



FACT SHEET

Fluids in Sport

Why fluid is important

Water is essential to maintain blood volume, regulate body temperature and allow muscle contractions to take place. During exercise, the main way the body maintains optimal body temperature is by sweating.

Heat is removed from the body when beads of sweat on the skin evaporate, resulting in a loss of body fluid.

Sweat production, and therefore fluid loss, increases with a rise in ambient temperature and humidity, as well as with an increase in exercise intensity.

Drinking fluid during exercise is necessary to replace lost sweat. This action will reduce the risk of heat stress, maintain normal muscle function, and prevent performance decreases due to dehydration. In most cases during exercise the rates of sweat loss are higher than the rate you can drink, so most athletes get into fluid deficit. Therefore, fluid guidelines promote drinking more fluid to reduce the deficit. However, it is also possible to over-hydrate during exercise, so athletes with low sweat losses need to drink at a more moderate rate.

The dangers of dehydration

- As dehydration increases, there is a gradual reduction in physical and mental performance. There is an increase in heart rate and body temperature, and an increased perception of how hard the exercise feels, especially when exercising in the heat.
- Studies show that loss of fluid equal to 2% of body mass is sufficient to cause a significant decrease in performance (that's a 1.4 kg loss in a 70 kg athlete).
- Dehydration of greater than 2% loss of body weight increases the risk of nausea, vomiting, diarrhoea, and other gastro-intestinal problems during exercise.
- Dehydration reduces the rate of fluid absorption from the intestines, making it more difficult to reverse the fluid deficit. You may end up feeling bloated and sick if you delay fluid replacement.
- It is impossible to 'train' or 'toughen' your body to handle dehydration. Don't bother trying!

The dangers of over-hydration

Drinking more fluid than is comfortable, in any condition, can interfere with good performance. In cool weather, or when the exercise pace is gentle; the rate of sweat loss may be quite low. It is unnecessary and potentially dangerous to drink at rates that are far greater than sweat losses.

Such over-hydration during exercise can cause a dilution of blood sodium levels (hyponatraemia). Symptoms include headaches, disorientation, coma, and in severe cases, death.

Estimating your fluid losses

Fluid is lost from the body mainly as sweat and urine.

Other minor losses come from breathing, spitting, vomiting and other insignificant sources. Sweat losses can be monitored to give you an idea of how much fluid to replace during training sessions and competition. Weigh yourself before and after the session, using accurate scales. If possible, weigh naked or in minimal clothing, and be sure to towel dry any excess sweat (so you are not weighing sweat lost into your clothing).

- Your weight change during exercise reflects your total fluid loss; i.e. the difference between your sweat losses and fluid intake.
- As a general rule, aim to keep this weight loss less than 1kg. (1kg = 1 litre of fluid)
- You can also express fluid loss or dehydration as a percentage of your initial weight. This is how to calculate % dehydration:
 $100 \times (\text{pre-exercise wt (kg)} - \text{post-exercise wt (kg)}) / \text{pre-exercise weight (kg)}$ e.g. If you weigh 80 kg before sport and 78 kg afterwards, then your % dehydration is:
 $100 \times (80 - 78) / 80 = 200 / 80 = 2.5\%$
Aim to keep this well under 2%.
- Total sweat loss can be estimated by considering fluid and food consumed, as well as weight change:
Total sweat loss (in mL) =
 $1000 \times [\text{pre-exercise wt (kg)} - \text{post-exercise wt (kg)}] + \text{fluid intake (mL)} + \text{solid food eaten (g)}$
e.g. If you weigh 80 kg before sport and 78 kg afterwards, drank 700 mL fluid and ate 50 g jelly beans, then your total sweat loss is:
 $(1000 \times 2) + 700 + 50 = 2750 \text{ mL}$

Knowing your rate of sweat loss helps you develop a general fluid intake plan. You should aim to drink at the maximum amount that is comfortable and practical for your sport, but a bit less than your sweat losses.

- Remember that weight loss during exercise is primarily water loss (not fat loss), and needs to be replaced soon after finishing exercise.

How much fluid & when?

Drinking fluid during exercise helps to prevent a drop in performance caused by dehydration, and fluid after exercise will re-hydrate you. The amount of fluid and the timing of drinks depend on the individual and the sport. Here are some tips:

- Always start exercise well hydrated; this will lower the risk of becoming dehydrated during sport. There is minimal performance benefit to being over-hydrated as drinking excessive amounts of fluid before exercise causes increased urination and feelings of bloatedness.
- Develop a plan for drinking during exercise based on your own sweat rates.
- Immediately after exercise, monitor your weight change to estimate your final fluid deficit. During recovery, you will continue to lose fluids through sweating and urine losses, so plan to replace 150% of this fluid deficit over the next 2-6 hours. For example, if you lost 1 kg (1000 mL), you will need to drink 1500 mL to fully re-hydrate. Drink fluids with your recovery snacks and the following meal to achieve this goal.
- Different sports pose different challenges and opportunities for optimal hydration. For team and racquet sports there are formal breaks between play, with substitutions and time-outs, all offering an opportunity to drink. Some individual sports require you to drink on the move. Be smart and practice strategies to get maximum benefit from fluid intake with minimal fuss and discomfort. Try special squeeze bottles, or hands free drink pouches if practical.
- Thirst is not an effective indicator of hydration status while exercising. There is usually a significant fluid loss before you feel thirsty. When drinking, your thirst will be satisfied well before these losses have been fully replaced.

What is the best fluid to drink?

As there are many drink options available you now need to think about which is best for you.

Plain water alone is an effective drink for fluid replacement, especially in low intensity and short duration sports. However, if carbohydrate and electrolytes are added to water, as in a sports drink, performance can be enhanced, especially in high intensity and endurance sports.

If a drink tastes good, athletes will consume more of it, therefore promoting re-hydration. Carbohydrate in fluid provides a muscle energy source as well as enhancing flavour. This can be one advantage of a sports drink over plain water.

Electrolytes such as sodium are lost in sweat and need to be replaced during and after prolonged exercise. Sodium in fluid improves hydration as it stimulates the thirst mechanism, promotes both carbohydrate and water uptake in the intestines and reduces the volume of urine produced post-exercise. For more information please see the SDA fact sheet # 19 on [Sports Drinks](#).

Caffeine

Caffeine is a diuretic, meaning it increases the volume of urine produced (fluid lost) by the body. Recent research has shown, however, that caffeine-containing fluids can be used as a re-hydration beverage. The increase in fluid lost as urine is not greater than the amount of fluid that is consumed from drinks such as tea and coffee. Non-caffeinated fluids (e.g. water, sports drinks, juice, cordial) are more effective for hydrating, and are therefore still the preferred choice, but the regular caffeine drinker does not need to avoid caffeine-containing drinks completely.

Alcohol

Alcohol will act as a diuretic and interfere with re-hydration and other recovery processes. If you choose to drink alcohol after exercise, look after your recovery needs first (i.e. replacing fluids and energy) and then enjoy an alcoholic beverage in sensible amounts (maximum four standard drinks for men and two for women).

Fluid guidelines summary

Dehydration impairs performance and mental skills, especially in hot weather.

- Monitor your typical sweat losses during exercise and develop a hydration plan for before, during and after exercise that replaces these losses.
- Aim to have minimal weight (fluid) loss during exercise, preferably less than 1kg.
- During exercise, drink at a rate that is comfortable and practical to replace most of your sweat losses.
- Do not drink at a rate that exceeds sweat losses.
- Be aware of greater fluid losses in hot and humid environments.
- Water is an excellent fluid for low intensity and short duration sports.
- Sports drinks are ideally suited to high intensity and endurance sports.
- Tea and coffee are helpful in replacing lost fluids.
- Drink alcohol sensibly.