt veganism just for health reasons, but also for environmental and

ethical/compassionate reasons.

Vegans believe that modern intensive farming methods are bad for our environment and unsustainable in the long term. If all our food were plant based our environment would benefit, animals would suffer less, more food would be produced, and people would generally enjoy better physical and **mental health**, vegans say.

v. Raw Food Diet

The Raw Food Diet involves consuming foods and drinks which are not processed, are completely plant-based, and ideally organic. Raw foodists generally say that at least three-quarters of food intake should consist of uncooked food. A significant number of raw foodists are also vegans - they do not eat or drink anything which is animal based.

There are four main types of raw foodists: raw vegetarians, raw vegans, raw omnivores (both animal and vegetable foods are eaten), and raw carnivores (contains animal flesh).

vi. Mediterranean Diet

The Mediterranean Diet is Southern European, and more specifically focuses on the nutritional habits of the people of Crete, Greece, and southern Italy.

The emphasis is on lots of plant foods, fresh fruits as dessert, beans, nuts, cereals, seeds, olive oil as the main source of dietary fats, cheese and yogurts are the main dairy foods, moderate amounts of fish and poultry, up to about four eggs per week, small amounts of red meat, and low/moderate amounts of wine

D. Nutrient Recommendations

- children 2 to 8 years: 1,000 to 1,400 calories
- active women 14 to 30 years: 2,400 calories
- sedentary women 14 to 30 years: 1,800 to 2,000 calories
- active men 14 to 30 years: 2,800 to 3,000 calories
- sedentary men 14 to 30 years: 2,000 to 2,600 calories
- active men and women over 30 years: 2,200 to 3,000 calories
- sedentary men and women over 30 years: 1,800 to 2,200 calories

5.2 Dietary Supplements

Manufacturers are responsible for ensuring their products are reasonably safe and not misleading, however, they are not required to prove a supplement works before marketing it, or even that it contains what it says it does. Some organizations test supplements to verify what is inside of them. An alternative to taking some of these supplements is to get the nutrients they provide in food.

Types

- Natural supplements are extracted from plants, animal tissues or inorganic material, such as seawater and rocks.
- Semi-synthetic supplements are extracted from natural sources and then chemically changed.
- Synthetic supplements are completely artificially produced.

a. Energy Production

A variety of vitamins are needed in metabolism. These vitamins help to break down food from bigger nutrients, such as carbohydrates and fatty acids, into smaller units that the body can use to turn food into fuel.

1. Thiamin

Thiamin is important to several metabolic pathways, such as the breakdown of carbohydrates and branched-chain amino acids.

- Good sources: Whole or fortified grain products, pork, peanuts and black beans

2. Niacin

Having too little or too much niacin can result in unpleasant and even dangerous side effects such as diarrhea, dementia, rashes and liver damage. Choose food sources before supplements.

- Good sources: Poultry, peanuts, fish, brown rice and whole grains

3. Vitamin B6

Involved in nearly 100 metabolic pathways, vitamin B6 is essential to the breakdown of foods, particularly carbohydrates.

- Good sources: Poultry, pistachios, chickpeas, lentils, pork, bananas and tuna

b. Performance Enhancement

The following vitamins and minerals often are taken for performance enhancement or to make up for missed nutrients of a restricted diet. Try focusing on food sources first, as high doses of

some supplements may result in side effects such as constipation, bone damage and kidney stones.

1. Vitamin B12

B12 is found only in animal products, putting vegan and vegetarian athletes at risk for a deficiency. Fortified foods including breakfast cereals, nutritional yeast and plant-based meat alternatives provide vitamin B12. Be sure to read the food label as not all these foods are fortified. Taking a B12 supplement may also be needed but check with a health care provider first.

- Food sources: Seafood, meats, milk and cheese, eggs and fortified breakfast cereals

2. Iron

Iron is essential for oxygen transportation, traveling in blood throughout the body. Not having enough iron in the body may cause fatigue and impact physical performance. Exercise may cause some iron losses or decreased absorption.

- Food Sources: Clams, turkey breast, fortified breakfast cereals, beef, beans, spinach and oats

3. Vitamin A

Well-known for its role in vision, vitamin A also may act as an antioxidant, particularly during endurance training. Excess amounts from supplements can have toxic effects, though, so check with a health care provider before taking.

- Food Sources: Sweet potato, carrot, pumpkin, collard greens, spinach and cheese

c. Bone Health

Running, jumping and acrobatics – intense physical activity puts stress on bones and joints. Some vitamins and minerals promote bone health.

1. Vitamin D

Vitamin D can be absorbed from exposure to sunlight, however, an individual's weight, geographic location and skin color all can affect how well vitamin D is absorbed from ultraviolet light.

- Food sources: Fortified milk and soymilk, cod-liver oil, seafood and eggs

2. Calcium

In addition to bone health, calcium is important for nerve function and the release of hormones.

- Food sources: Milk, cheese, fortified orange juice and soymilk, and collard greens

d. Builds Muscle

1. The Best Protein Sources

Bodybuilding supplements are dietary supplements commonly used by those involved in bodybuilding, weightlifting, mixed martial arts, and athletics for the purpose of facilitating an increase in lean body mass. The intent is to increase muscle, increase body weight, improve athletic performance, and for some sports, to simultaneously decrease percent body fat so as to create better muscle definition. Among the most widely used are high protein drinks, branched-chain amino acids (BCAA), glutamine, arginine, essential fatty acids, creatine, HMB and weight loss products.

Supplements are sold either as single ingredient preparations or in the form of "stacks" – proprietary blends of various supplements marketed as offering synergistic advantages. While many bodybuilding supplements are also consumed by the general public the frequency of use will differ when used specifically by bodybuilders

Food	Serving Size	Grams of Protein
Chicken breast, cooked	4 ounces	33
Fish, salmon, cooked	4 ounces	29
Ground beef, cooked	4 ounces	26
Greek yogurt	1 cup	18 to 22
Yogurt	1 cup	12 to 14
Tofu, firm	½ cup	11
Milk	1 cup	8
Beans	½ cup	7 to 9
Nut butters	2 tablespoons	7 to 8
Cheese	1 ounce	7
Nuts	1 ounce	6
Egg	1 large	6
Quinoa, cooked	½ cup	4

2. Creatine

Found in food sources such as meat and fish, creatine also is produced naturally in our muscles for energy production. Creatine

supplements claim to improve strength and exercise performance. However, more research is needed as results vary greatly depending on the study and athletic event.

5.3 Nutrients and its performance

Sportsman/ Sportswoman are very special. Some play for their passion and some play for the country. Being a sports person is not an easy task. Apart from being physically active they also have to look very deep into the amount and quality of calories they eat. It is true that they need more energy, calories, proteins, fats, carbohydrates than the regular person but right amount and quality of calories, protein, carbohydrates and fats are very important.

The guidance and the timely facts about the required nutrients will even make a sportsperson fall in line with his or her routine. An appropriate nutritional diet for a sports person consists of a minimum of 2000 calories per day, in which the division from different nutrients are as follows:

- **Carbohydrates** – 55% – 65%
- **Proteins** - 15% – 20% &
- 20–30% from **Fats**

Athletes who exercise strenuously for more than 60 to 90 minutes every day may need to increase the amount of energy they get from carbohydrates to between 65 and 70 per cent.

More recent advice also provides guidelines for carbohydrate and protein based on grams per kilogram (g/kg) of body weight. The current recommendations for fat intake are for most athletes to follow similar recommendations to those given for the general community, with the preference for fats coming from olive oils,

nuts, avocado, nuts and seeds. Athletes should also aim to minimise intake of high-fat foods such as biscuits, cakes, pastries, chips and fried foods.

Diet of sports person is crucial because their energy requirement varies. It intensifies when they are playing sports. So body store of nutrition should be such that help them to meet up those requirements during their optimum activity.

On an average a healthy young sports man in the age group of 19-30 yrs requires 3000 Kcals whereas beyond 30 years it varies from 2800-3000 Kcals. Still the requirement remains high as compared to regular person.

While talk about a mixture of carbohydrates, Proteins and fats, we cannot forget the importance of multi vitamins in the diet. They are also as important as other food groups.

Sports nutrition requires emphasis in three areas:

- Pre Event Meal
- Eating during Exercise
- Post Event Nutrition

1. Pre Event Meal

The pre-competition meal provides a final opportunity to top up the muscle and liver fuel stores. A high-carbohydrate, low fat meal is the best choice. The pre-event meal is an important part of the athlete's pre-exercise preparation. A high-carbohydrate meal three to four hours before exercise is thought to have a positive effect on performance. A small snack one to two hours before exercise may also benefit performance.

Some people may experience a negative response to eating

close to exercise. A meal high in fat or protein is likely to increase the risk of digestive discomfort. It is recommended that meals just before exercise should be high in carbohydrates and known not to cause gastrointestinal upset.

Examples of appropriate pre-exercise meals and snacks include cereal and low-fat milk, toast/muffins/crumpets, fruit salad and yoghurt, pasta with tomato-based sauce, a low-fat breakfast or muesli bar, or low-fat creamed rice.

2. Eating during exercise

During exercise lasting more than 60 minutes, an intake of carbohydrate is required to top up blood glucose levels and delay fatigue. Eating or drinking carbohydrate becomes to maintain the blood glucose levels and improve performance.

Carbohydrate can be used as a fuel is 60 grams of carbohydrate per hour of exercise (approximately 0.7 gm carbohydrate/kg body weight/hour). This is the reason why sports drinks that contain 6 grams of carbohydrate per 100 ml. It is important to start intake early in exercise and to consume regular amounts throughout the exercise period. It is also important to consume regular fluid during prolonged exercise to avoid dehydration. Sports drinks, diluted fruit juice and water are suitable choices. For people exercising for more than four hours, up to 90 grams of carbohydrate per hour is recommended. For athletes who have not carbohydrate loaded, consumed a pre-exercise meal or are dieting to lose fat weight, taking in carbohydrates during exercise is even more important.

3. Post Event Nutrition

Rapid replacement of glycogen is important following exercise. Carbohydrate foods and fluids should be consumed after exercise, particularly in the first one to two hours after exercise. To

top up glycogen stores after exercise, eat carbohydrates with a moderate to high GI in the first half hour or so after exercise. This must be continued until the normal meal pattern resumes. Suitable choices to start refuelling include sports drinks, juices, cereal and low-fat milk, low-fat flavoured milk, sandwiches, pasta, muffin/crumpets, fruit and yoghurt.

Carbohydrates and exercise

During digestion, all carbohydrates are broken down into sugar (glucose), which is the body's primary energy source. Glucose can be converted into glycogen and stored in the liver and muscle tissue. It can then be used as a key energy source during exercise to fuel exercising muscle tissue and other body systems. Athletes can increase their stores of glycogen by regularly eating high-carbohydrate foods.

If carbohydrate in the diet is restricted, a person's ability to exercise is compromised because there is not enough glycogen kept in storage to fuel the body. This can result in a loss of protein (muscle) tissue, because the body will start to break down muscle tissue to meet its energy needs and may increase the risk of infections and illness.

Carbohydrates are essential for fuel and recovery

Current recommendations for carbohydrate requirements vary depending on the duration, frequency and intensity of exercise. Foods rich in unrefined carbohydrates, like wholegrain breads and cereals, should form the basis of the athlete's diet. More refined carbohydrate foods (such as white bread, jams and lollies) are useful

to boost the total intake of carbohydrate, particularly for very active people.

Athletes are advised to adjust the amount of carbohydrate they consume for fuelling and recovery to suit their exercise level. For example:

- Light intensity exercise (30 mins/day): 3–5 g/kg/day
- Moderate intensity exercise (60 mins/day): 5–7 g/kg/day
- Endurance exercise (1–3 hrs/day): 6–10 g/kg/day
- Extreme endurance exercise (more than 4 hrs/day): 8–12 g/kg/day

Importance of Carbohydrates: Carbs are the first nutrient to give energy to the body. Brain cells, cornea of eye and nervous tissues are majorly dependant on carbs as a source of energy. So for any sports person it is very important to undergo carb counting of the day as per the intensity and duration of his exercise. If exercise is for a short duration then the glycogen (form of carbs) stored in the body will be used up but if the exercise continues for a long time than constant supply of carbs to the body is important.

Choice of carbohydrates: Whole grains and fruits are better choice over refined carbs which will raise the glucose rapidly which causes overeating. Good amount of fiber should also be included in the diet.

Protein and sporting performance

Protein is an important part of a training diet and plays a key role in post-exercise recovery and repair. Protein needs are generally met by following a high-carbohydrate diet, because many foods,

especially cereal-based foods, are a combination of carbohydrate and protein.

The **amount of protein recommended for sporting people** is only slightly higher than that recommended for the general public. For example:

- General public and active people – the daily recommended amount of protein is 0.8–1.0 g/kg of body weight (a 60 kg person should eat around 45–60 g of protein daily).
- Sports people involved in non-endurance events – people who exercise daily for 45–60 minutes should consume between 1.0–1.2 g/kg of body weight per day.
- Sports people involved in endurance events and strength events – people who exercise for longer periods (more than one hour) or who are involved in strength exercise, such as weight lifting, should consume between 1.2–1.7 g/kg of protein of body weight per day.

Dietary surveys have found that most athletic groups comfortably reach and often exceed their protein requirements by consuming a high-energy diet. Protein supplements are therefore unlikely to improve sport performance.

While more research is required, other concerns associated with very high-protein diets include:

- Increased cost
- A potential negative impact on kidney function
- Increased weight if protein choices are also high in fat
- A lack of other nutritious foods in the diet, such as bread, cereal, fruit and vegetables.

Importance of Proteins: As we know proteins are building blocks of the body so they become important for sportsman but apart from its function of body building it helps in building up immunity and increase the body stamina to sustain that high intensity of activity for a longer period of time. So to build up optimum stamina required by the sport it's essential to supply body with adequate protein on regular basis. 30-35% of total calories should come from protein.

Choice of Proteins: Choose lean meat proteins like chicken, lean fish, egg whites. These are first class proteins. For vegetarians proteins would include skimmed milk, yoghurts, beans etc but the quality of protein is low. So for a vegetarian it is recommended to include a protein supplement in the diet.

Fats: Fats are also required by the body for proper lubrication of bones. Fats help in absorption and transportation of fat soluble vitamins. Vitamin D required for bone strengthening requires fat for its absorption. Recommended amount is 25-30% of total calories.

Choices of Fats: Choose saturated fats over trans fats. Trans fats are harmful to the body. They increase the oxidative stress in the body and thereby cause cell destruction and reduce the immunity of the athlete. So avoid fried foods and junk foods. Include nuts olive oils, fatty fish, low fat milk, and low fat dairy products to meet up the requirements.

Water and Fluids: Hydrating body for an athlete is equally important with other nutrients. It increases the functionality of the sportsman. As proteins tend to induce constipation, adequate

supply of water and fluids become necessary.

Fiber: With everything else is the diet fiber also plays an equally important part. It helps to keep the bowel movement regular. But before exercise fiber can be avoided.

Sodium: Major source of sodium in the diet is salt. So, observed amount of salt intake is recommended.

5.4 Water Mechanism

Heat Disorders

Thermoregulation

Body heat may be transferred by 4 mechanisms: (1) conduction, which refers to heat that flows from a cooler to a warmer object by direct contact; (2) convection, which involves heat transfer via air circulation at the body surface; (3) radiation, which arises through the transmission of electromagnetic waves; and (4) evaporation, which occurs via sweat at the skin surface.

Physiological changes include increases in plasma volume, sweat rates, cutaneous vasodilatation and decreases in urinary sodium excretion, sweating threshold, sweat electrolyte content, and heart rate at a given workload.

Factors of Heat

Environment

- Temperature

- Humidity and direct sunlight
- Presence or absence of wind
- Onset of a heat wave

The Individual

- Individual differences in strength and physical constitution
- General Health condition
- The person's physical health and level of fatigue
- The degree to which the person is acclimated to the heat
- Clothing etc.

Exercise

- Intensity, nature, and duration of exercise
- Rehydration
- Rest break regimen

Heat Disorder

- Heat stroke - Defined by a body temperature of greater than 40 °C (104 °F) due to environmental heat exposure with lack of thermoregulation. Symptoms include dry skin, rapid, strong pulse and dizziness.(High body temperature, Disturbance of consciousness, Slow reaction to calls and stimuli, Unusual speech and behaviour and Wobbly)
- Heat exhaustion - Can be a precursor of heatstroke; the symptoms include heavy sweating, rapid breathing and a

fast, weak pulse.(General feeling of malaise, Nausea/ vomiting, Headache and Decreased ability to concentrate or make decisions)

- Heat syncope - Fainting or dizziness as a result of overheating.(Dizziness, Fainting, Facial pallor, Quickening and weakening of the pulse)
- Heat cramps - Muscle pains that happen during heavy exercise in hot weather.(Muscle pain, Cramps and Muscle convulsions)
- Heat rash - Skin irritation from excessive sweating.

Symptoms

1. Symptoms of heat exhaustion include:
2. Heavy sweating
3. Extreme weakness or fatigue
4. Dizziness, confusion
5. Nausea
6. Clammy, moist skin
7. Pale or flushed complexion
8. Muscle cramps
9. Slightly elevated body temperature
10. Fast and shallow breathing

Water inhuman Body

The human body can last weeks without food, but only days

without water. The body is made up of 50 to 75 per cent water. Water forms the basis of blood, digestive juices, urine and perspiration, and is contained in lean muscle, fat and bones. As the body can't store water, we need fresh supplies every day to make up for losses from the lungs, skin, urine and faeces (poo). The amount we need depends on our body size, metabolism, the weather, the food we eat and our activity levels.

Water in our bodies

Some facts about our internal water supply include:

- Body water content is higher in men than in women and falls in both with age.
- Most mature adults lose about 2.5 to 3 litres of water per day. Water loss may increase in hot weather and with prolonged exercise.
- Elderly people lose about two litres per day.
- An air traveller can lose approximately 1.5 litres of water during a three-hour flight.
- Water loss needs to be replaced.

Importance of water

Water is needed for most body functions, including to:

- maintain the health and integrity of every cell in the body
- keep the bloodstream liquid enough to flow through blood vessels
- help eliminate the by products of the body's metabolism,

excess electrolytes (for example, sodium and potassium), and urea, which is a waste product formed through the processing of dietary protein

- regulate body temperature through sweating
- moisten mucous membranes such as those of the lungs and mouth
- lubricate and cushion joints
- reduce the risk of cystitis by keeping the bladder clear of bacteria
- aid digestion and prevent constipation
- moisturise the skin to maintain its texture and appearance
- carry nutrients and oxygen to cells
- serve as a shock absorber inside the eyes, spinal cord and in the amniotic sac surrounding the fetus in pregnancy.

Water content in food

Most foods, even those that look hard and dry, contain water. The body can get approximately 20 per cent of its total water requirements from solid foods alone. The digestion process also produces water as a byproduct and can provide around 10 per cent of the body's water requirements. The rest must come from liquids.

Recommended daily fluid intake

Approximate adequate daily intakes of fluids (including plain water, milk and other drinks) in litres per day include:

- infants 0–6 months – 0.7 l (from breast milk or formula)

- infants 7–12 months – 0.9 l (from breast milk, formula and other foods and drinks)
- children 1–3 years – 1.0 l (about 4 cups)
- children 4–8 years – 1.2 l (about 5 cups)
- girls 9–13 years – 1.4 l (about 5-6 cups)
- boys 9–13 years – 1.6 l (about 6 cups)
- girls 14–18 years – 1.6 l (about 6 cups)
- boys 14–18 years – 1.9 l (about 7-8 cups)
- women – 2.1 l (about 8 cups)
- men – 2.6 l (about 10 cups).

These adequate intakes include all fluids, but it is preferable that the majority of intake is from plain water (except for infants where fluid intake is met by breast milk or infant formula). Sedentary people, people in cold environments, or people who eat a lot of high-water content foods (such as fruits and vegetables) may need less water.

Some people need higher fluid intake

People need to increase their fluid intake when they are:

- on a high-protein diet
- on a high-fibre diet, as fluids help prevent constipation
- pregnant or breastfeeding (the fluid need is 750-1,000 ml a day above basic needs)
- vomiting or have diarrhoea
- physically active
- exposed to warm or hot conditions.

Sports drinks

For optimal performance, athletes should be hydrated and adequately fuelled during exercise. Although there are a wide range of beverages marketed with reference to sport or performance; sports drinks are specifically designed to provide the right balance of carbohydrate, electrolytes and fluid to adequately fuel exercise and provide fluid for hydration. When used appropriately they can result in performance benefits.

Sports drinks are beverages whose stated purpose is to help athletes replace water, electrolytes, and energy before and after training or competition, though their efficiency for that purpose has been questioned, particularly after exercise.

Sports drinks can be split into three major types:

- Isotonic sport drinks contain similar concentrations of salt and sugar as in the human body.
- Hypertonic sport drinks contain a higher concentration of salt and sugar than the human body.
- Hypotonic sport drinks contain a lower concentration of salt and sugar than the human body.

Most sports drinks are approximately isotonic, having between 4 and 5 heaped teaspoons of sugar per eight ounce (13 and 19 grams per 250ml) serving.

Electrolytes

Besides water, electrolytes are the major component of sweat. Sodium and chloride comprise the largest proportion of electrolytes in sweat, along with smaller amounts of potassium, magnesium, calcium, iron, copper and zinc. Sodium stimulates thirst and

enhances the absorption of carbohydrate and water by the small intestine. Sports drinks typically contain 20-60mg sodium/100mL and may or may not contain small amounts of other electrolytes. Although higher levels of sodium would result in better fluid retention, the palatability of the drink would be compromised. During ultra-endurance events such as adventure racing and Ironman triathlons, inadequate repletion of sodium can lead to a dangerous condition known as hyponatremia, however for most athletes engaged in prolonged exercise, the danger of this condition is relatively low if they remain well fuelled and hydrated.

Practical applications

1. Before exercise

Sports drinks may be useful before an event to fine tune fluid and fuel (carbohydrate) intake. The carbohydrate in sports drinks can increase carbohydrate availability, while the added sodium may reduce urine losses before exercise begins.

2. During exercise

Sports drinks are primarily designed for use during exercise lasting more than 90 minutes by providing optimal fluid and fuel delivery. Sports drinks may allow athletes to perform for longer and more effectively in training and competition by providing energy to working muscles and the brain.

3. Recovery

Sports drinks can help meet nutrition recovery goals by replacing fluids and electrolytes lost in sweat and helping to replenish glycogen stores. If there is limited time between training sessions or competition, drinks with higher sodium content may promote more effective rehydration. To meet all recovery goals, the

ingestion of sports drinks should be complimented with foods and fluids that provide adequate carbohydrate, protein, and other nutrients essential for recovery.

Natural Home-made Recipe

Coconut water is often referred to as “Nature’s Gatorade.” It contains 13 times more potassium – an electrolyte needed for proper cell function – than Gatorade, plus twice the amount of another electrolyte (sodium). (source) (This brand doesn’t have any additives/preservatives)

Raw honey is rich in minerals and easily digestible sugars, which can be used for energy. Sugar “signals the body to down-regulate the production of stress hormones like cortisol. Cortisol levels spike during exercise and particularly during anaerobic (when get breathless) exercise.” (source)

Sea salt is full of electrolytes and minerals. Plus it “plays an important role of balancing the stress hormones during exercise. Salt reduces adrenaline levels and supports overall metabolic health.” (source)

Trace mineral drops add to the electrolyte content of the drink. Due to soil depletion many of us do not get enough trace minerals in our diet, so I supplement with this regularly.

Freshly pressed juices such as lemon, lime, and orange contain vitamins, enzymes and easily digestible sugars that help maintain energy during a workout, then help speed recovery afterwards.

5.5 Ergogenic Aids

In the context of sport, an ergogenic aid can be broadly defined as a technique or substance used for the purpose of enhancing performance. A performance enhancer, or ergogenic aid, is anything that gives a mental or physical edge while exercising or competing. This can range from caffeine and sports drinks to illegal substances.

As competition in athletics grows and becomes more beneficial, so does the temptation to use chemical performance enhancers. The use of drugs and supplements to enhance performance is almost universal across athletic competition. The use of ergogenic aids stretches from the professional athlete to adolescent competitors without regard to gender. This large prevalence suggests education and monitoring is required at all levels.

I. Types of Ergogenic Aids

It includes Chemical or Pharmacological, Physiological, Nutritional, Psychological and Mechanical product introduced into the body for the specific purpose of enhancing athletic performance

1. Pharmacological Aids

Pharmacological ergogenic aids can be described as drugs, both legal and illegal, that are used to enhance physical performance. Pharmacological aids are commonly used by athletes of various sports competitions in order to gain a more competitive edge. They should be used with caution as pharmacological aids can have harmful side-effects and can potentially be dangerous or life threatening when abused. Before taking a pharmacological aid, it is

important to conduct research to find out the effectiveness of the drug, any possible side effects, and if the drug is legal.

Common examples of pharmacological ergogenic aids include:

- Amphetamines – Improves concentration, decreases fatigue and appetite
- Anabolic steroids – Increases training time and intensity of workouts, as well as reduces recovery time.
- Beta-hydroxy methyl butyrate (HMB) – Improves strength and muscle mass
- Creatine – Increases muscle energy, short term endurance, strength, and lean muscle mass
- Caffeine – Stimulates the central nervous system, increases focus and alertness.
- Carnitine – Claimed to increase fat metabolism
- Chromium picolinate – Falsely promoted to build muscle, enhance energy, and burn fat
- Dehydroepiandrosterone (DHEA) – Increases endogenous steroid production
- Human growth hormone (HGH) – Hormone naturally produced in the pituitary gland that regulates growth and development.

2. Physiological Aids

Natural substances like herbal tea and things like acupuncture are physiological ergogenic aids and can be used to aid performance. Most of these aids are safe and effective.

a. Legal

1. Oxygen - is essential for the production of energy by aerobic processes. The greater the body's capacity to supply oxygen to the muscles during exercise, the greater the ability to maintain aerobic activity without fatigue. If a person can improve their capacity to utilize oxygen they are likely to improve their performance in endurance events.

2. Sports Massage - Massage is the most effective therapy for releasing muscle tension and restoring balance to the musculoskeletal system. Received regularly this may help athletes prevent injuries, which might otherwise be caused by overuse.

a. Illegal

1. Blood Doping - involves putting extra blood into the body which increases the level of hemoglobin thereby providing an increased oxygen carrying capacity for delivery to the working muscles.

2. EPO - EPO (erythropoietin) stimulates red blood cell production. It causes an increase in the total number of circulating red blood cells.

3. Nutritional Ergogenic Aids

Products that may enhance energy production to improve strength, speed, power, or endurance (such as: carbohydrates, fat, protein, fluid, vitamins, minerals, and/or herbs). Products that may enhance performance by changing body composition (such as protein, energy, chromium). Products that may enhance recovery (such as fluids, carbohydrates, vitamins, minerals, and/or herbal products).

Aid	Possible Effect	Possible Side Effect	Legality
Caffeine	Increases use of fat as fuel Stimulates the central nervous system (CNS)	Dehydration Elevated heart rate and blood pressure	Legal up to 15 micrograms/ml (the equivalent of drinking 10 cups of coffee in 1 hour)
Anabolic steroids	Increases protein synthesis and muscle mass Accelerates recovery from heavy exercise	Possible disorders of the heart, liver, and kidney Reduction in size and function of testes Increased risk of heart disease	Controlled substance Prescribed for individuals with low testosterone, HIV, and sexual dysfunction Detected levels above normal are illegal in sports that test for it
Carbohydrates	Increase exercise performance Accelerate recovery from heavy exercise Essential for fat burning and most high-	Can add non-nutritious calories to the diet and promote fat storage, if the carbs eaten are simple sugars	Legal Strive to get 40–60% of calories from complex carbs that have fiber and nutrients.

	intensity activities		
Erythropoietin	Stimulates the production of red blood cells Increases oxygen transport capacity of the blood, thereby improving performance in aerobic activities	Thickens the blood, increasing blood clot risk May damage kidneys and blood vessels Is a danger to pregnant women and fetuses	Is prescribed by doctors for patients with anemia (low red blood cell count) Can be naturally increased through exposure to altitude, but supplementation is Illegal in sports
Creatine	May increase muscle stores of creatine phosphate, a high-energy source of ATP in the muscle May result in improved performance for short duration, high-intensity activities	According to most studies, safe in doses of 5–20g/day May be dangerous to those with kidney disease Other side effects possible, so caution is advised	Legal

4. Psychological Aids

Techniques that support the athlete's mental state are psychological ergogenic aids and can aid performance. Most of these aids are safe and effective. Psychological aid techniques are easy to learn and can be done anywhere.

- a. Hypnosis - a very effective tool to distract the mind from negative thought before an event. It is a good idea to consult a professional for help.
- b. Cheering - having affirmation from friends and family can improve the mental state of the athlete resulting in an improved performance.
- c. Imagery - Involves positive visualization including seeing the winning an event, mastering a challenge, relieve feeling of stress, seeing perform a specific skill and planning game strategy.
- d. Music - soothing music can calm pre-game jitters while energetic music can pump up before an event.
- e. Psychology - techniques which athletes can use in the competitive situation to maintain control and optimize their performance. These include relaxation and imagery. Once learned, these techniques allow the athlete to relax and to focus his/her attention in a positive manner on the task of preparing for and participating in competition.
- f. Relaxation - involves breathing techniques and muscle manipulation to help ease stress.
- g. Yoga - can help relax tense muscles and calm the mind with breathing exercises

5. Mechanical Ergogenic Aids

Mechanical forms of ergogenic aids include specially-designed clothing, enhanced forms of sports equipment, and/or physical devices in contact with a person's body.

Here are a few examples of some mechanical aids:

- Altitude Training
- Heart Rate Monitors
- Computers - Used to analyze VO2 max, technique, test results etc.
- Video recorders - Used to analyze technique
- Weights
- Parachutes
- Downhill running
- Elastic cord (pulling and resisting)
- Uphill running
- Treadmills
- Weighted vests
- Sports clothing, footwear and equipment
- Timing equipment
- Nasal Strip

Aid	Possible Effect	Possible Effect
Wicking clothing	Transfers moisture from the skin through clothing to be evaporated Aids in cooling the skin for	Legal and sold at most sporting goods stores

	temperature regulation during exercise	
Compression garments	May prevent post-exercise tissue swelling (edema) and aid in recovery from exercise Limited information on performance enhancement potential	Legal
Clap skates (a type of speed skate designed to keep more surface area of the skate on the ice)	Provides added acceleration and speed during the push-off phase	Legal and widely used in speed skating
Aerodynamic cycle and helmet	Reduces drag and allows for greater race speed	Legal
Drag-resistant swimsuits (specially designed compression suits)	Increases buoyancy and reduces drag, greatly improving speed in the water	Regulated by the International Swimming Federation for international competition
Specially designed running shoes (many varieties are available, depending on the activity)	Improves running speed due to improved traction and better foot support Reduces injury	Legal

World Anti-Doping Agency (WADA)

Multinational organization created to develop standards, definitions, testing, and regulations with regards to doping control on a worldwide basis for athletic competition.

The WADA stance on the presence of a prohibited substance or its metabolite(s) or marker(s) in an athlete's bodily specimen(s) or sample is clear: it is each athlete's personal duty to ensure that no prohibited substance enters his or her body. WADA also informs athletes about drug testing programs and provides a prohibited drug list, information about drug use, drug actions, adverse drug actions, side effects, and ethics. Different compounds may represent banned substances in different competitive sports and, thus, prohibitive lists are sport specific.