Diet and Sports Performance

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Abstract

This position paper reviews the current scientific data related to the energy needs of athletes, assessment, special nutrient needs during training, the use of supplements and nutritional ergogenic aids, and the nutrition recommendations for vegetarian athletes. During times of high physical activity, energy and macronutrient needs-especially carbohydrate and protein intake-must be met in order to maintain body weight, replenish glycogen stores, and provide adequate protein for building and repair of tissue. Fat intake should be adequate to provide the essential fatty acids and fat-soluble vitamins, as well as to help provide adequate energy for weight maintenance. Overall, diets should provide moderate amounts of energy from fat (20% to 25% of energy); however, there appears to be no health or performance benefit to consuming a diet containing less than 15% of energy from fat. Body weight and composition can affect exercise performance, but should not be used as the sole criterion for sports performance; daily weigh-ins are discouraged. Consuming adequate food and fluid before, during, and after exercise can help maintain blood glucose during exercise, maximize exercise performance, and improve recovery time. Athletes should be well-hydrated before beginning to exercise; athletes should also drink enough fluid during and after exercise to balance fluid losses. Consumption of sport drinks containing carbohydrates and electrolytes during exercise will provide fuel for the muscles, help maintain blood glucose and the thirst mechanism, and decrease the risk of dehydration or hyponatremia. Athletes will not need vitamin and mineral supplements if adequate energy to maintain body weight is consumed from a variety of foods. However, supplements may be required by athletes who restrict energy intake, use severe weight-loss practices, eliminate one or more food groups from their diet, or consume high-carbohydrate diets with low micronutrient density. Nutritional ergogenic aids should be used with caution, and only after careful evaluation of the product for safety, efficacy, potency, and whether or not it is a banned or illegal substance. Nutrition advice, by a qualified nutrition expert, should only be provided after carefully reviewing the athlete's health, diet, supplement and drug use, and energy requirements.The link between good health and good nutrition is well established. Interest in nutrition and its impact on sporting performance is now a science in itself. Whether you are a competing athlete, a weekend sports player or a dedicated daily exerciser, the foundation to improved performance is a nutritionally adequate diet.

***Key Word**-Diet, Sports, Traning.*

Introduction

Dietary supplements are used by athletes worldwide. In the United States, the Dietary Supplement Health and Education Act has defined dietary supplements as something added to the diet, mainly vitamins, minerals, amino acids, herbs or botanicals, and metabolites/constituents/extracts, or combination of any of these ingredients. In addition to actual food products targeted to athletes and physically-active individuals, numerous companies have marketed dietary supplements to athletes, often with the claim that sports performance may be enhanced. This is the first in a series of six articles to discuss the major classes of dietary supplements listed above. The major focus will be on efficacy of such dietary supplements to enhance exercise or sport performance, with brief coverage of safety, legality, and ethicality.

Daily training diet requirements

The basic training diet should be sufficient to:

- provide enough energy and nutrients to meet the demands of training and exercise
- enhance adaptation and recovery between training sessions
- include a wide variety of foods like wholegrain breads and cereals, vegetables (particularly leafy green varieties), fruit, lean meat and low-fat dairy products to enhance long term nutrition habits and behaviours
- enable the athlete to achieve optimal body weight and body fat levels for performance
- provide adequate fluids to ensure maximum hydration before, during and after exercise
- promote the short and long-term health of athletes.

Recommendations

The ideal diet for an athlete is not very different from the diet recommended for any healthy person. However, the amount of each food group you need will depend on:

- The type of sport
- The amount of training you do
- The amount of time you spend doing the activity or exercise

People tend to overestimate the amount of calories they burn per workout so it is important to avoid taking in more energy than you expend exercising.

To help you perform better, avoid exercising on an empty stomach. Everyone is different, so you will need to learn:

- How long before exercising is best for you to eat
- How much food is the right amount for you

The athlete's diet

An athlete's diet should be similar to that recommended for the general public, with energy intake divided into:

- more than 55 per cent from carbohydrates
- about 12 to 15 per cent from protein
- less than 30 per cent from fat.

Athletes who exercise strenuously for more than 60 to 90 minutes every day may need to increase the amount of energy they get from carbohydrates to between 65 and 70 per cent.

More recent advice also provides guidelines for carbohydrate and protein based on grams per kilogram (g/kg) of body weight. The current recommendations for fat intake are for most athletes to follow similar recommendations to those given for the general community, with the preference for fats coming from olive oils, nuts, avocado, nuts and seeds. Athletes should also aim to minimise intake of high-fat foods such as biscuits, cakes, pastries, chips and fried foods.

In addition to regular training, consuming the proper caloric intake every day helps to boost your athletic performance. Often this caloric intake depends upon a number of factors, including gender, body type and size, activities performed and performance goals. At the most basic level, athletes need to eat at least 1,800 calories per day, according to the President's Council on Fitness, Sports and Nutrition Additional calories increase based on the activity performed.

Endurance

Endurance athletes, particularly runners should consume more calories based on their body weight, gender and average amount of miles ran per day. Men should consume 6 to 10 percent more calories than women each day because they require more calories for the muscles to properly function and tend to burn a greater number of calories on average than women. Consider this comparison: a 130-pound woman who runs 30 miles a week requires 18 to 20 calories per pound (about 2,400 calories a day) while a 160-pound man who runs the same amount should consume 20 to 22 calories per day (about 3,200 calories per day). Endurance athletes should consume a base of nutritionally sound foods, such as low-fat proteins, vegetables, fruits, low-fat dairy products, and soy foods. These type of athletes also should consume a meal high in carbohydrates and protein following a long run.

Resistance Training

Compared to endurance athletes, resistance exercisers require significantly less calories because they often perform less aerobic activity; aerobic activities burn more calories than resistance training. Weightlifters and bodybuilders focus not only on the amount of calories on the whole, but also the composition of carbohydrates, fats and protein contained within those calories. If you wish to increase muscle mass with resistance training, you should consume higher levels of protein. When working to build muscle mass, consume an average of 1.5 to 1.7 grams of protein per kilogram of body weight. Athletes should consider their daily caloric requirements based on their basal metabolic rate (BMR), which is the amount of calories needed to sustain your body weight. Consume more calories than your caloric expenditure in order to see muscle gain. For example, if you're a 150-pound man whose body fat is between 18 and 22 percent, you have a BMR of 1,620 calories. As a weightlifting athlete at the same weight, you should consume at least 2,120 calories per day to gain muscle.

Competitive Athletes

Competitive athletes who practice and train daily for the equivalent hours of a full-time job have very high caloric needs in order to support their activity. Competitive athletes may require up to 6,000 calories a day for men and as many as 4,000 calories for women. These types of athletes should consume five or six small meals per day in order to consume the needed calories to sustain athletic performance. These types of requirements are associated with professional football players, swimmers and tennis players.

Carbohydrates and exercise

During digestion, all carbohydrates are broken down into sugar (glucose), which is the body's primary energy source. Glucose can be converted into glycogen and stored in the liver and muscle tissue. It can then be used as a key energy source during exercise to fuel exercising muscle tissue and other body systems. Athletes can increase their stores of glycogen by regularly eating high-carbohydrate foods. If carbohydrate in the diet is restricted, a person's ability to exercise is compromised because there is not enough glycogen kept in storage to fuel the body. This can result in a loss of protein (muscle) tissue, because the body will start to break down muscle tissue to meet its energy needs, and may increase the risk of infections and illness.

Carbohydrates are essential for fuel and recovery

Current recommendations for carbohydrate requirements vary depending on the duration, frequency and intensity of exercise. Foods rich in unrefined carbohydrates, like wholegrain breads and cereals, should form the basis of the athlete's diet. More refined carbohydrate foods (such as white bread, jams and lollies) are useful to boost the total intake of carbohydrate, particularly for very active people. Athletes are advised to adjust the amount of carbohydrate they consume for fuelling and recovery to suit their exercise level. For example:

- Light intensity exercise (30 mins/day): 3–5 g/kg/day
- Moderate intensity exercise (60 mins/day): 5–7 g/kg/day
- Endurance exercise (1–3 hrs/day): 6–10 g/kg/day
- Extreme endurance exercise (more than 4 hrs/day): 8–12 g/kg/day

Carbohydrates are needed to provide energy during exercise. Carbohydrates are stored mostly in the muscles and liver.

- Complex carbohydrates are found in foods such as pasta, bagels, whole grain breads, and rice. They provide energy, fiber, vitamins, and minerals. These foods are low in fat.
- Simple sugars, such as soft drinks, jams and jellies, and candy provide a lot of calories, but they do not provide vitamins, minerals, and other nutrients.
- What matters most is the total amount of carbohydrates you eat each day. A little more than half of your calories should come from carbohydrates.

You need to eat carbohydrates before you exercise if you will be exercising for more than 1 hour. You might have a glass of fruit juice, a cup (245 grams) of yogurt, or an English muffin with jelly. Limit the amount of fat you consume in the hour before an athletic event.

You also need carbohydrates during exercise if you will be doing more than an hour of intense aerobic exercise. You can satisfy this need by having:

- Five to 10 ounces (150 to 300 milliliters) of a sports drink every 15 to 20 minutes
- Two to three handfuls of pretzels
- One-half to two-thirds cup (40 to 55 grams) of low-fat granola

After exercise, you need to eat carbohydrates to rebuild the stores of energy in your muscles if you are working out heavily.

- People who exercise or train for more than 90 minutes should eat or drink more carbohydrates, possibly with protein, 2 hours later. Try a sports bar, trail mix with nuts, or yogurt and granola
- For workouts lasting less than 60 minute, water is most often all that is needed.

Sporting performance and glycaemic index

The glycaemic index (GI) ranks food and fluids by how 'carbohydrate-rich' they are and how quickly they affect the body's blood sugar levels. The GI has become of increasing interest to athletes in the area of sports nutrition.

More research is required to confirm the best recommendations for sports nutrition. However, there is a suggestion that low GI foods may be useful before exercise to provide a more sustained energy release.

Moderate to high GI foods and fluids may be the most beneficial during exercise and in the early recovery period. However, it is important to remember the type and timing of food eaten should be tailored to personal preferences and to maximuse the performance of the particular sport in which the person is involved.

Pre-event meal

The pre-event meal is an important part of the athlete's pre-exercise preparation. A high-carbohydrate meal three to four hours before exercise is thought to have a positive effect on performance. A small snack one to two hours before exercise may also benefit performance. Some people may experience a negative response to eating close to exercise. A meal high in fat or protein is

likely to increase the risk of digestive discomfort. It is recommended that meals just before exercise should be high in carbohydrates and known not to cause gastrointestinal upset. Examples of appropriate pre-exercise meals and snacks include cereal and low-fat milk, toast/muffins/crumpets, fruit salad and yoghurt, pasta with tomato-based sauce, a low-fat breakfast or muesli bar, or low-fat creamed rice.

Eating during exercise

During exercise lasting more than 60 minutes, an intake of carbohydrate is required to top up blood glucose levels and delay fatigue. Current recommendations suggest 30-60 g of carbohydrate is sufficient, and can be in the form of lollies, sports gels, low-fat muesli and sports bars or sandwiches with white bread.

It is important to start your intake early in exercise and to consume regular amounts throughout the exercise period. It is also important to consume regular fluid during prolonged exercise to avoid dehydration. Sports drinks, diluted fruit juice and water are suitable choices. For people exercising for more than four hours, up to 90 grams of carbohydrate per hour is recommended.

Eating after exercise

Rapid replacement of glycogen is important following exercise. Carbohydrate foods and fluids should be consumed after exercise, particularly in the first one to two hours after exercise. To top up glycogen stores after exercise, eat carbohydrates with a moderate to high GI in the first half hour or so after exercise. This should be continued until the normal meal pattern resumes. Suitable choices to start refuelling include sports drinks, juices, cereal and low-fat milk, low-fat flavoured milk, sandwiches, pasta, muffin/crumpets, fruit and yoghurt.

Protein and sporting performance

Protein is an important part of a training diet and plays a key role in post-exercise recovery and repair. Protein is important for muscle growth and to repair body tissues. Protein can also be used by the body for energy, but only after carbohydrate stores have been used up. Protein needs are generally met by following a high-carbohydrate diet, because many foods, especially cereal-based foods, are a combination of carbohydrate and protein.it is also a myth that a high-protein diet will promote muscle growth.

- Only strength training and exercise will change muscle.
- Athletes, even body builders, need only a little bit of extra protein to support muscle growth. Athletes can easily meet this increased need by eating more total calories (eating more food).

The **amount of protein recommended for sporting people** is only slightly higher than that recommended for the general public. For example:

- General public and active people – the daily recommended amount of protein is 0.8–1.0 g/kg of body weight (a 60 kg person should eat around 45–60 g of protein daily).
- Sports people involved in non-endurance events – people who exercise daily for 45–60 minutes should consume between 1.0–1.2 g/kg of body weight per day.
- Sports people involved in endurance events and strength events – people who exercise for longer periods (more than one hour) or who are involved in strength exercise, such as weight lifting, should consume between 1.2–1.7 g/kg of protein of body weight per day.

Dietary surveys have found that most athletic groups comfortably reach and often exceed their protein requirements by consuming a high-energy diet. Protein supplements are therefore unlikely to improve your sporting performance.

While more research is required, other concerns associated with very high-protein diets include:

- increased cost
- a potential negative impact on kidney function
- increased weight if protein choices are also high in fat
- a lack of other nutritious foods in the diet, such as bread, cereal, fruit and vegetables.

Using nutritional supplements to improve sporting performance

A well-planned diet will meet your vitamin and mineral needs. Supplements will only be of any benefit if your diet is inadequate or you have a diagnosed deficiency, such as an iron or calcium deficiency. There is no evidence that extra doses of vitamins improve sporting performance. Nutritional supplements can be found in pill, tablet, capsule, powder or liquid form, and cover a broad range of products including:

- vitamins

- minerals
- herbs
- meal supplements
- sports nutrition products
- natural food supplements.

Before using supplements, you should consider what else you can do to improve your sporting performance. diet, training and lifestyle changes are all more proven and cost effective ways to improve your performance. Supplements should not be taken without the advice of a qualified health professional. It's best if dietary imbalances are adjusted after analysing and altering your diet, instead of by using a supplement or pill. It's also important to remember that if you take supplements, you are at risk of committing an anti-doping rule violation no matter what level of sport you play.

Water and sporting performance

Water is the most important, yet overlooked, nutrient for athletes. Water and fluids are essential to keep the body hydrated and at the right temperature. Your body can lose several liters of sweat in an hour of vigorous exercise.Dehydration can impair athletic performance and, in extreme cases, may lead to collapse and even death. Drinking plenty of fluids before, during and after exercise is very important. Don't wait until you are thirsty. Fluid intake is particularly important for events lasting more than 60 minutes, of high intensity or in warm conditions.

Water is a suitable drink, but sports drinks may be required, especially in endurance events or warm climates. Sports drinks contain some sodium, which helps absorption. A sodium content of 30 mmol/L (millimoles per litre) appears suitable in sports nutrition.

Using salt tablets to combat muscle cramps is no longer advised. It is lack of water not sodium that affects the muscle tissue. Persistent muscle cramps might be due to zinc or magnesium deficiencies.

Achieving Desired Weights For Competitive Purposes

Changing your body weight to improve performance must be done safely, or it may do more harm than good. Keeping your body weight too low, losing weight too quickly, or preventing weight gain in an unnatural way can have negative health effects. It is important to set realistic body weight goals.

Young athletes who are trying to lose weight should work with a registered dietitian. Experimenting with diet on your own can lead to poor eating habits with inadequate or excessive intake of certain nutrients.Speak with a health care professional to discuss a diet that is right for your sport, age, gender, and amount of training.

Things to remember

- Good nutrition can enhance sporting performance.
- A well-planned, nutritious diet should meet most of an athlete's vitamin and mineral needs, and provide enough protein to promote muscle growth and repair.
- Foods rich in unrefined carbohydrates, like wholegrain breads and cereals, should form the basis of the diet
- Water is a great choice of fluid for athletes to help performance and prevent dehydration.

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