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Nutrition and sports

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Abstract

Sports Nutrition is the study and practice of nutrition and diet as it relates to athletic performance. It is concerned with the type and quantity of fluid and food taken by an athlete, and deals with nutrients such as vitamins, minerals, supplements and organic substances such as carbohydrates, proteins and fats. Although an important part of many sports training regimens, it is most popular in strength sports (such as weight lifting and bodybuilding) and endurance sports (for example cycling, running, swimming, rowing). All athletes consider taking dietary supplements because they are looking for the “magic ingredient” to increase performance. In the extreme case of performance-enhancing supplements, athletes, particularly bodybuilders may choose to use illegal substances such as anabolic steroids, compounds which are related to the hormone testosterone, which can quickly build mass and strength, but have many adverse effects such as high blood pressure and negative gender specific effects. Blood doping, another illegal ergogenic, was discovered in the 1940s when it was used by World War II pilots. Dietary protein began to be consumed in the 1940s and muscle building results were found in resistance and strength training athletes. Protein intake is a part of the nutrient requirements for the regular athlete and is an important component of exercise training, because it can also aid in performance and recovery. Dietary protein intake for well-trained athletes should occur before, during and after physical activity as it is advantageous in gaining muscle mass and strength. However, if too much protein and amino acid supplements are consumed (especially by the average exerciser), it can be more harmful than beneficial; health risks include: “dehydration, gout, calcium loss, liver, and renal damage [and] gastrointestinal side effects include diarrhea, bloating, and water loss” (Lawrence). A bountiful protein diet must be paired with a healthy, well-rounded meal plan and regular resistance exercise. Yet, characteristics such as the type of exercise, intensity, duration, the carbohydrate values of diet, the individual's sex and age and also the amount of background training and training environment.

Keywords: sports, nutrition

Introduction

Basic Diet

Young athletes need a balanced diet that includes a variety of foods. This is important to improve athletic performance and maintain a healthy body. Ask your pediatrician how many calories your child or teenager needs each day. The daily training diet should include the following amounts of these types of foods:

- **Carbohydrates should provide 55% to 75% of total energy (calories):** Carbohydrates include foods such as breads, cereals, grains, pastas, vegetables, and fruits. Carbohydrates provide 4 calories per gram.
- **Proteins should provide 15% to 20% of total energy (calories):** Protein-rich foods include meats, fish, poultry, tofu, dairy foods, legumes, eggs, and nuts. Proteins provide 4 calories per gram.
- **Fats should provide 25% to 30% of total energy (calories):** Common fats include oils, butter, and margarine. Fat is also in many protein-rich foods. Fats provide 9 calories per gram.

The prevalence of obesity in the UK has risen significantly over the past decade, prompting efforts from the government to increase awareness about the importance of a balanced diet and staying physically active in order to maintain a healthy weight and optimum mental health.

According to recent statistics from the NHS Information Centre for Health and Social Care, 32% of men and 33% of women said they were sedentary for six or more hours on weekdays, and 44% of men and 39% of women said they were sedentary for six or more hours at weekends.

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There is mounting evidence to support the notion that regular exercise is an essential component of a healthy lifestyle, and that those who do lead active lifestyles stand a reduced risk of developing a range of health concerns, are less likely to get ill and generally live longer. However, actually mustering up the motivation to get active is very challenging for some.

Figures from the same NHS Information Centre report show that many individuals are trying to increase their physical activity levels. According to the report, 24.3% of adult respondents in England reported that they had taken part in sport on 11 to 28 days in four weeks. It was also stated that 86% of 5-10 year olds surveyed had taken part in extracurricular sporting activities in the past four weeks. However, despite these positive steps in the right direction, more needs to be done to encourage active lifestyles in the UK.

Physical activity does not have to be vigorous and everyone and anyone from young children and teenagers through to pregnant women and the elderly can incorporate at least some form of exercise into their daily routine.

Whether you are just trying to get started at incorporating exercise into your lifestyle, or you are a body builder or a professional athlete, nutrition and hydration play a key role in physical activity and training, providing you with the fuel you need in order to carry out the exercise.

Energy is measured in calories, a word that we should all be very familiar with as it is how our intake of food is calculated. On average a man needs around 2,500 calories a day to maintain his weight, and for women this figure is slightly lower at around 2,000 calories per day. These amounts are just approximates and can vary depending on a person's age, level of physical activity and a combination of additional factors.

Often when individuals are trying to maintain a healthy weight they can become focused on monitoring their calorie consumption, but it is important to remember that eating a healthy and balanced diet, staying physically active, and balancing the amount of calories eaten with the amount of calories burned is also important.

A calorie is a unit of energy which is defined by the amount of energy or heat it takes to increase the temperature of 1 gram of water by 1 degree Celsius. Nowadays we tend to associate calories with food and drink, but in actual fact they can apply to anything which contains energy, such as electricity or gas.

In food terms nutritionists tend to substitute the word kilocalorie with the word calorie. This terminology is technically incorrect, as 1000 calories are equal to 1 kilocalorie, though food packaging tends to use the former term to refer to the latter.

This also seems to be the chosen terminology in many food charts etc. and so for simplicities sake we will continue to use the term 'calorie' to refer to food calories (kilocalorie) throughout the remainder of this fact-sheet.

The calories we do consume must provide a good energy and nutrient balance and ideally the average day-to-day diet should include the following nutrients:

- Carbohydrates – these are our key energy source.
- Fats – another key energy source important in relation to fat soluble vitamins.
- Minerals – inorganic elements which occur in the body.
- Proteins – needed for the growth and repair of muscles and body tissue.
- Roughage – the fibrous indigestible portion of our diet which is needed for a healthy digestive system.
- Vitamins – water soluble and fat soluble vitamins are

important in many of the body's chemical processes.

- Water – carries other nutrients around the body and is required for normal body functioning.

Nutrients

Carbohydrates

There are two key forms of carbohydrates – starchy or complex, and simple sugars. Simple sugars are carbohydrates which are found in refined sugars and provide a sweet taste. Simple sugars are naturally found in milk products, fruit and vegetables but can also be added to foods using white sugar, brown sugar, honey, molasses and maple syrup etc. Though all of the sugars which we eat (whether they occur naturally or are added) are used by the body in the same way, it is better to get your simple sugars from foods in which they occur naturally as these foods also contain fibre and important nutrients.

Complex carbohydrates, also known as starches, include grains such as bread, pasta and rice. Similarly to simple sugars there are some complex carbohydrates which are better than others, with processed refined grains such as white rice and white flour being less favourable as the nutrients and fibre are removed.

Instead, nutritionists recommend that where possible individuals opt for unrefined grains which are still packed full of vitamins, minerals and fibre.

The carbohydrates we consume are then converted into glucose, a form of sugar which is carried in the blood and delivered to the cells for energy. When this happens the glucose is then broken down into water and carbon dioxide and any that is unused will be converted into glycogen, another form of carbohydrate that is stowed away in the muscles and liver.

The body is unable to hold any more than around 350 grams of glycogen at one point, and once it has reached full capacity any excess glucose will be converted into fat.

Fats

Fat is an essential component of any diet as it helps the body to absorb nutrients as well as being a great source of energy which provides the body with essential fatty acids that it is unable to manufacture independently.

However, though fats are important we should attempt to monitor how much of them we are eating, as large amounts could lead to excess weight gain and could subsequently result in an increased risk of serious health concerns such as heart disease and high blood pressure.

All fat contains both saturated and unsaturated fatty acids though are usually referred to as either 'saturated' or 'unsaturated' depending on the percentage of fatty acids present.

Saturated fats are commonly found in animal products and processed foods such as meat, dairy and chips, and the unsaturated fats are found in foods such as avocados, olives, nuts and oily fish.

The structure of saturated and unsaturated fat is very different. Saturated fat, which is solid at room temperature, is saturated with hydrogen atoms and does not contain double bonds between carbon atoms. This type of fat is not considered to be healthy for the heart and is known to raise your LDL (bad) cholesterol levels.

Unsaturated fats on the other hand are considered to be heart healthy, and can actually work to lower your LDL cholesterol levels as well as raising your HDL (good) cholesterol levels. Contrastingly to saturated fat, unsaturated fats are liquid at room temperature and contain double bonds.

Protein

Protein is present in every cell of the body and is important for helping to build and repair tissues. It's also used to make enzymes, hormones and a variety of additional body chemicals as well as forming the building blocks of bones, muscles, cartilage, skin and blood.

Similarly to carbohydrates and fats, protein is a macronutrient and the body requires a large amount of it, but unlike fat and carbohydrates, the body has nowhere to store protein for when it requires a new supply.

Protein foods include meat, fish, eggs, pulses, nuts, seeds and soya products.

High protein diets

High protein diets are popular with some sportsmen and women, in particular those who are trying to build muscle, such as individuals interested in body building.

Most high protein diets involve a high intake of protein and a moderate to low intake of carbohydrates. Many athletes and sports enthusiasts believe they need a diet which is high in protein in order to fuel their muscle growth, though most scientific research does not support this notion.

Glycogen is energy which is stored within the body and used as fuel during exercise, whilst also helping to maintain water. Some long distance athletes will use a technique known as carbo-loading, which essentially means they stock up on carbohydrates to increase the amount of glycogen available for a long event.

Depletion in glycogen can mean that endurance athletes run out of fuel so it is unlikely that significantly reducing carbohydrate intake is going to improve sporting performance.

Whilst many endurance athletes know that a high carbohydrate and low fat diet is a good option for them, many strength athletes still adhere to a low carbohydrate, high protein diet, believing that it will help them to build muscle. However, much research from sports nutritionists has suggested that strength athletes require both carbohydrates and glycogen stored within the muscle, and that extreme muscle contractions are actually fuelled heavily by carbohydrates, as both fat and protein are unable to meet the demands of high intensity physical activity.

High protein diets have also become a popular weight loss method, with some research suggesting that protein has the ability to satisfy hunger for longer periods of time than fats and carbohydrates. Many individuals are also attracted to the prospect of significant initial weight loss, which occurs as a result of muscle glycogen depletion.

Experts are unsure of how protein is able to reduce appetite, though a popular theory is that a high-protein diet sends less appetite stimulating hormones to the brain, potentially due to a reduced carbohydrate intake, or specific effects on the brain chemistry caused by the protein.

If you are considering a high protein diet for weight loss or for sports training then you should always consult your health care provider as well as your nutritionist before significantly increasing your intake of protein.

Energy requirements for exercise

If you are doing a lot of exercise or training each day then it goes without saying that your body will need more energy than it would if you were doing nothing. When you exercise the body must begin producing energy at a much faster rate than when it is resting. The heart will beat faster in order to pump blood more rapidly around the body, the lungs work harder, and your muscles will begin to contract.

All of this will use up your stored energy at a faster rate than normal, and for this reason, individuals such as athletes who are not trying to lose weight will need to consume extra food each day so that what they eat and what they burn remains in balance.

Individuals who do, do a lot of training should not use this as a license to gorge on unhealthy foods, but should aim to increase portion sizes of carbohydrate rich foods like porridge, wholegrain pasta and brown rice, as carbohydrates will help to fuel your exercise regime.

Many nutrition experts recommend that you wait between one and four hours after you have eaten a meal or snack until you exercise, as this gives the body time to digest the food. Obviously the more you eat the longer the digestion process will take to set in, meaning snacks will not require a great deal of time to begin digesting where as a three course meal will take much longer.

It is thought that an average sized meal, eaten no more than two hours before exercise provides the best results. The meal should contain some form of carbohydrate, should be low in fat and should not contain too much protein as this may work to slow down stomach movements and could leave you feeling uncomfortable.

Staying well hydrated whilst exercising is also extremely important. When the body's water content falls below its normal level this can have an impact on performance. If you are exercising for longer than 30 minutes then you should be drinking fluid whilst doing it and ideally should be keeping fluid levels topped up throughout the day.

Eating and staying well hydrated are also essential to the training and exercise recovery process. Once individuals have completed a training session they should aim to have a snack which is rich in carbohydrates within at least 30 minutes as this will help to promote muscle repair and growth.

In order to ensure that your body is well prepared for exercise and training, understanding that different foods can provide different types of energy is important. It is also important to take into account the type of training and its intensity, as this will also be a factor when determining a suitable nutrition programme.

If you are interested in tailoring your nutrition to help you to maximise your training potential then a qualified nutritionist could help you to do this.

Supplements

Supplements are used by athletes, bodybuilders and sports men and women to boost their strength, performance and recovery, and are available in numerous different forms ranging from multivitamins and minerals through to protein, creatine and various other 'ergogenic' aids which are intended to enhance performance.

Before individuals opt to take any form of supplement they should ensure their diet is healthy, balanced and suits their sport. Those who do decide to proceed and begin taking a supplement should always consult an accredited sports dietician or a registered nutritionist who specialises in sports nutrition beforehand, as they will be able to assess your suitability for a particular supplement.

Common sports supplements include the following Creatine

Simply explained, creatine is a high-energy compound which helps to store and provide energy. Creatine is produced within the body, occurs naturally in fish and meat and can also be taken in supplement form.

Creatine as a dietary supplement is considered to be a 'legal steroid' and is used by athletes and sports men and women to increase muscle bulk. It is intended to help you train for longer and also to boost performance during frequent high-intensity exercise.

Concerns have been raised over the long-term health and safety implications of taking creatine for prolonged periods of time, as some research has suggested it may have undesirable effects on the digestive system and could also result in muscular and cardiovascular issues as well as potentially increasing the risk of cancer. However, more research into the possible risks of the supplement is required to substantiate these claims, and creatine currently remains a hugely popular dietary supplement.

Whey protein

Whey protein is a natural protein present in milk, containing very little fat, carbohydrate or lactose. Whey is what is known as a naturally complete protein, meaning that it is made up of all of the essential amino acids which are needed in the average daily diet.

As well as housing the perfect combination of amino acids, whey protein also contains what is known as a branch chain of amino acids (BCAAs), which are the first ones to be used during intense training. The whey protein provides the body with these amino acids and in turn they assist with repairing and rebuilding lean muscle tissue.

Another benefit of whey protein is that it is extremely easy to digest, meaning it is absorbed quickly and can provide instantaneous nourishment to the muscles.

Energy drinks

Staying well hydrated during exercise and training is extremely important, and even a small amount of dehydration could be detrimental to performance levels. Drinking water is a good way of keeping yourself hydrated during exercise periods, and some individuals also opt for energy drinks, particularly those who undertake endurance events such as long distance running.

Many energy drinks contain electrolytes such as sodium, which help to stimulate thirst and encourage drinking, as well as enhancing the body's ability to hold water. In addition, the carbohydrates contained in many energy drinks can provide individuals with extra energy which may be needed in the latter stages of training, and could also provide extra protein to help prevent muscle loss.

Sports training and nutrition

The day-to-day diet and eating habits of individuals who frequently train or participate in sport is very important in terms of performance level and progression.

Scientific developments and new discoveries about how different food types work within the body mean that athletes can now tailor their diets to help them excel in their particular sport.

Whether you are a professional or amateur athlete, if you wish to optimise your performance level and guarantee continuous improvement, a healthy and well-planned diet could help you to do so.

There is no magic food or shortcut which is going to provide the body with all of the vitamins and minerals it needs, so it is important to maintain a balanced diet which incorporates a variety of food groups and nutrients.

Many athletes and sports enthusiasts spend a lot of time planning meals which could help to optimise their

performance, but very few individuals actually possess the specialist knowledge needed to develop an appropriate and effective nutritional strategy. If this sounds like something you would be interested in doing but are unsure of where to start then this is where the 'know how' of a qualified sport nutritionist could be of benefit.

Sport nutrition is essentially the study of the science behind food and how it can benefit or impair sporting performance and fitness. As we have discussed throughout this fact-sheet, what an athlete eats and drinks prior to training, whilst training and during competitions can have reverberating effects on their body composition and ultimately performance and recovery.

If you do choose to consult a sport and exercise nutritionist, they will apply their knowledge to create a diet programme which is going to help maximise your sporting performance as well as improving overall health and well-being.

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