Introduction

Here is what you will learn in this unit:

- Hydration strategies before, during and after exercise
- Should you hydrate before exercise?
- Is it possible to fluid-load before exercise?
- Sports drinks or water?
- Best drinks per activity type
- How much carbohydrate in drinks during exercise
- What happens if you drink too much water?
- Can drinking during exercise make you sick?
- What’s the best post-exercise drink?
- How much to drink on non-training days?

Includes the following downloadable material for immediate use with your client:

- Best drinks per activity type (session handout)
- Carbs in drinks per exercise duration (table)
Hydration before exercise
Should we hydrate before exercise?

Your client’s main priority is to ensure they are well-hydrated before exercise. If your client begins a training session or competition in a dehydrated state, their performance will suffer and they will be at a competitive disadvantage!

- In one study, runners performed a 5000 m run and a 10,000 m run in either a normally hydrated or slightly dehydrated condition. When dehydrated by 2% of body weight, their running speed dropped substantially (6-7%) in both events!

Prevention is better than cure: Tell your client to make sure they are well hydrated before they begin exercising, especially in hot and humid weather!
The American College of Sports Medicine (ACSM) recommends drinking **5 to 7 ml of fluid per kg of body weight slowly between 4 and 2 hours before exercise** to promote hydration and allow enough time for excretion of excess water.

- That’s equivalent to **300-420 ml for a 60 kg person**, or **350-490 ml for a 70 kg person**.

- If this does not result in urine production within 2 hours or if urine is dark coloured, your client should continue drinking. But advise your client not to force drinking so much that they gain weight.

- **110 to 250 ml 5 to 10 minutes before exercise** is not a bad idea as this will be available to replace sweat losses immediately.

**Be cautious!** The International Olympic Committee cautions against over-drinking before and during exercise, because of the risk of water intoxication.
Calculate your own fluid intake between 4 and 2 hours before training!

1. What’s your body weight (BW)?: _______ kg

2. Now multiply your body weight by 5 ml and then 7 ml of fluid:
   
   ______ kg x 5 ml = _____ ml  
   ______ kg x 7 ml = _____ ml

3. Your ideal fluid intake before exercise is:
   
   From _____ ml to _____ ml of fluid between 4 and 2 hours before training (intake should be gradual to avoid water intoxication)

Make the same calculation for your client and explain the importance of hydration for health and performance!
Hydration during exercise
How much fluid during exercise?

- Significant fluid losses will result in a drop in performance for most (non-elite) athletes, so experts advise limiting dehydration to less than 2% of your body weight.

- For example, this would mean 1 kg for a 50 kg person, 1.5 kg for a 75 kg person and 2 kg for a 100 kg person.

- However, in cold environments, dehydration greater than 2% is likely to be better tolerated.

- Also, dehydration of up to 3% has little effect on strength, power and sprint exercise.

- Studies have shown that you can maintain optimal performance if you replace at least 80% of your sweat loss during exercise.

The best strategy is to work out how much fluid your client loses through sweating by weighing themselves before and after a typical workout, then aim to drink sufficient to ensure a weight loss of no more than about 2%.
Is it possible to “fluid-load” before exercise?

- ‘Loading up’ or ‘hyper-hydrating’ with fluid before an event seems advantageous for those competing in ultra-endurance events, activities during which there is little opportunity to drink, or in hot humid conditions.

- You can’t achieve hyperhydration by consuming large volumes of water or sports drinks before the event. The body simply excretes surplus fluid and you will end up paying frequent visits to the toilet or bushes.

- However, there is a method of hyperhydration (“fluid loading”) that involves the consumption of glycerol along with fluid 2 hours before exercise.
  - Glycerol is a hyperhydrating agent, which, through its strong osmotic activity, drags water into both the extra-cellular and intra-cellular fluid. This results in an increase in total body fluid. In theory, you will be able to maintain blood volume, increase sweating and reduce the rise in core body temperature that occurs during exercise.
  - Studies at the Australian Institute of Sport found that by doing this, athletes retained an extra 600 ml of fluid and improved performance in a time trial by 2.4%.
  - The potential performance benefits should be weighed up against the possible side effects, which include gastrointestinal upset and headaches.
Practical drinking tips!

- The ACSM recommends cool drinks (15-22 °C).
- You will also be inclined to drink more if the drink is palatable and in a container that makes it easy to drink.
- Studies have shown that during exercise, athletes voluntarily drink more of a flavoured sweetened drink than water, be it a sports drink, diluted fruit juice, or fruit squash.
- Bottles with sports caps are probably the most popular containers.
- It is also important to make drinks readily accessible: for example, for swim training have drinks bottles at the poolside; for games played on a pitch or court (football, hockey, rugby, netball, tennis) have the bottles available adjacent to the pitch or court!
Sports drinks, or water?

✔ During low or moderate-intensity activities such as ‘easy pace’ swimming, cycling, or power walking carried out for LESS than 1 hour, fluid losses are likely to be relatively small and can be replaced fast enough with plain water. There is little benefit to be gained from drinking sports drinks compared with water during these types of activities.

✔ During high-intensity exercise lasting LESS than 1 hour (a 10 km run, tennis, squash, cycling, sprint training, circuit training and weight training), drinking a sports drink containing up to 8 g sugar per 100 ml rather than water may benefit your performance.

✔ During high-intensity exercise lasting LONGER than 1 hour (e.g. half-marathon, football match), you require rapid fluid replacement, as well as fuel replacement. In other words, you need to avoid early glycogen depletion and low blood sugar, as well as dehydration, as all three can result in fatigue. A sports drink would help prevent this.

Examine the table in the next page which summarises this.
# Best Drinks per Activity Type

This table depicts the best drink for performance according to activity volume and intensity:

<table>
<thead>
<tr>
<th>Activity type</th>
<th>Best drink for performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise lasting less than 30 minutes</td>
<td>Nothing or water if thirsty</td>
</tr>
<tr>
<td>Low-moderate intensity exercise lasting less than 1 hour</td>
<td>Water</td>
</tr>
<tr>
<td>High-intensity exercise lasting less than 1 hour</td>
<td>Hypotonic or isotonic sports drink</td>
</tr>
<tr>
<td>High-intensity exercise lasting more than 1 hour</td>
<td>Hypotonic or isotonic sports drink, or glucose polymer drink</td>
</tr>
</tbody>
</table>

Source: The Health Sciences Academy
How much carbohydrate from sports drinks?

- **During hot and humid conditions**, you may be losing more than 1 litre of sweat per hour. Therefore, you should increase your drink volume (although still be guided by your thirst), if possible, and use a more dilute drink: around **20-40 g of carbohydrate per litre**.

- **For exercise longer than 1 hour**, the recommendation is an intake of between **30-60 g carbohydrate per hour** to maintain blood sugar levels and delay fatigue.
  - Most commercial sports drinks contain this level, which corresponds to the maximum rate at which fluid can be emptied from the stomach. More concentrated fluids take longer to absorb.

- **For exercise lasting more than 3 hours**, consuming **90g carbohydrate per hour** can increase performance. However, this can be achieved only by consuming a mixture of carbohydrates ('multiple transportable carbohydrates'): **glucose plus fructose, or maltodextrin plus fructose in a 2 : 1 ratio**.
  - This carbohydrate mixture appears to increase carbohydrate oxidation in the muscles as well as increase fluid uptake. It is possible for your client to make up these drinks themselves, although commercial sports drinks and gels with this formulation are available.

- Sports drinks based on glucose polymers may be a good choice if your client’s sweat rate is low (e.g. during cold conditions) during hard exercise, because they can provide more fuel than fluid replacers as well as reasonable amounts of fluid. In practice, many athletes find that glucose polymer drinks cause stomach discomfort and that sports **drinks containing 4-8 g carbohydrate per 100 ml** do an equally good job.

Use the summary table (next page) as a guidance. The key to choosing the right drink during exercise is to experiment with different drinks in training to find one that suits your client best!
## Carbs in Drinks per Exercise Duration

Use this table as a guidance with your client which summarises the recommendations for carbohydrate intake in drinks during physical activity:

<table>
<thead>
<tr>
<th>Exercise duration</th>
<th>Recommended amount of carbohydrate</th>
<th>Type of carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 45 minutes</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>45 to 75 minutes</td>
<td>Mouth rinse / Very small amounts</td>
<td>Any</td>
</tr>
<tr>
<td>1 to 2 hours</td>
<td>Up to 30g per hour</td>
<td>Any</td>
</tr>
<tr>
<td>2 to 3 hours</td>
<td>Up to 60g per hour</td>
<td>Glucose, maltodextrins</td>
</tr>
<tr>
<td>3 hours</td>
<td>Up to 90g per hour</td>
<td>Multiple transportable carbohydrates: Glucose + Fructose OR Maltodextrin + Fructose in a 2:1 ratio</td>
</tr>
</tbody>
</table>

Source: The Health Sciences Academy
What happens if you drink too much water?

- **Water intoxication or hyponatraemia** sometimes happens in long distance runners or triathletes who consume a lot of water and lose a lot of salt through sweat.

- **During intense exercise, urine output is reduced**, which further limits the body’s ability to correct the imbalance.

- As the *water content of the blood increases*, the salt content is diluted.

- Consequently, the *amount of salt available to body tissues decreases*, which can lead to *problems with brain, heart and muscle function*. Initial symptoms of overhydration include dizziness, nausea, bloating, lapses in consciousness and seizures due to swelling of the brain.

- However, these symptoms are also associated with dehydration – so it’s important for your client to be aware of how much they are drinking!

- An *advisory statement on fluid replacement in marathons* written for the International Marathon Medical Directors Association and USA Track & Field advises endurance runners **not to drink as much as possible but to drink ad libitum no more than 400-800 ml per hour.**

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**Helpful Tips**

When your client sweats heavily for long periods of time, they should drink dilute electrolyte/carbohydrate drinks rather than plain water. These will help avoid hyponatraemia, maintain better fluid levels in the body, spare muscle glycogen and delay fatigue!
Can drinking during exercise make you sick?

- If your client feels nauseous or experiences other gastrointestinal symptoms when they drink during exercise, this may either indicate that they are dehydrated or be related to the fact they are exercising at a very high intensity for a prolonged period.

- If your client trains at high intensity for a long time, they need to be aware that even a fairly small degree of dehydration (around 2% of body weight) slows down stomach emptying and upsets the normal rhythmical movement of the gut. This can result in bloating, nausea and vomiting.

- Your client can avoid this by ensuring they are well hydrated before exercise and then continue drinking little and often according to thirst during their workout.

It’s the nature of the training (i.e. high intensity prolonged exercise) that affects gut motility, causing discomfort and nausea. If your client is prone to such symptoms during training or competition, advise them to be well hydrated before exercise so the risk of dehydration and therefore the need to drink during exercise will be less.
Hydration after exercise
How much fluid after exercise?

- Both **water and sodium need to be replaced** to restore normal fluid balance after exercise. This can be **achieved by water** (or non-sports drinks) **plus accompanying food** if there is no urgency for recovery.

- Ideally, your client should drink approximately 1.2-1.5 times the weight of fluid lost during exercise. **1 litre of sweat is roughly equivalent to a 1 kg body weight loss.**

- **Example:**
  - Weight loss during exercise: 1 kg
  - Rehydration needed: between 1.2 and 1.5 litres (i.e. 1 x 1.2 and 1 x 1.5)

- The simplest way to work out how much your client needs to drink is to **weigh themselves before and after training.**

- It’s **not advisable to drink the whole amount straightaway,** as a rapid increase in blood volume promotes urination and increases the **risk of water intoxication!**

- Tell your client to consume as much as they feel comfortable with, then drink the remainder in **divided doses** until they are fully hydrated.
Are sports drinks better for recovery?

- Sports drinks may be better than water at speeding recovery after exercise, particularly when fluid losses are high (e.g. a loss of more than 5% body mass) or for those athletes who train or compete twice a day.

- The downside with drinking water is that it causes a drop in blood osmolality (i.e. it dilutes sodium in the blood), reducing your thirst and increasing urine output, and so you may stop drinking before you are rehydrated!
What’s the best post-exercise drink?

- **Sodium** plays an important role in driving the thirst mechanism.
- A low sodium concentration in the blood signals to the brain a low thirst sensation.
- Conversely, a high sodium concentration in the blood signals greater thirst and thus drives you to drink.
- Hence, the popular strategy of putting salted peanuts and crisps at the bar to encourage customers to buy more drink to quench their thirst!
- **Sports drinks**, on the other hand, increase the urge to drink and decrease urine production.
- Research at Loughborough University suggests that skimmed milk may be an even better option for promoting post-exercise rehydration. Volunteers who drank skimmed milk after exercise achieved net positive hydration throughout the recovery period.
- A further US study also suggests that consuming a drink containing carbohydrate with a small amount of protein improves fluid retention after exercise. **Those athletes who consumed the carbohydrate-protein drink retained 15% more fluid than carbohydrate-only, and 40% more than water alone.**
How much on non-exercising days?

- The quantity of water needed to ensure optimum health is often quoted as around 8 glasses of water, which equates to about 2-2.5 litres of water a day.
- This is approximately 1 litre for every 1000 calories expended on a daily basis.
- Fluid intake should be continuous throughout the day and can be taken in many ways, not only through the liquids taken on board, as for many people the majority of fluid they consume each day is within the food they eat.
Test your knowledge!

1) It’s advisable to drink 5 to 7 ml of fluid per kg of body weight slowly between 4 and 2 hours before exercise

2) On non-training days, you should drink 1 litre for every 1000 calories expended

3) A high sodium concentration in the blood causes a low thirst sensation

4) Ideally, you should drink approximately 1.2 to 1.5 times the weight of fluid lost during exercise

5) Skimmed milk is not sufficient to promote post-exercise rehydration

6) Sports drinks aren’t as good as water at speeding post-exercise recovery

7) Symptoms of overhydration are similar to those of dehydration

8) During a marathon, you shouldn’t drink more than 800ml per hour

9) It’s impossible to “fluid-load” before exercise

10) Sports drinks are good for moderate intensity exercise lasting less than 1 hour

11) Write down the recommended carbohydrate intake and carbohydrate type for a training session lasting 3 hours:

* The correct answers to this exercise can be found in the next page. Do not peek! Try to resolve it yourself first.
Exercise Answers

1) **TRUE.** 5 to 7 ml of fluid per kg of body weight slowly between 4 and 2 hours before exercise to promote hydration and allow enough time for excretion of excess water.

2) **TRUE.** This is on average 8 glasses of water, which equates to about 2-2.5 litres of water a day.

3) **FALSE.** The opposite – a low sodium concentration in the blood signals to the brain a low thirst sensation; whereas a high sodium concentration in the blood signals greater thirst and thus drives you to drink.

4) **TRUE.** Ideally, you should drink approximately 1.2-1.5 times the weight of fluid lost during exercise. 1 litre of sweat is roughly equivalent to a 1 kg body weight loss.

5) **FALSE.** Research shows that skimmed milk may be a great option for promoting post-exercise rehydration.

6) **FALSE.** Sports drinks may be better than water at speeding recovery after exercise.

7) **TRUE.** Symptoms of overhydration include dizziness, nausea, bloating, lapses in consciousness and brain seizures.

8) **TRUE.** The advice is not to drink more than 400-800 ml per hour of exercise.

9) **FALSE.** Some athletes use glycerol as a hyperhydrating agent, which drags water into both the extra-cellular and intra-cellular fluid, increasing body fluid.

10) **FALSE.** Water is better for low to moderate intensity exercise lasting less than 1 hour.

11) **3 hour- training session:** Up to 90g of carbohydrate per hour, ideally multiple transportable carbohydrates: “Glucose + Fructose” OR “Maltodextrin + Fructose” in a 2 to 1 ratio (that is, 2 grams of either glucose or maltodextrin per 1 gram of fructose).
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