

Creating Your Personal Hydration Plan

Hydration is one area of marathon preparation where you really have to make an effort during training to create your individual plan. Putting the time in to get your hydration right will certainly pay dividends on race day.

During running, body water and electrolytes are lost via sweating to encourage. Marathon runners can expect average sweat rates of 1.0–2.5L/h and body weight loss (BWL) of 2–10% both of which can increase core temperature and affect performance. Females may lose a greater proportion of body water and plasma volume, despite sweating less in the same conditions while smaller athletes may sweat less due to a reduced body surface. A wide range of factors influence hydration including the weather, individual sweat rates, running intensity and efficiency, composition of your drinks, gastric emptying and intestinal absorption, gender, body composition/weight and training status. Overall guidance for runners is therefore just general meaning that each runner must define their personal hydration strategy.

General hydration guidelines

Recently there has been a move away from the idea that everyone should aim to replace as much fluid as they lose in sweat in order to finish an event weighing the same as at the start. Current thinking is that there is probably no real danger to either performance or health from *mild* levels of dehydration, although *severe* dehydration will result in a loss of performance capacity. As a rule of thumb, during an endurance event you should aim to drink just enough to lose no more than 2-3% of your pre- race weight.

Table 1: General recommendations for fluid intake for marathon runners	
Pre-event	<p>It is important to start the marathon hydrated. However, drinking more than you need does not appear to add any advantage, and may lower sodium levels. You can monitor your hydration status by checking your body weight on a daily basis and paying attention to the colour and frequency of your urine (see below).</p> <p>General guidelines for fluid intake pre-event are:</p> <ul style="list-style-type: none"> • 400-600ml, or 5-7 mL/kg/body weight, of fluid approximately 2-4hrs before the start, to normalise total body water volume and return urine output to normal • a further 5-8ml per kg/body weight 10-20 minutes before you start running.
During the event	<p>During the marathon, rehydration takes priority over energy provision to reduce the risk of dehydration and excessive loss of electrolytes. You should feel comfortable with your fluid intake and that is why you really need to work out your hydration strategy in training</p> <p>Recommended intake is:</p> <ul style="list-style-type: none"> • 3-4ml per kg/body weight every 15-20 minutes during running, to a probable maximum of 225ml every 20 minutes. Remember the stomach can only empty 800-1000mL of fluid/hour and your own requirements may be less than this. Slower runners and walkers should keep to the lower recommendations as they will take longer to complete the event and therefore have a higher risk of hyponatremia.

Post-event hydration	After the event, you will need to consume slightly more fluid than you lost in sweat to cover ongoing urine losses and glycogen. This is particularly so if the weather is warm and/or humid. The suggested intake is 1.5 litres of hypotonic or isotonic drink for every 1kg of total weight loss (including fluid consumed) over several hours. Although not essential, including glucose at less than 2% in rehydration drinks can improve palatability and encourage you to drink. Rehydration drinks should also contain at least 50mmol of sodium/litre (check the label). Potassium can generally be replaced through food.
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Personalising the Guidelines

As mentioned above, these are general guidelines and runners must take responsibility for developing their own hydration plan in order to drink just enough to replace fluid lost at their personal sweat level. Some people sweat a great deal while others hardly sweat at all, and those who drink the most, are not necessarily those who sweat the most. There is some evidence that the people who drink most begin a training session already dehydrated and so this might also apply in a race situation.

So how do you personalise the guidelines?

Remember, as a rule of thumb, you are aiming to drink just enough to lose no more than about 2-3% of your pre-race weight. The following approach can help to identify how much to drink.

Identifying Your Personal Hydration Needs	
Step 1:	Record your body weight before and after as many of your long runs as you can. Weigh yourself at the last minute before going out, after you have been to the toilet and without any clothes.
Step 2:	Weigh yourself again as soon as you get back and write the two weights in your training diary along with the approximate distance and duration of your run, how you felt while running, the weather conditions, what you were wearing and how much effort you put into your run on the day. Work in kilograms and litres since 1kg of weight loss is roughly equal to one litre of sweat. You do also use some stored fuels in the form of carbohydrate and fat, but these can be ignored with no great loss of accuracy.
Step 3	After a few weeks of recording this information, you will probably start to see some patterns emerging, and if you collect enough measurements, you'll be able to allow for factors such as the weather, distance, clothing etc to get an idea of what to drink in different conditions.
Step 4	Once you know what your sweat losses are for a particular set of conditions, you can plan your fluid intake for race day, and work through the guidelines below to choose the type of carbohydrate you wish to add to your plan.

Examples

Example 1

You weigh 70kg and are going to run for three hours at 20°C. You sweat about 1 litre per hour at this pace and temperature, so you will probably lose about three litres of sweat. To stay within the guideline of not losing more than about 2-3% (i.e. 1.4-2.1kg or 1.4-2.1 litres of fluid) you should aim to drink between 900ml and 1.6 litres during the race. That's about 300-500 ml per hour somewhat less than most of the general recommendations.

Example 2

You weigh 60kg and plan to run 10 miles in about 62 minutes in about 25°C. You know you will sweat about 2.2 litres in that hour. A 2-3% loss in body weight would be equal to 1.2-1.8 litres of fluid, so you should plan to drink about 400-1,000ml. This is a very wide range, and so it's probably best to keep to the lower end of the range and increase your intake if you need to.

Carbohydrates – how much do you need?

During events lasting 90 minutes or more, consuming drinks containing carbohydrate can help to offset the effects of fatigue by providing muscles with an additional source of energy. To make sure you have sufficient energy for those final miles, the general guideline is to take in 30-60g of carbohydrate per hour at 4-8% concentration (40-80g per litre of water). This is roughly equivalent to approximately 350ml of standard sports drink before the race starts, and then 5-6 mouthfuls every 15 minutes during the race, although you will have worked out your own personal requirements during training.

If you are using energy gels, it is harder to work out how many you might need to consume. So another task when working out your hydration plan in training is to experiment with different types of gels if you want to use them. You need to find one you like and can tolerate. You can then use the manufacturer's product information regarding the carbohydrate content of your preferred product to calculate how many gels you are likely to need to achieve a minimum of 30g/hour of carbohydrate. Or you can just experiment with taking one gel every 45 minutes (from the start of the race), or 5-6 or 8 miles, and see how you feel. Remember that you will also need to calculate the amount of water required with each gel as this can vary by brand. All of this activity is part of individualising your hydration plan.

Remember also that when training or racing for more than one hour, it can be helpful to add sodium at a level of 0.5-0.7g/kg/bodyweight to help meet sodium requirements whilst maintaining palatability. Without sufficient sodium, excess fluid just increases urine output.

Carbohydrates – which form is best?

In terms of effectiveness, it doesn't seem to matter if you take in solid or liquid carbohydrates. Sports drinks provide both energy and fluid and are probably best for those who do not like the taste of energy gels or bars, or who cannot handle semi-solid or solid forms of carbohydrates while running. Sports drinks are also manufactured in the right concentrations. Some studies have found that consuming fluids, as opposed to semi-solids, results in much stronger endurance and exercise capacity. Others have also indicated that in exercise lasting 30-60 minutes, actually swallowing a sports drink might not be necessary – just rinsing your mouth and spitting the drink out can improve performance since it is thought that the mouth rinse may connect with a receptor in the mouth that sends a signal to the brain indicating that food was on its way so reducing your perception of effort and making the exercise task easier. Nevertheless, this approach might not be great for your

fellow runners in a crowded marathon and once the exercise is for two hours or more, it is essential to swallow carbohydrate to get it on board.

With regard to energy gels, it can be difficult to know what concentration of carbohydrate you are getting with these products. If the carbohydrate is too concentrated (e.g. too much gel to liquid), it will be absorbed slowly and may pull fluid into the gut which reduces blood volume and is dehydrating. If the carbohydrate is not concentrated enough, there will not be enough available to the muscles leading to glycogen depletion.

Carbohydrates as solid food clearly take longer to digest than sports drinks, and you must eat solid foods with water. But if you like the taste of energy bars, you might like to try them as they are convenient to carry on the run and easy to consume.

Glucose, fructose, maltodextrin or other polymers – which are best?

Glucose, or glucose polymers such as maltodextrin, impact less on stomach emptying, and at an isotonic concentration (4-8%), can enhance carbohydrate absorption, preserve blood glucose and spare glycogen. A number of studies have found that consuming carbohydrates as a mixture of glucose and fructose, or maltodextrin and fructose, results in more energy being produced from the drink especially in the later stages of exercise. This may be because at standard concentrations and volumes, glucose, or glucose polymer, carbohydrate drinks only supply an additional 250kcal per hour, which is not sufficient to replenish the energy used in training or racing. Large amounts of fructose alone may reduce carbohydrate absorption and cause gastro-intestinal upset.

Other benefits of combined glucose/fructose drinks over conventional glucose-only products include better hydration due to increased amounts of water absorbed from the stomach and a reduced sense of fullness after consuming the same volume of drink.

Many popular sports drinks products do contain a combination of carbohydrate sources.

Hyponatremia

Hyponatremia defines a serum sodium less than 135 mEq/L (normal range 135-145 mEq/L). Signs and symptoms include bloating or a feeling of fullness in the stomach, nausea and vomiting, disorientation, headache, confusion and lethargy. You may feel unable to take in any more water, but also unable to urinate. Severely low serum sodium, especially if it develops rapidly, can be very serious and even fatal.

In athletes, hyponatremia is usually a result of excess fluid intake. Other risk factors include runners with a finishing time greater than four hours, those with low body mass index (BMI) and inexperienced runners. Slower marathon runners are running for longer and may therefore sweat more and consume too much fluid without sodium over a longer time period. Sodium (salt and chloride) is an essential for water to permeate cell walls and be redistributed throughout the body, to allow muscles to work and organs to function. Slower runners must be particularly aware of any possible signs and symptoms of hyponatremia both during the marathon and for 24h afterwards.

Actions to reduce the risk of hyponatremia:

- drink small amounts of fluids to stay hydrated, but don't overdose on water.
- use sports drinks which contain sodium and potassium.
- find out what drinks will be available in your marathon and train with them if possible
- include some foods containing salt after your event
- do not use salt tablets unless you know how to use them properly and can tolerate them
- avoid taking any form of painkillers during the race, as they can affect kidney function.

- before your long runs and your marathon, eat and drink a good breakfast that you have practised in training
- consider eating an energy bar, banana, some sports drink or an orange about half an hour before a long race or training run
- on race day, follow the hydration and fuelling strategy you have practised in training
- if during the marathon, or any training run, your stomach feels too full, or you can't take in more water or you don't feel well get medical help immediately.

Other important points re hydration

- Pure water should only be used for low-intensity or short-duration exercise. It is less easily absorbed than a sports drink, and consuming large quantities of water during prolonged exercise may increase the risk of hyponatremia.
- Post-exercise, water with high carbohydrate snacks may be suitable if you can eat soon after exercising.
- Alcohol generally impedes restoration of fluid balance, particularly at more than 4% alcohol content. So wait a while for that celebratory drink!!
- The temperature of drinks is largely an issue of personal preference. You may drink more if drinks are cooler than the ambient temperature and flavoured. Make sure any containers are easy to drink from.
- Remember, where possible, to acclimatise to possible race conditions during training in order to improve your tolerance of warm or hot conditions.