

Why is Fluid so Important for Athletes?

During exercise your muscles use up energy from food, however, this process is not very efficient and much of the energy is converted into heat.

This is why exercise makes you warmer, your body can only operate efficiently at a narrow temperature range and so it takes steps to cool you down by sweating. The sweat then evaporates and cools the body. You cannot stop your body losing fluid by sweating but you can prevent it from becoming dehydrated.

The amount of fluid lost as sweat varies between individuals and is dependent on the following factors.

- **Exercise intensity** - the harder you train, the more fluid you will require.
- **Exercise duration** - the longer your training session or competition, the more fluid you will require.
- **Temperature** - you require more fluid in hotter weather.
- **Humidity** - you need more fluid in humid conditions
- **Hydration status** - adequate hydration before exercise will reduce the risks of dehydration.
- **Training status** - endurance training helps the body to maintain fluid balance
- **Acclimatisation** - will help your body cope with extremes of temperature i.e. high or low temperatures, however you will still continue to sweat when acclimatised.
- **Type of clothing** - e.g. multiple layers of clothing prevent evaporation of sweat and result in increased body temperature.
- **Altitude** - due to reduced air pressure, more fluid is needed
- **Individual person** - two people can do the same exercise together at the same time and one may sweat at a greater rate than the other, larger people generally need more fluid than smaller people

Everyone should be aware of their personal needs and use these targets to calculate their strategies.

To replace fluid losses it is important to drink before and during your activity, then continue drinking afterwards.

Symptoms of Dehydration

Thirst is a poor indicator of hydration. By the time you are thirsty you are already dehydrated

Even mild dehydration can result in reduced sporting performance.

Fluid is lost as:

- Sweat (to regulate body temperature)
- Water vapour (in breath)
- Urine (to excrete waste substances)

Symptoms to look out for are:

- Fatigue
- Dry mouth / thirst
- Headache / irritability
- Flushed skin
- Dark scant urine
- Weakness
- Dizziness
- Cramp
- Profuse sweating

And later

- Impaired mental performance
- Stumbling / dizziness
- Shrivelled skin
- Sunken eyes
- Muscular spasm
- Nausea

Severe dehydration may lead to heat stroke and sweating will stop, by this stage you will need medical treatment.

Sporting performance is affected both physically and mentally with reduced muscular strength, increased perception of effort, fatigue, slowing of self-selected pace. Reduced concentration, reduced skill / accuracy, reduction in decision-making ability.

Check you are producing plenty of pale urine, dark urine is an indication of dehydration.

What Should I Drink?

Drinking during exercise aims to provide:

- Water and electrolytes to replace sweat losses
- Carbohydrate to supplement energy stores

The choice of drink will depend on whether you need a drink to replace fluid losses or to provide more energy / carbohydrate or both

There are three types of drinks

- **Hypotonic**
- **Isotonic**
- **Hypertonic**

Hypotonic

Hypotonic drinks are absorbed into the body more quickly than plain water. They usually contain low levels of carbohydrate, less than 3g carbohydrate/100ml and may have a little salt added. They quench thirst and provide fluid, but do not provide significant amounts of energy.

When to Use: They are a good type of drink to choose when you want to replace fluid quickly without a lot of carbohydrate e.g. when training lasts for less than one hour and is of low intensity. They can also be useful if you need a high fluid intake when in a hot climate and do not want to consume too many calories

Isotonic

Isotonic drinks are absorbed as fast as or faster than plain water. In addition to replacing fluids they also provide carbohydrate, 5 - 8g carbohydrate/100ml.

They are designed to provide some carbohydrate to fuel the muscles, and have a little salt added to enhance the absorption and retention of fluid in your body. Most commercial sports drinks fall into this category.

When to use: Isotonic drinks are good for replacing fluids and providing carbohydrate if you are training for more than one hour. They can be drunk before, during and after exercise.

Hypertonic

In these drinks the carbohydrate content is much higher, usually more than 10g carbohydrate/100ml. Hypertonic drinks are absorbed more slowly than plain water. They replace lost energy rather than replacing fluids and therefore are not an effective fast way to re-hydrate. e.g. pure fruit juice, many canned drinks and energy drinks

When to use: These types of drinks are taken when energy replacement is the priority rather than fluids and can be used to top up your daily carbohydrate intake.

Stimulant Drinks

They usually have a high carbohydrate content but also have other additives which are advertised as giving you more energy e.g. herbs, caffeine, guarana, taurine, ginseng, carnitine etc. There is no evidence that most of these additives have a beneficial effect on performance and they should generally be avoided during sport.

What About Water?

For many people water is the fluid of choice, it is cheap and readily available. It is useful in non-endurance events of low intensity, where carbohydrate replacement is not the priority.

It will replace your fluid losses but will not provide any energy, however, research has shown that adding a little carbohydrate (sugar) and salt will enhance the absorption and retention of fluid in the body and provide some energy for your exercising muscles allowing you to exercise for longer or at a higher intensity before becoming tired. This is helpful in team and endurance events longer than one hour.

Can I drink too Much?

Yes. Large intakes of water will dilute the blood; this then stimulates urine output and effectively dehydrates the body. Fluid overload can be minimised by adding salt to a drink.

In some situations, most likely during prolonged moderate to high intensity activities lasting greater than 4 hours in hot or humid conditions, there is an increased risk of hyponatremia, a potentially fatal condition of low blood sodium levels that primarily results from the consumption of excessive intakes of water and inadequate sodium replacement.

New hydration guidelines were issued by the USA Track and Field Association (USAFT) the National Governing Body for track and field, distance running and race walking in the States in 2003. These are especially aimed at those completing the marathon in greater than 4 hours, particularly in hot conditions where sweat rates will increase and where athletes have the opportunity to consume large volumes of fluid.

The signs and symptoms of exertional hyponatremia are similar to that of heat stroke, such as respiratory distress, progressively worsening headache, nausea and vomiting, dizziness and disorientation, but the unique distinguishing characteristic is low plasma sodium levels <130mmol/L and there may also be swelling of hands and feet.

This is fortunately a rare condition which can be avoided by monitoring your fluid losses and therefore your fluid requirements. The USATF suggest a suitable self testing protocol for optimum hydration on their website <http://www.usatf.org/>

How Much Should I Drink?

Most people need 1.5 - 2.0 litres of fluid per day plus whatever they lose during exercise.

It is important to start exercise fully hydrated. To encourage adequate pre-exercise hydration, you should drink 500 - 600ml of fluid, preferably water or a sports drink about 2 hours prior to exercise, followed by an additional 150 - 350ml dependant on tolerance 0 - 10 minutes before exercise commences.

During exercise it is better to drink smaller amounts more frequently, ideally 150 - 200ml every 15 - 20 minutes but this will depend on the demands of your sport.

After exercise you should ideally attempt to replace losses within the first 2 hours of recovery; this becomes more important when multiple training sessions occur during the same day.

How Do I Know How Much Fluid I Have Lost?

Weighing yourself before and after exercise gives an indicator of the amount of fluid lost during exercise sessions.

1 kilogram body weight lost is equal to 1litre of fluid lost from the body.

Weigh yourself before exercise, wearing as few clothes as possible and again after exercise in the same clothes after towelling off any excess sweat on your body. You should also remove your socks

and trainers on each occasion. If you weigh yourself in sweaty clothes, you will underestimate your fluid losses.

If necessary you should pass urine before weighing yourself before exercise. After exercise you should weigh yourself again before passing urine. Record your weight and also record the weight/volume of the drinks used during the exercise session. The amount of fluid lost is the weight lost plus the fluid consumed.

You should replace 1.5 times the volume of fluid lost to account for normal fluid replacement as well as the continued raised sweat rate after exercise.

For Example

Weight before training (A)	65kg
Weight after training (B)	64.5kg
Difference (A-B = C)	0.5kg =0.5litre
Volume of fluid drunk during training (D)	0.5 litre
Total sweat loss (C+D = E)	1.0 litre
Total volume you should drink (E x 1.5)	1.5 litre

If you exercise in a variety of environmental conditions, it may be useful to undertake before and after weighing in different temperatures and before and after training sessions.

Recipes for Home-made Sports Drinks

Experiment in training to find a drink you like, sometimes drinks taste different during and after exercise than when are not exercising.

Try making your own drinks using the following recipes

Salt is added to help the body absorb the fluid more quickly and to help retain the fluid in the body.

Hypotonic Drinks

1. 100ml fruit squash
900ml water
1/5th teaspoon salt (1g)
2. 250ml fruit juice
750ml water
1/5th teaspoon salt (1g)

Isotonic Drinks

1. 50 - 70g glucose or sugar
1 litre water or sugar free squash

1/5th teaspoon salt (1g)

Dissolve the glucose or sugar and salt in 100ml warm water before adding it to the remaining 900ml cold water or sugar free squash

2. 500ml unsweetened fruit juice
500ml water
1/5th teaspoon salt (1g)
3. 150ml High Juice squash
850ml water
1/5th teaspoon salt (1g)

Hypertonic Drinks

400ml squash

1 litre of water

1/5th teaspoon salt (1g)

Top Tips

- Always take a full drinks bottle to training and competitions
- Choose a drink you enjoy. Cool drinks are more refreshing and palatable
- Choose a drink that best matches your needs
- Practice your drinking routines during training
- Start drinking early, about 2 hours before starting exercise. Do not wait until you feel thirsty, by this time you will already be dehydrated
- Immediately before exercise drink about 150 - 350ml, then continue taking small amounts of fluid 150 - 200ml every 15 - 20 minutes
- Start drinking as soon as possible following training or competition
- When travelling take extra drinks with you, you may forget to drink when your routine is changed
- Air travel, air conditioning and altitude will all increase your fluid requirements