

## FLUID IN SPORT FACTS

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Proper fluid intake before, during and after training or competition is the simplest practice to maximize performance. Yet, proper hydration is often overlooked or ignored. Dire consequences on performance and health result from improper fluid intake when exercising in warm environments. All coaches, parents, athletes and exercise enthusiasts should consider the facts and should ask themselves, “Am I, or my athletes and teammates, drinking enough of the right stuff?”

### Why Fluid is Important

The human body is made up of 45-75% water, depending on body composition. The body needs water to...

- Maintain blood volume, which allows efficient transportation of nutrients and oxygen to tissues
- Aid digestion in saliva and digestive juices that break down and absorb food
- Provide the setting in which all biochemical reactions of the cell occur
- Lubricate joints and cushion organs and tissues upon impact
- Eliminate waste from the body through urination
- Regulate core body temperature at 37°C by perspiration

Because we lose body fluids every day through excretion (urine) and sweat, it is essential to replace those fluids on a daily basis. For an athlete, remaining well hydrated is especially important to prevent the rise in body temperature associated with exercise, and even more so when exercising in hot or humid environments. Heat illnesses are easily preventable, though common.

Some biochemical reactions in the body generate heat as a sort of “by-product”. During exercise, the body, its tissues and

cells, generate more heat. During physical activity, muscle tissue can generate up to 20 times more heat than it does at rest! This heat builds up and is stored in the body, which can raise overall body temperature. The most efficient way the body can rid itself of this heat is through perspiration. With longer and/or more intense exercise, more heat builds up in the body stimulating the body to produce more sweat. This eventually leads to an overall body fluid deficit. During a training session, an athlete needs to drink the volume of fluid they are losing. This ensures the body maintains core temperature (through perspiration) and still has enough fluid for regulation of blood volume, digestion, joint lubrication, etc. *However, even when fluids are easily accessible, athletes tend to avoid fluid intake during a workout or event. This is referred to as “voluntary dehydration”.*

### Consequences of Dehydration

We do not adapt to dehydration. A loss of 1-2% body fluid reflected in body weight significantly decreases athletic performance. This amount of fluid loss is common in a one-hour training session, where sweat losses can measure ½ to 1½ litres!

One of the easiest ways to tell whether you are adequately hydrated is by checking the colour of your urine. Light coloured urine is an indication of adequate hydration. If you are experiencing infrequent urination and the colour of urine is dark yellow, these are signs of dehydration.

**Symptoms of Dehydration** include constipation, irritability, fatigue, light-headedness, headaches, muscle cramps, reduced endurance, and exercise may feel more difficult than usual. Because body fluids are essential for the proper functioning of joints and related tissues, dehydration also increases risk of injury.

### Physiological Changes:

- Drop in blood volume, blood pressure and cardiac output, as well as increased viscosity of the blood resulting in less oxygen being transported to the muscles.
- Decreased skin blood flow, which is needed to dissipate body heat.
- Heart rate speeds up.
- Slower gastric emptying. This means that when hydration is poor, the fluids and foods that are ingested will be released from the stomach more slowly. The athlete's ability to incorporate water and nutrients into the body is impaired.

Dehydration also decreases tolerance to heat strain; even in athletes acclimatized to warm training locations. The dehydrated athlete's body temperature rises, placing them at risk of developing *heat illnesses* in hot/humid environments.

### **Heat Illness (Hyperthermia)**

The Manitoba Marathon 2005 took place on a very hot and humid morning. Runners were dropping like flies and 15 people were sent to the hospital with heat exhaustion. By luck or by virtue of an excellent medical staff, no one was seriously injured. In the heat, sweat rates can climb to 1-2 litres of sweat loss per hour. Marathoners have been noted to lose up to 7 litres of sweat in one event! When sweat losses are not matched by fluid intake in the heat, there is a risk of developing 3 different types heat illnesses:

- 1) **Heat cramps:** These are painful, involuntary and intermittent muscle spasms that can occur in any muscle group.
- 2) **Heat exhaustion:** This is more hazardous as the sufferer's mental status is changed; they become irritable, dizzy and have poor judgment. Other symptoms include nausea, headache, sudden fatigue and profuse sweating. Skin colour may be pale. When not treated, this can develop into heat stroke.

- 3) **Heat stroke:** This occurs when body temperature rises to 41°C and above. This illness is very dangerous and could lead to coma or death. Central nervous system dysfunction causes loss of motor coordination, confusion, delirium and loss of consciousness. At a body temperature of 42°C and higher, protein within the body coagulates and causes cell death – in words more appealing to Hannibal Lector, the body cooks itself. This leads to multi-system organ failure. Symptoms may include reddened skin, rapid heartbeat, quick shallow breathing, normal-profuse sweating, personality changes and fainting.

### **Check your hydration status**

1. Monitor your urine colour and volume. If your urine is dark yellow and you're excreting small volumes, you need to drink more fluids.
2. Do not wait to feel thirsty before re-hydrating. The sensation of thirst generally does not occur until fluid loss accounts for 2% of body weight, which as described earlier is enough to impair performance!
3. **Before exercise:** Begin all workouts/competitions well hydrated by drinking 2-2½ cups of water or sports drink 2 hours before, and try ½ to 1 cup 10-20 minutes before a training session or event. Drink what you can tolerate.
4. **During exercise:** Try to match fluid input with fluid output. To find out your sweat rates, weigh yourself

before and after exercise in the nude or, for the more discrete, in the same clothes before and after. The amount of weight lost during exercise is indicative of the volume of fluid lost: 2.2lbs (1kg) accounts for 4 cups (1 litre) of fluid that needs to be replaced. You can also try drinking ½ to 1 cup of fluid every 20 minutes during your session.

5. **After exercise:** Aim for complete re-hydration. Try drinking 3 cups of fluid for every pound of body weight lost within 2 hours after exercise. It is recommended that you consume 500-1000 ml (2-4 cups) of fluid post exercise.

### **Choosing Good Re-hydrating Drinks**

For a training session that lasts less than one hour, water is sufficient. When exercising for more than one hour, consider a sports drink. This will help replenish some of the lost carbohydrates, already burned for energy, as well as electrolytes (notably sodium) lost in sweat. Commercially sold sports drinks (Gatorade, Powerade, etc.) are concentrated 4-6%, tested to maximize water absorption and minimize stomach discomfort. However, if you do experience some stomach distress with these drinks, dilute them with water. You can make your own sports drink by mixing fruit juices with water, and adding a pinch of salt.

*\*Note : you can drink too much water! When exercising for long durations in the heat, sodium is lost in sweat. If nothing but water is consumed, the body will reach a diluted sodium concentration, which causes cramping, headaches and nausea, and could lead to poor coordination and seizure. Sodium-*

*containing sport drinks should be considered during (or salty foods plus fluids) before and after exercise.*

- Sport drinks and juices also make good recovery drinks. After a workout, consuming simple fast absorbing carbohydrates stimulates muscle recovery.
- Energy drinks are less ideal for good hydration. Carbohydrate concentration in these beverages ranges from 20-25%. Studies have shown that drinks with a carbohydrate concentration of 8% and higher slow down fluid absorption in the intestine.
- Alcohol and sporting events seem to mix together. Remember that alcohol has a diuretic effect – you pee more, making you lose more fluids. One study showed that athletes who drank beer lost about 2 cups more urine over the course of four hours than those who drank a low-alcohol or alcohol free beer. Hydration plays a huge role in high energy performance. During or after a hard event, alcohol won't help you re-hydrate or recover.

### **Prevent and treat heat illnesses**

When training in hot conditions, remember the signs and symptoms of dehydration and heat illnesses. Act immediately upon onset of the first signs and symptoms by removing yourself from the sun or the heat, and by consuming some fluids.

Minnesota Vikings right tackle, Korey Stringer, was caught on camera struggling with pre-season practice in a heat wave in the summer of 2001. He died of heat stroke the next day. Exercise-induced heat stroke deaths are not unheard of in sports involving non-stop intensity and heavy uniforms. Be sure to watch out for other teammates, as they may not realize or want to admit they are becoming dehydrated and ill.

***First Aid as provided by the Mayo Clinic:***

If you are hit with *heat cramps*, take a rest to cool down, drink some fluids and practice stretching and massaging of the cramped muscle(s). If the cramp persists for an hour or longer, call a physician.

If *heat exhaustion* is suspected, remove the affected person from the sun or into a cool location. Have the person drink water and cool down their body with cool water spray or cold blankets and fanning. Call for medical assistance.

In the event of *heat stroke*, move the affected person to a shady or air-conditioned location. Call for emergency medical assistance and cool down the person with water spray, fanning and cold blankets or damp sheets. Never give anything by mouth to an unconscious individual!

All heat illnesses can generally be successfully treated with fluid replacement, oral or intravenous. Severe heat stroke can be treated by immersing the affected person in an ice-cold bath for 15-20 minutes, while carefully monitoring their body temperature so that it does not drop below 37°C. However, if an individual is suffering from heat stroke, the first measure to take is to dial 911.

An athlete can become acclimatized to the heat, however when slightly dehydrated, this acclimatization has no benefit. Acclimatize slowly, giving yourself at least 1-2 weeks to fully get used to training in the heat. Reduce your training volume and intensity on warm days by taking longer breaks. Reduce the amount of protective gear worn during practice, and take advantage of the shade.

**Message to all coaches, parents, athletes and exercise enthusiasts**

Remember that...

- Dehydration hurts athletic performance
- Be aware of the symptoms of dehydration: fatigue, light-headedness, muscle cramps, struggling with exercise
- Be responsive to signs of heat illness: nausea, dizziness, sudden fatigue, profuse sweating, confusion, irritability, rapid shallow breathing
- Consume fluids before during and after training sessions to limit rise in core body temperature and to prevent heat illnesses in hot and humid environments
- Choose water, juices and sports drinks over energy drinks and alcohol
- Maintain hydration and take longer breaks in the shade when acclimatizing to the heat

**MAKE YOUR OWN SPORT DRINK FOR HIGH ENERGY PERFORMANCE & OPTIMAL RECOVERY:**

- 2 Cups Unsweetened Orange Juice
  - 2 Cups Water
  - ¼ tsp Salt
- 1 L = 54 g (5.4%) carb and 0.5 to 0.7 g salt

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