

The Nutritional Demands of Swimming

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Demands of the sport

Swimming involves long duration training sessions once or twice a day or more. It involves both anaerobic and aerobic metabolism depending on the distance which can range from 50 to 1500 metres.

British Swimming is the National Governing Body for Swimming, Diving, Synchronised Swimming, Water Polo and Open Water in Great Britain. It is responsible internationally for the high performance representation of the sport. ⁴

The members of British Swimming are the three Home Countries national governing bodies of England (Amateur Swimming Association), Scotland (Scottish Amateur Swimming Association) and Wales (Welsh Amateur Swimming Association).

British Swimming seeks to enable its athletes to achieve gold medal success at the Olympics, Paralympics, World Championships and Commonwealth Games.

The ASA supports 1,220 affiliated swimming clubs through a National/Regional/County structure. ¹

There are 4 swimming strokes: Breast stroke, backstroke, butterfly and freestyle. In competitions individuals and teams of swimmers race medleys which incorporate all 4 strokes.

Races are typically divided into sprint (50-100m), middle distance (200-400m) and distance events (800-1500m)

Training requirements

Programmes are often based on the experience and expertise of their coaches rather than a set formula or scientific evidence. Elite swimmers train 1-3 times a day. This depends on the phase of training and where they are in the competition season. Pool sessions involve aerobic warm ups and cool downs, drills to improve techniques and practice of starts and turns. Swimmers do land training to complement their water based sessions consisting of stretching and flexibility work as well as specific resistance work. Running and cycling is also undertaken by some swimmers

Swimming requires the swimmer to dedicate a great deal of time to the huge training volumes and also require them to be highly coordinated and flexible

Competition

At international level competitive swimming is organised under the rules of La Federation Internationale de Nation (FINA). Long course (50m pool) and short

course (25m pool) programmes are run. The Olympics include only the long course format. It is usual for a swimmer to compete in one event only although exceptional Olympians Ian Thorpe and Michael Phelps have competed in many events with 2 or 3 races in the heats/finals. World Cups and Grand Prix series of competitions also provide opportunities for swimmers to compete on the world stage. Elite swimmers organise their competition programme so they peak at one or two international meets per year including qualification trials when the national team is selected. For younger swimmers swimming is organised through schools and clubs with divisions for age groups

Physiological demands

Success in swimming depends on the production of huge amount of power combined with efficient technique and high degree of coordination making their sport look effortless. Competitive swimming involves high rates of energy turnover with relative emphasis on anaerobic glycolysis for sprint events and aerobic glycolysis for distance events. Both male and female swimmers tend to be taller and leaner than non swimmers with long limbs and high level of muscularity in legs and upper body. Breast stroke swimmers tend to be smaller than those who do backstroke or freestyle. All swimmers try to maintain a lean physique with low body fat levels although there is little research to support improved performance solely due to low body fat levels, rather a lean body mass is a predictor of swimming ability. Indeed despite lack of scientific research there is still a culture in swimming for female swimmers to be very lean which can lead to poor body image, restricted eating and occasionally eating disorders³

Nutrition and Performance

Key nutritional Issues

Energy Requirements

Male swimmers report to have high energy needs relative to body mass (4-5,000kcal daily) although different phases of the competitive calendar mean that adjustments in food intake are made to compensate (high volume training, tapering off and off season)²

Female swimmers undertaking 14-18 hours training a week have been reported to consume between 2-2,600kcal daily. It is hard to estimate actual needs as many females, especially those during adolescence who struggle with changes in physique and so may underreport their intakes³

Recovery

Swimmers need to recovery after training or competition. Carbohydrate stores (glycogen) must be rapidly restored to enable quality training and adaptation to training to be maintained. The best time to restore the muscle glycogen stores is during the first hour after pool or land training. This is when a swimmer needs to consume carbohydrate as soon as possible. It is of utmost importance if the swimmer has more than one session a day, if glycogen stores are not replenished

adequately then fatigue will be a consequence and the associated poor quality training which will then ensue. Swimmers should aim for 1 - 1.2g carbohydrate per kg body weight immediately and then repeated until they eat their next meal.

There has been many studies looking at the consumption of a protein food/drink alongside carbohydrate in the recovery period (breakfast cereal and milk, milk based smoothie) 10-20g protein have been suggested as a way of increasing protein synthesis and reduce muscle breakdown especially after land based resistance training sessions⁶

Body image issues

Swimmers need to achieve and maintain optimal power to body mass ratio and there is a culture of having a low body fat which for female swimmers can pose difficulties especially during adolescence

Early morning training poses a dilemma as nutritional advice states it is best, for digesting food, to eat 2-3 hours before a training session. This is often impractical so swimmers are advised to eat carbohydrate snacks that are easily prepared and quickly digested.

Post recovery snacks are well documented as being of utmost importance in fuelling the body's carbohydrate stores after heavy training sessions. A supply of suitable snacks should be available at all times to ensure an optimal recovery.

Hydration issues

Dehydration can contribute significantly to fatigue and be detrimental to swimming performance – not only physically but also mental skills such as skill and decision making can be affected. Average sweat losses have been estimated at 365ml/hr and 415 ml/hr for female and male swimmers respectively, with sweat losses greater during the anaerobic threshold sessions than aerobic sessions⁵

Performance is likely to be impaired when a swimmer become dehydrated by as little as 2%. A 2% weight loss due to dehydration in a 70kg swimmer is equal to 1.4 kg

Competition issues

During tapering phase swimmers need to adjust their energy intake to prevent excessive weight gain. They need to be adequately prepared with appropriate fuel sources for multiday competitions and post recovery snacks between heats, semis and finals

Swimmers need to be aware of the requirements for food and fuel when travelling to competitions

Some practical solutions for swimmers

Early mornings

Examples of suitable foods/drinks include:

Smoothies/bananas or other fresh fruit/waffles/pancakes/breakfast cereals/porridge

Cereal bars

Foods should be low fat (use skimmed or semi skimmed milk with the cereals) and lowish in fibre to prevent discomfort while training.

Post recovery snacks

Examples of suitable choices include:

- Milkshakes/yoghurts/chicken sandwich (very low fat mayonnaise or none)
- Ham roll/raisins/sultanas/teacake/currant bun/scone and jam

Hydration

Dehydration can be avoided by:

- Drinking plenty of fluids throughout the day, not just when in the pool
- Carrying a drinks bottle with water at all times and drinking frequently
- Never being thirsty. Being thirsty means a swimmer is already dehydrated
- Taking an isotonic sports drink and/or water to all training sessions. Isotonic drinks do have an advantage over plain water as they are rapidly taken up by the body and provide extra carbohydrates
- Taking plenty of fluids with you. One 500ml bottle is unlikely to be enough
- The following is just a suggestion
- Before training: 500ml fluid 2 hours before
125-250ml immediately before
- During training: 125-200ml fluid every 15 minutes during
- After training: Drink 600ml as soon as possible to try and replace losses
- Checking urine colour! Urine colour is a good indicator of hydration status. If a swimmer is well hydrated, urine will be a pale colour, be odourless and there will be plenty of it!

As swimmers are already wet they are generally unaware of their sweat losses in the pool. To calculate how much a swimmer is losing in sweat during a session they can weigh themselves before and immediately after the training session. A loss of 1kg is equal to losing a litre of sweat. The swimmer needs to rehydrate by drinking 1.5 times the fluid loss over a period of 1-2 hours.

NOTE: Pools are often hot and humid, ideal for bacterial growth in warm sugary sports drinks – placing the drinks in a cool bag at the side of the pool will help to keep these drinks cool, more palatable and reduce the risk of contamination from bacterial growth

Travelling and Competition issues

Adequate carbohydrate and fluid levels require a planned approach, starting with a strategy for travelling. Researching routes and venues will help with the planning and if necessary, allow the swimmer to plan what food and fluid will need to be taken in their luggage. A selection will need to be taken to the competition pool to allow for refuelling and rehydration after each event. Issues such as storage, drug protocol (sealed containers and taking own supplies helps with this issue) need to be thought about. Foods such as cereal bars, fresh and dried fruit, jelly sweets and home made rolls and sports drinks are all suitable at this stage. Meets in hot environments mean that hydration needs are of paramount importance

1. ASA: <http://www.swimming.org/asa>
2. Barr, S I., and Costill, D.L., 1992 Effect of increased training volume on nutrient intake of male collegiate swimmers. *Int. J. Sp. Med* 13:47-51
3. Burke L, *Practical Sports Nutrition* 2007
4. British Swimming: <http://www.swimming.org/britishswimming>
5. Cox G.R, et al, 2002 Body mass changes and voluntary fluid changes of elite level water polo players and swimmers. *J. Sci & Med in Sp* 5:183-193
6. Jeukendrup A, Gleeson M. *Sport nutrition An introduction to energy production and performance* 2nd Ed. Human Kinetics 2010

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