

EMPOWERING IRISH SPORT



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# HYDRATION

YOU ARE WHAT YOU DRINK





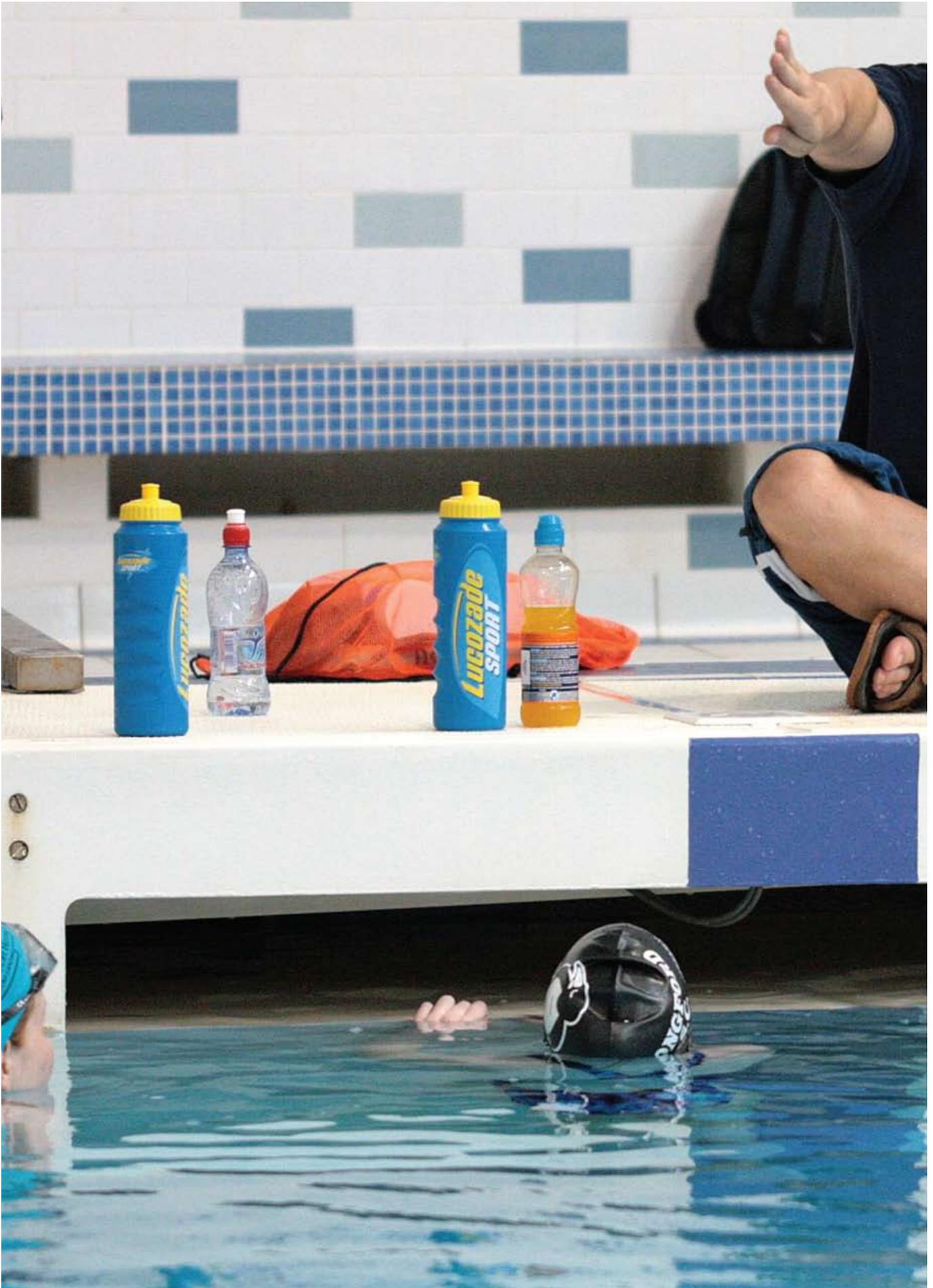
Written for Coaching Ireland by Sharon Madigan, Edited by Antonia Rossiter.



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# HYDRATION:

## YOU ARE WHAT YOU DRINK

*“There is no life without water”*

*- Albert Szent-Gyoygyi*

Adequate hydration is essential for good health and performance. Water is the most essential nutrient as the body can only survive for a few days without it. So with that in mind it is not surprising that this also applies to sport and performance.

Small levels of dehydration can have a negative effect on performance in training and competition. Even athletes who drink regularly during training often find it difficult to match the losses that occur during exercise. A key point to remember is that we can minimise the effect of dehydration by addressing fluid intake before exercise starts.

For most athletes some degree of dehydration will exist and is normal during exercise because sweat losses may exceed fluid intake. Some athletes find it difficult to drink enough fluids during exercise and in some sports access to fluids is limited.

The most recent guidance from the American College of Sports Medicine (ACSM, 2007) is that water is still the most reasonable choice of drink for exercise lasting less than 60 minutes; however, it is important to consider the variable nature of sports and the individual athletes in the sports. These new guidelines encourage individual behaviour and attitudes to be the focus for improving fluid intake and the need for personal experimentation to find the most suitable quantity and type of drink.

# ONE:

## WHY IS FLUID IMPORTANT?

Despite the climate we live in, fluid intake is essential for maintaining hydration on a daily basis. Water has a number of functions within the body, circulation of nutrients around the body, the removal of waste products and, very importantly, helping to keep our body temperature stable.

The human body consists of approximately 55 to 65% water and it is found in all parts of the body. Muscles are made up of approximately 70% water and it also makes up a large part of our blood. Additionally, every gram of carbohydrate or glycogen (the stored form of carbohydrate) holds 3 grams of water with it.

We lose fluid through a variety of different ways, most notably sweating and urination, with smaller losses through breathing and faecal losses. Water loss through breathing can be higher when the air is very dry, so athletes need to be mindful of this when training at altitudes where the air can be cold and dry.

Sweat losses will depend on a number of factors including body weight, genetic predisposition, protective clothing, the environment, the intensity and duration of the exercise. Research has shown that sweat rates can range between 0.5 to 2.0 litres per hour over a range of different sports in different environments (Bergeron, 2003; Broad et al, 1996; Burke et al, 2005; Maughan et al, 2005). There is considerable variability of sweat losses between individuals, even within the same sport on the same day, so individual plans are needed.

# TWO:

## DANGERS OF DEHYDRATION

Your health can also be affected if you don't drink enough on a daily basis. Your requirements for fluid are based on your body weight; however exercise will increase these overall requirements.

Fluid loss as little as 2% of body weight (1.4kg in a 70kg athlete) has been shown to decrease endurance performance (Casa et al, 2003). It is thought that it is a combination of effects, rather than any one in isolation, that causes dehydration to have an effect on exercise performance (ACSM, 2007).

Body temperature and heart rate increase during exercise. If the athlete is dehydrated, the body needs to work harder to regulate body temperature, causing further cardiovascular

strain (Sawka & Coyle, 1999). An increase in body temperature means that we are also less effective in the way we use carbohydrates. Even small fluid losses can cause exercise to seem more difficult and the body to tire more quickly.

Side effects of dehydration include:

- Poor concentration, co-ordination and reaction time
- Increased body temperature resulting in increased risk of heat stress/exhaustion
- Increased use of carbohydrate (glycogen stores) leading to quicker fatigue
- Increased heart rate/cardiovascular strain
- Exercise is perceived as being more difficult
- Nausea and gastrointestinal upset.



## THREE:

### HOW CAN I MONITOR HYDRATION?

Hydration can be measured in several ways. Weighing yourself before and after exercise is an easy and quick method to assess fluid balance and can be used in training and competition, although it does have limitations. Food/fluid intake and bowel function may need to be accounted for. However it is a good self-monitoring tool, especially if used in conjunction with other monitoring tools.

Urine colour (dark), smell (strong) and volume (small) can also tell you if you are dehydrated. Specific gravity measures the concentration of the urine and is another useful tool to measure hydration. This is done using a refractometer (which is a small hand held device) and a sample of the athlete's urine.

Each athlete or team needs to determine the method or methods that suit them best, and try to use them on a regular basis.



## FOUR:

### HOW MUCH DO I NEED?

Fluid intake needs to be specific to each athlete and it is influenced by many factors including exercise intensity, body size, environmental conditions and clothing. Athletes over 18 years are recommended to take 35mls per kg of body weight plus their usual losses from exercise. A 21-year-old footballer, weighing 80kg, will need 2800mls (2.8 litres) on a daily basis plus losses during exercise.

The easiest way to calculate usual losses is to weigh yourself before and after exercise. Any fluid losses should be replaced as soon as possible. During recovery, every 1kg of weight that is lost in exercise should be replaced by 1500mls.

When fluid losses are high (> 1000mls) athletes often find it difficult to replace fluids at the rate they are losing them. Small and frequent intakes of fluids tend to be better tolerated than taking on a lot at one time. However, the sport itself will probably dictate how much fluids can be consumed comfortably during competition.

Sports such as basketball and hockey may allow easy access to fluid, as they have timeouts and running benches, whereas soccer generally has limited opportunities to get fluid to players over 90 minutes. Sports should consider how they will get fluids to players during competition and may consider the use of a runner (similar to Australian Rules Football) to take fluids to players during competition if the rules will allow it.

# FIVE:

## RECOMMENDATIONS FOR FLUID INTAKE

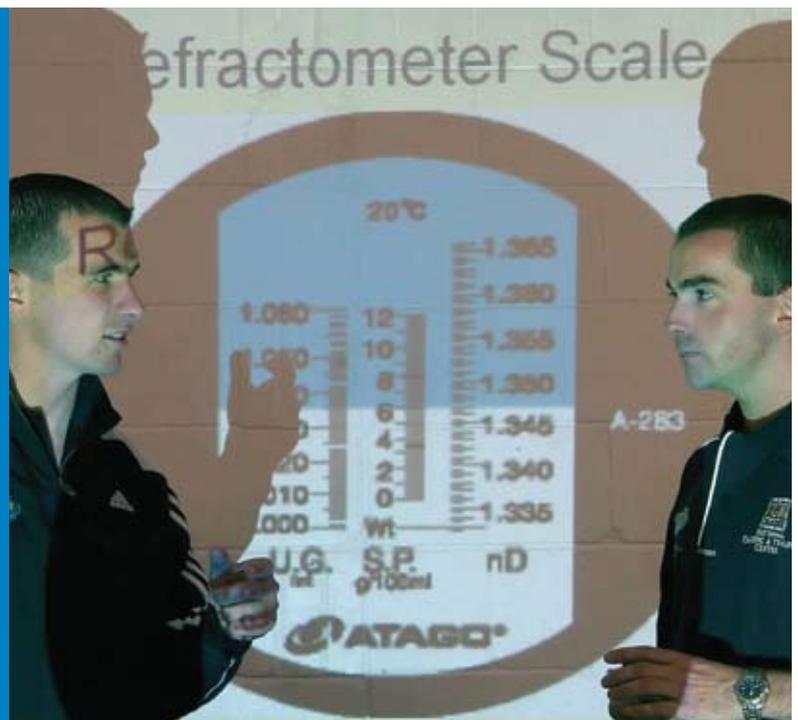
It is important to discuss your hydration strategy with your coach, nutritionist and sport scientist. The American College of Sports Medicine gives the following general guidelines:

- **Before Exercise:** When hydrating prior to exercise you should slowly drink 5 to 7mls per kg of body weight at least 4 hours before. For a 70kg athlete this is 350 to 490mls. If no urine is produced, or it is dark or concentrated, then more fluids need to be consumed (another 3 to 5mls per kg or 210 to 350mls for the 70kg athlete). Consuming drinks that contain sodium and/or small amounts of salted foods will help stimulate thirst and retain fluid.
- **During Exercise:** Each athlete needs to have a pre-planned practiced routine that suits his or her own requirements and sport. The aim of drinking during exercise is to prevent excessive dehydration. A suitable starting point may be 150 to 250mls every 15 to 20 minutes during activity. If this is not possible, athletes need to consume larger amounts at half time. This should be practised during training and at minor competitions.
- **After Exercise:** 1.5 litres of fluid need to be consumed for every 1kg of body weight lost. Drinks and snacks / food that contain sodium and carbohydrates will help speed up the recovery process by stimulating thirst and fluid retention, as well as replacing the glycogen stores that have been used during exercise.

Athletes who compete in weight category sports (lightweight rowing, judo, boxing) may need to develop specific drinking plans for after their weigh-in. This is especially important if there is only a short time between weigh-in and competition. Rehydration solutions may be useful for athletes who have employed some element of dehydration to lose weight.

Athletes should be encouraged to make weight through losses in body fat over the long term rather than short term weight loss from fluids, as this will affect performance. This is especially important in a tournament situation, where you may have to weigh in on subsequent days.

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## SIX:

### WHAT SHOULD I DRINK?

Sweating causes the loss of electrolytes (salts) and water from the body. Drinking fluids can prevent dehydration and rehydrate an athlete. Sports drinks have the added benefit of easily providing fuel, usually in the form of carbohydrates, and replacing electrolytes lost through sweat. Carbohydrate is an important fuel for exercising muscles, but it will also aid water absorption so long as it is at the right concentration.

Hypotonic drinks are drinks where the carbohydrate concentration is very low or absent (< 2%). Examples are sports waters (< 2g carbohydrate per 100mls) or very dilute squash or sports drinks. These may be useful for those who are monitoring their weight and restricting calorie intake, or where fluid intake is a priority (warm conditions), as well as where rapid rehydration is required.

Isotonic sports drinks are made to have a concentration (osmolality) close to body fluids. This means that the body absorbs the fluid and fuel more readily than pure water. There is usually 6 to 9% of carbohydrate (6 to 9 g per 100mls) and

some sodium added to these drinks. These can be made up at home, or there are a variety of commercial ones available to buy. These drinks are useful to top up carbohydrate stores just before, during and directly after intense exercise lasting longer than 60 minutes.

Hypertonic drinks have a carbohydrate concentration greater than 10% (> 10g per 100mls). Examples are fizzy drinks and fruit juices. They are more a food than a fluid and may increase the risk of de-hydration and stomach upset. They are useful to help achieve optimal carbohydrate intakes, but should not be used immediately before or during exercise.

Recently some sports drinks have had protein added along with carbohydrates. These drinks are particularly useful in recovery from exercise, as they help promote muscle growth and recovery of carbohydrate stores. They can be used after high intensity or endurance type exercise and are particularly useful for athletes who may not like to drink milk-based drinks, which can be used as a way of replacing carbohydrates and protein.

## SEVEN:

### HYPONATREMIA

There have been some incidences where athletes have hyper-hydrated (taken in too much fluid, particularly water), especially in endurance or ultra endurance events. This occurs when the normal sodium concentration of the blood is diluted, and is associated with symptoms such as confusion, headaches, fatigue and, most seriously, coma.

This is a rare event, but it is caused when excessively large volumes of low sodium (salt) drinks are taken during prolonged exercise. Those most at risk of hyponatraemia are small athletes who may not sweat a lot and are drinking large volumes of salt free drinks. This is another reason why individual athletes should monitor their own personal losses, which are unique to themselves.

## EIGHT: PRACTICAL TIPS

- Each athlete needs to know their own needs. Basic daily requirements might be adequate if you have a desk job or are driving all day but if you have a manual job as well as a heavy training load you will need more fluids.
- If you are well hydrated you should be producing urine every couple of hours.
- Urine that is clear in colour and not strong in smell typically indicates that you are well hydrated. However if you take a vitamin supplement or sports drinks the B-Vitamins can cause your urine to be a bright yellow colour.
- Consider specific gravity of urine as a measure of hydration status. This is especially useful to measure pre training and competition hydration status. Coaches and athletes can gauge if they are coming to training and events well hydrated.
- Drink a wide range of fluids, water, sugar free dilute squash, fruit juices, soup and sports drinks. Water will also be obtained from foods; for example, fruit and vegetables that have high water content.
- If you are drinking a lot of sugary drinks you need to be careful with your teeth. Brush and floss regularly and rinse the mouth out with water after consuming these drinks.
- Contrary to popular opinion, caffeine consumption will not have a huge effect on daily urine output or hydration status (ACSM, 2007).
- Alcohol consumption can increase urine output and delay full rehydration (ACSM, 2007). Drinking alcohol in recovery means you are less likely to be drinking appropriate fluids required to rehydrate.
- Some athletes (jumpers, sprinters and throwers) may need to monitor the effect of large volumes of fluid on their performance. Is the weight of the fluid that they are carrying around more detrimental than being slightly dehydrated? This is where individual and practiced plans, in consultation with the relevant specialists, are essential.

## NINE: FACT SHEET SUMMARY

This fact sheet has highlighted the importance of proper hydration in an athlete's training regime. In order to ensure that optimum performance is achieved, and to avoid any detrimental side effects, a carefully thought out and appropriate hydration programme is essential.

While general guidelines can be drawn, every athlete's requirements vary. For this reason it is important to discuss your hydration strategy with your coach, nutritionist and sport scientist when planning any training regime.



# REFERENCES

**AMERICAN COLLEGE OF SPORTS MEDICINE.** Exercise and Fluid Replacement. *Medicine and Science in Sports and Exercise* 2007.

**CASA DJ, CLARKSON PM, ROBERTS WO.** American College of Sports Medicine Roundtable on Hydration and Physical Activity: Consensus Statements. *Current Sports Medicine Reports*. 4: 115-127; 2005.

**SAWKA MN & COYLE EF.** Influence of Body Water and Blood Volume on Thermoregulation and Exercise Performance in the Heat. *Exerc. Sport. Sci. Rev.* 27: 167-218, 1999.

**BERGERON, M.F. 2003.** Heat Cramps: Fluid and Electrolyte Challenges During Tennis in the Heat. *Journal of Science and Medicine in Sport* 6: 19-27.

**BROAD, E.M., L.M. BURKE, G.R. COX, P. HEELEY AND M. RILEY. 1996.** Body Weight Changes and Voluntary Fluid Intakes During Training and Competition Sessions in Team Sports. *International Journal of Sport Nutrition* 6: 307-320.

**BURKE, L.M., C. WOOD, D.B. PYNE, R.T. TELFORD AND P. SAUNDERS. 2005.** Effect of Carbohydrate Intake on Half-Marathon Performance of Well-trained Runners. *International Journal of Sport Nutrition and Exercise Metabolism* 15: 573-589.

**MAUGHAN, R.J., S.M. SHIRREFFS, S.J. MERSON, AND C.A. HORSWILL. 2005.** Fluid and Electrolyte Balance in Elite Male Football (soccer) Players Training in a Cool Environment. *Journal of Sports Sciences* 23: 73-79



Coaching Ireland

University of Limerick, Limerick, Ireland t +353 61 202 895 f +353 61 202 868  
e [info@coachingireland.com](mailto:info@coachingireland.com) [www.coachingireland.com](http://www.coachingireland.com)