

## THE FACTS: WHAT THE RESEARCH HAS TO SAY...

The findings of scientific research overwhelmingly indicate that sports drinks containing electrolytes (particularly sodium) and a low carbohydrate concentration (4-8%), improve performance more effectively than plain water. Research has demonstrated that such sports drinks are more effective at restoring bodily fluid levels, whilst at the same time having the additional benefit of supplementing the bodies limited stores of carbohydrate.

Much of this research has been conducted using exercise bouts

lasting an hour or longer. Research findings confirm that ingestion of carbohydrate solutions results in improved exercise performance in such long duration activities. However there is a growing body of evidence indicating that players and athletes involved in shorter duration (less than an hour) and intermittent, high intensity activities (for example, tennis and soccer) may also benefit from simultaneous fluid and carbohydrate replenishment.

## ..... & FINALLY

The importance of adequate fluid intake in order to maintain performance should not be underestimated. The primary benefit of fluid ingestion during exercise is that it helps to maintain cardiac output. Thereby maintaining adequate blood flow to both the working muscles (providing the oxygen necessary for energy metabolism), and to the skin facilitating a high rate of heat removal and therefore preventing excessive storage of body heat.

An additional consequence of intense exercise is a gradual depletion of the body's fuel stores.

The inclusion of low concentrations of carbohydrate in sports drinks can serve to offset such losses and therefore may serve to prolong exercise duration and maintain exercise intensity.

The inclusion of sodium is recommended as it enhances the palatability of the drink, maintains thirst and promotes greater fluid retention.

## HANDY HINTS

- Practice drinking during training to become accustomed to drinking fluids while exercising.
- Make sure you are fully hydrated prior to competition or training by ensuring a high fluid intake in the days prior to competition.
- Thirst alone is not a good indicator of fluid requirements. Typically sports people tend to replenish 1/3 to 2/3 of sweat losses.
- When exercising it is important to drink early and often. Research demonstrates that dehydration can occur in as little as 20 minutes. Drinking when dehydrated may cause gastrointestinal distress.
- Water is not the optimum hydration drink. Water effectively reduces thirst and stimulates urine production.

Produced by:



Produced by:  
**National Coaching & Training Centre**  
 University of Limerick, Limerick, Ireland  
 Tel: +353-61-202895  
 Fax: +353-61-338174  
 Email: sports info@ul.ie

Sponsored by:



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 COACHING & TRAINING  
 CENTRE  
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"Aside from the limits imposed by heredity and the physical improvements associated with training, no factor plays a bigger role in exercise performance than does nutrition."

Dr. David Costill,  
 Exercise physiologist  
 1998

SNAP Printing, Limerick.

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# Keeping Topped up... Fluid & Fuel Replacement

## WHY & HOW?:

It is now common to see athletes and games players drinking regularly from sports bottles during training and competition. However, the wealth of information regarding fluids and exercise often leads to confusion about what, when and how much to drink. Substantial benefits can result from the inclusion of an oral rehydration sports drink as part of a well-balanced healthy diet. To obtain these benefits, the athlete must have the necessary knowledge to, firstly, select an appropriate sports drink and, secondly, to know when and how often to top-up fluid and fuel stores. The purpose of this fact sheet is to provide the sportsperson with the information necessary to correctly answer these questions. To do this it is first of all necessary to review some basic exercise physiology....

## WHAT HAPPENS TO THE BODY IN RESPONSE TO VIGOROUS EXERCISE?

A direct consequence of physical activity is an increase in internal (core) body temperature. This increase in temperature occurs as a result of both the mechanical heat generated by the active muscles and as a consequence of the chemical reactions associated with metabolic energy production.

Humans can tolerate only small increases (<5°C) in internal temperatures. The consequences of overheating range from under performance and simple heat cramps to life-threatening heat stroke.

## WHY DO WE SWEAT?

In order to regulate core temperature and protect from the adverse effects of excessive heat accumulation the body must initiate various heat regulation mechanisms.

The sweat response is the primary method the body employs to lose heat and to maintain an optimal body core temperature during exercise. The evaporation of sweat accounts for up to 80% of heat losses during vigorous activity. A moderate exercise workout generally produces 0.5 - 1.5 litres of sweat loss over a 1 hour period.

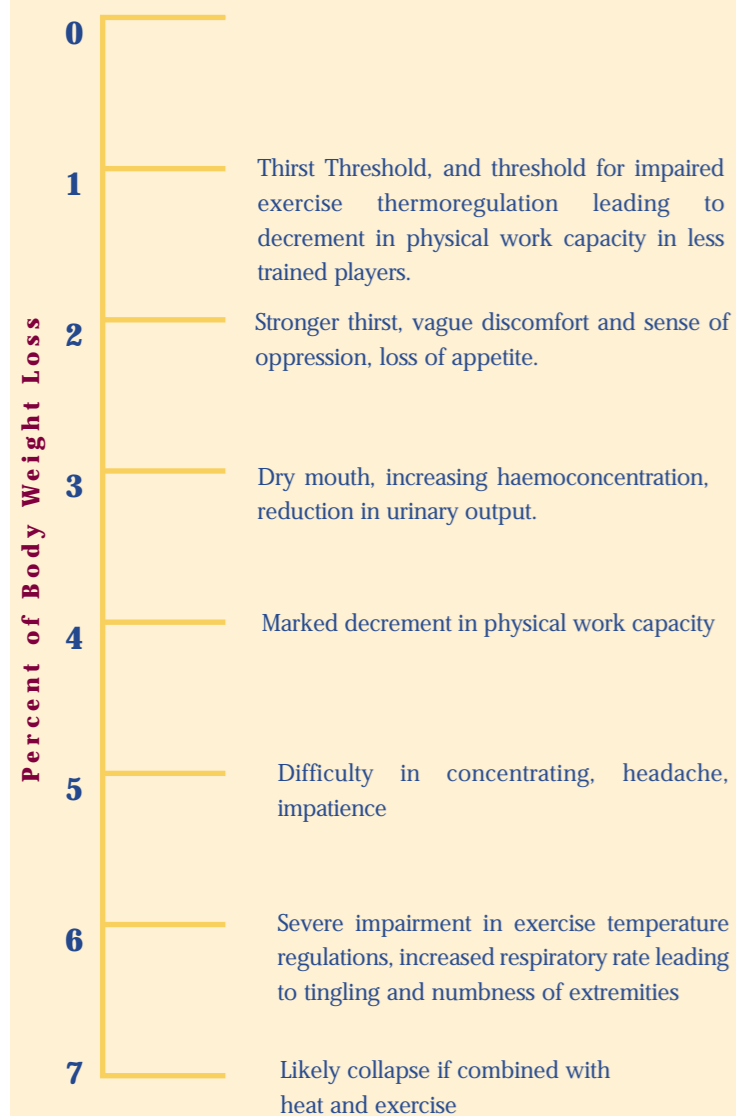
The heat required to convert the liquid sweat lying on the skin to vapour (in other words to 'boil' the sweat) is taken from the body, leading to a reduction in the total amount of body heat. Sweating therefore fulfils an essential function in the regulation of body temperature, however there is a price to pay!

Our bodies consist of approximately 55-65% fluid, when some of this fluid is lost, our ability to function adequately is compromised. Fluid loss places a significant strain on circulatory function, which ultimately impairs exercise capacity.

## THE DANGERS OF DEHYDRATION

Dehydration occurs when fluid loss is not replaced by fluid intake. As body fluid levels are reduced blood plasma volume decreases. This means that there is less blood available to maintain vital oxygen supplies to the working tissues of the body, as a result the heart must work harder to fulfil the body's oxygen demands. Also there is now less blood available to fulfil the cooling function of transporting heat from the body's core to its surface. Therefore as an individual begins to dehydrate their ability to regulate heat declines resulting in further sweat loss and an ever-worsening dehydration condition. Dehydration, in cases of extreme heat and chronic fluid deprivation can be fatal, although during athletic activities such occurrences are extremely rare. What is of more immediate concern to the athlete is the fact that physical abilities deteriorate in conjunction with dehydration, resulting in premature fatigue. Sweat losses of as little as 2% of body weight have been demonstrated to adversely affect athletic performance (see Table 1).

**Table 1**  
**ADVERSE EFFECTS OF DEHYDRATION**



Adapted From: Greenleaf, J.E. and M.H. Harrison. Water and electrolytes. In: Nutrition and Aerobic Exercise, edited by D.K. Layman. Washington, D.C.: American Chemical Society, 1986. P.107 - 124

## WHAT ARE SPORTS DRINKS

Sports drinks are commercially available preparations designed to promote rapid fluid and carbohydrate replacement, thereby enhancing exercise performance

## REPLACING WHAT'S LOST

The primary benefit of water replacement during exercise is that blood volume is maintained, facilitating the efficient transfer of heat from the body's core to the skin, thereby preventing excessive storage of body heat. Maintaining optimum blood volume is also essential in facilitating the efficient supply of oxygen to the working muscles. There is an additional cooling benefit if the ingested liquid is cooler than body temperature. But water is not the only constituent of sweat nor is it the only limited bodily resource depleted during exercise, therefore is it reasonable to expect water to be the ideal fluid replacement beverage?

## HOW TO CHECK FOR HYDRATION STATUS

- Monitor weight before and after exercise. For each kilo of weight lost drink 1.2 to 1.5 litres of fluid
- Urine should be pale in colour (except first thing in the morning)
- Thirst is an unreliable indicator of fluid requirements, therefore carry a drinks bottle with you at all times and drink regularly.
- Avoid alcohol drinks (especially spirits) and caffeine based drinks such as tea, coffee and coke.

## WHAT DRINK IS BEST? WATER V'S SPORTS DRINKS

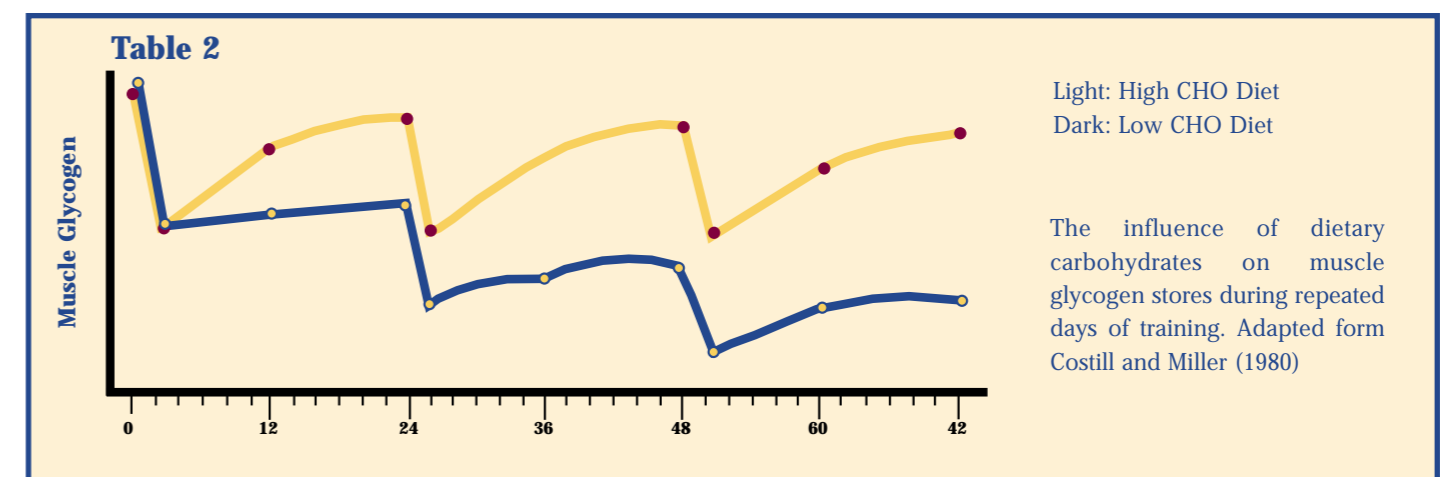
An additional consequence of prolonged exercise is the depletion of bodily stores of carbohydrate. Carbohydrate is the body's preferred fuel for energy during intense exercise. However our reserves of carbohydrate are limited and during prolonged exercise these stores can become depleted resulting in a reliance on less efficient fuel sources, and an associated decrease in sporting performance. Replenishment of carbohydrate stores is therefore necessary for optimum sporting performance in events of an extended duration.

In order to maximise sports performance it is imperative that both hydration levels and carbohydrate stores are maintained at optimum levels.

Individuals with gruelling training schedules, consisting of multiple sessions per week, and those who compete in events lasting up to an hour or more may find it difficult to effectively replace fluid and fuel losses. The complete replenishment of carbohydrate stores through solid food sources may involve eating large volumes of bulky complex carbohydrates; this is not always practical or comfortable for those with high-energy expenditures and busy schedules. Concentrated carbohydrate sources such as commercially available energy bars or

carbohydrate replacement drinks, in addition to the consumption of solid food sources of carbohydrate, allows the athlete to fully replenish carbohydrate stores without compromising a healthy diet. In addition a properly formulated isotonic energy replacement drink has the dual benefit of simultaneously replenishing both fuel and fluid losses.

The benefits of carbohydrate feeding during exercise are well documented (See Table 2). Carbohydrate is present in the body as glycogen, in the muscle and liver, and as glucose in the blood. A decrease in carbohydrate availability will negatively affect sporting performance. Consumption of a sports drink containing low (isotonic) concentrations of carbohydrate during exercise can benefit high intensity, long duration aerobic exercise and also repetitive short bouts of near-maximal efforts. It does this by either sparing muscle glycogen, and/or, by maintaining blood glucose levels. Consumption of an appropriate sports drink can thereby also prevent the headaches, dizziness and nausea often associated with exercising under conditions of low blood glucose levels. Blood glucose also supplies muscles with glucose when glycogen supplies become depleted.



## THE ROLE OF SODIUM

A key benefit of isotonic sports drinks is that sodium and other electrolytes that are lost through sweating are included as ingredients. Changes in sodium concentrations play a vital role in both retaining ingested fluid and in promoting thirst. One of the limitations of using water as a rehydration fluid is that it is very effective at satisfying thirst. When thirst is removed we tend to drink less although we may still be dehydrated. The value of water as a rehydration fluid is further diminished by the fact that it stimulates urine output, thus reducing fluid retention and slowing the rehydration process. In contrast, a beverage containing sodium maintains thirst, improves palatability, slows the rate of urine production, and enhances fluid retention. The inclusion of an appropriate amount of sodium should therefore be considered an essential element of any properly formulated sports drink.

The inclusion of carbohydrate, in appropriate isotonic concentrations, and sodium does not negatively affect the rate of fluid absorption. Isotonic sports drinks are absorbed as quickly as plain water and will be retained more effectively in the body.

## WHAT TO LOOK FOR IN A SPORTS DRINK

- No caffeine, which is a diuretic and may contribute to dehydration
- Not carbonated, which can lead to gastric bloating
- The right concentration of carbohydrate - isotonic proportions, 6-8% carbohydrate
- An appropriate form of carbohydrate - Glucose, sucrose, maltodextrin, or a combination of these. Fructose is not suitable as the only carbohydrate source as it may cause gastrointestinal distress. It may however be used in combination with other carbohydrate forms.
- Palatable taste
- Drink should be cool, not warm