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## Role of Nutrition in Sports

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### Abstract

Participation in physical activity is essential for physical and mental health of children. Adolescents taking part in sports have high demands of nutrients due to additional needs of increased physical activity besides growth, development and wellness. The health and nutritional status may be compromised in this population due to lack of proper nutritional counseling. Also misinformation about healthy and nutritious foods by the media targeting school going children can be quite hazardous. The purpose of this review paper is to represent the nutritional needs of adolescents participating in different games and also to empower and teach adolescents to know about the importance of nutrition during participation in physical activity (PA) or games; hydration level (Fluids) that deliver nutrients involves proper fueling and recovery

**Keywords:** Physical activity; Nutrition counseling; Food and health.

### Introduction

Sports nutrition is a specialization within the field of nutrition that partners closely with the study of the human body and exercise science Sports Nutrition can be defined as the application of nutrition knowledge to a practical daily eating plan providing the fuel for physical activity, facilitating the repair and building process following hard physical work and achieve athletic performance in competitive events, while also promoting overall health and wellness. The basic concept for sports nutrition for athletes requires proper eating strategies and need to have a command of general nutrition as well as exercise science. The second step is to gain the knowledge of how nutrition and exercise science are intertwined, emphasize that physical training and dietary habits are reliant on each other in order to produce optimal performance. The final step is the practical application of sport nutrition knowledge on the individual sports person who is participating in any sport or physical activity

### Sports nutrition:

An athlete challenges his body on a regular basis through physical training and competitions. In order to keep up with requirement of his activity or sport, he requires enough fuel for his body on day to day basis

### Important of Sports nutrition:

Participating in endurance sports requires optimal nutrition, with specific focus on dietary modifications. Targeted fitness development at an early age, especially in adolescence is deemed the foundation for leading an active lifestyle, avoiding potential overweight, reducing motor deficiencies and thus improving the general quality of life

At the time of final performance an athlete is supposed to be well nourished, uninjured, fit, focused and ready to compete. Sports nutrition is not just about calories to achieve weight or body composition goals; nor is it all about protein for muscles or carbohydrates for fuel. Nutritional and eating habits have been of specific interest in sports, especially given their impression on athletic performance. General recommendations need to be suggested by sports nutrition experts to accommodate the specific requirements of individual athlete regarding health, sports, nutrient, food choices and body weight and body composition.

Athlete challenges their bodies on a regular basis through tough physical training and competitions. In order to keep up with demand for stamina of their activity or sport, athlete needs adequate fuel for their body on day to day basis

Nutrition is important for an athlete because it provides energy required to perform the activity. The food they take leaves an impact on strength, training, performance and recovery. Not only the type of food is important for sport nutrition but also the time is equally important for what they eat throughout the day. It also has an impact on their performance level and their body ability to recover after workout. An athlete needs to pay close attention about when, what and how much does he eat or drink prior to a game or match.

The role of nutrition in sports performance is very important. Proper nutrition must be available prior, during and post competition. Greasy and Jeukendrup stated that from fueling to recovery, muscle building weight and making optimal nutrition ensure the best platform for success in any sport Meals eaten after and before the exercise are the most important in nutrition but we should really be very careful with all that the athlete intake in his body. As a general rule of thumb an athlete should eat about two hours before any exercise and the meal should be high in carbohydrates, low in fat and low to moderate in protein. Carbohydrates are the main source of energy that provides power to an athlete in exercise regime. Protein is required to develop muscle growth.

**Basic nutrients:** Food and beverages are composed of six nutrients that are vital to the human body for producing energy, contributing to the growth and development of tissues, regulating body processes and preventing deficiency and degenerative diseases. The six nutrients are classified as essential nutrients. They are carbohydrates, proteins, fats, vitamins, minerals and water. The body requires these nutrients to function properly however the body is unable to endogenously manufacture them in the quantities needed on a daily basis

**Carbohydrates:** Carbohydrates are stored in the body in a form of glycogen, which can be used during physical activity. Carbohydrate is necessary to meet the demands of energy needed during exercise, to maintain blood glucose level and replenish muscle glycogen store. During sub-maximal exercise, carbohydrates in the body are the major source of fuel

**Protein:** Protein is needed for nutrient transfer in the blood, connective tissue support and the repair of tissue in response to periods of exercise

**Fats:** Fat is primarily used as a fuel during low to moderate intensity exercise. Fat is also engaged in providing structure to cell membranes, helping in the production of hormones, lining of nerves for proper activity and make it easier for process of absorption of fat soluble vitamins

**Vitamin and Minerals:** Vitamins are required in wide variety of bodily functions and operations which helps to sustain the body healthy and disease free. The function of minerals is for structural development of tissues as well as the regulation of bodily process

**Water:** The human body can survive for a long duration without any of the micro and macro nutrient but not without water. The body is made of 55-60% water, representing a nearly ubiquitous presence in bodily tissues and fluids. In athletics, water is important for temperature regulation, lubrication of joints and the transport of the nutrients to active tissues. It regulates the body temperature, cushion and protects vital organs, aids the digestive system, acts within each cell to transport nutrients and dispel waste

Nutrition is essential for supporting an athlete's general health and their training needs. Having a suitable diet provides a person with enough energy and nutrients to meet the demands of training and exercise. In addition to helping a person perform optimally, it facilitates recovery. OR Nutritional needs for peak athletic performance includes sufficient calorie intake, adequate hydration and attention on timing of meals taken. Adolescent athletes and their advisor often are misinformed or have misconception about sports nutrition. The studies show nutritional need for young athletes have common misconceptions about sports nutrition. Studies show that proper nutrition for young athletes is critical not only to their athletic success, but more importantly to their growth, development and overall health.

The science of nutrition in relation to sports performance has progressed from empirical studies investigating the effect of dietary manipulations such as restriction and supplementation to the direct investigation of physiological basis of the specific nutritional demands for hard physical exercise

The main role of sports nutrition is to support the training program. Dietary intake for performance will change as the training regime changes. Poor nutrition can lead to injury, fatigue and poor recovery, all three of which can hinder as to how efficiently an athlete performs

American Dietetic Association, Dietician of Canada and American College of Sports and Medicine stated that physical activity, athletic performance and recovery from exercise are enhanced by optimal nutrition. Appropriate selection of foods and fluids, timing of intake and supplement choices are required for optimal health and exercise performance

Slater and Phillips in 2011 found that athletes related to strength and power are mainly interested in enhancing power, related to body weight and thus almost all about some form of resistance training. While athletes may attempt to boost skeletal muscle hypertrophy, fundamental nutritional issues are broader than those apposite to hypertrophy and include an admiration of the sports supplement industry, the strategic timing of nutrient intake to maximize fuelling and recovery objectives, plus accomplishment of pre-competition body mass requirements. Also that total energy and macronutrient intakes of strength-power athletes are mostly high but intakes tend to be routine when expressed relative to body mass.

Greater perceptiveness into optimization of nutrient intake to accomplish nutrition-related goals would be achieved from the judgment of nutrient distribution throughout the day, especially ingest before, during and after exercise

Holway and Spriet in 2011 confirmed that dietary planning should include sufficient carbohydrate on a moderate energy budget, along with protein requirement Strength and power team sports require muscle-building programs that must be accompanied by adequate nutrition.

Huberty et al., defined that a paramount consideration is that an individual approach is needed to meet each athlete's nutritional needs. Contemporary training for power sports involves diverse routines, which place a wide array of physiological demands on the athlete. Nutritional strategy support general training needs - tailored to specific training phases - as well as the various demands of competition. Elite athletes have high training intensities and volumes for most of the training season, so energy intake must be sufficient to support recovery and adaptation. Low muscle glycogen decreases high-intensity performance, so day to day carbohydrate intake must be emphasized throughout training and competition phases. It was found that the timing, type and amount of protein intake influence post-exercise recovery and adaptation. Most games and sports feature demanding competition schedules, which require aggressive nutritional recovery strategies to optimize muscle glycogen resynthesis

Burke et al. stated that an athlete's carbohydrate intake can be judged by whether total daily intake and the timing of ingestion in relation to exercise conserve adequate carbohydrate substrate for the muscle and central nervous system. High carbohydrate availability and carbohydrate energy sources are limiting for the daily exercise program.

Sharma et al. found that carbohydrates, is the preferred fuel for working muscles particularly during high intensity activity. Some carbohydrate will be consumed irrespective of the type of exercise performed. A study was conducted to evaluate the knowledge of adolescent female football players regarding carbohydrate and its significances. It was found that 70% adolescent females were aware of the term carbohydrate. The knowledge of the females regarding the term carbohydrate (simple and complex) and its affiliation with the function of carbohydrate is highly significant ( $P < 0.001$ ). The awareness of the females on carbohydrate sources, type of carbohydrate to be ingested before, after and during competition was insignificant. A need for developing nutrition education programs becomes pertinent to enable the players to choose appropriate diet to enhance their performance].

Not only nutrient content of food is important other factors also play an important role in food selection in important events. A study was conducted to assess the food provision and nutrition support at the London 2012 Olympic (OG) and Paralympics Games (PG) from the perspective of sports nutrition experts attending the event. Participants ( $n = 15$ ) were asked to finish an online survey and grade on a Likert scale menu qualities, food safety, quantity, sustainability patterns, nutrition labeling and provision for ethnic needs, dietary plans and specific situations

Open-ended responses were elaborate to find out opinion and areas for improvement. Participants graded their overall knowledge of the food supply as 7.6 out of 10 (range 5 to 10). It was greater than 7. The availability, variety, presentation, temperature and freshness of menu Items ranked as average to good. A number of feedbacks were received about the gluten free diet and lower energy food items. The inclusion of allergens on nutrition labeling was considered more important than nutrient content

### **Fuel for exercise**

When carbohydrate is delivered at desirable rates during or after endurance exercise, protein supplements appear to have no direct performance increasing effect. Carbohydrate and fat are the two major fuel sources oxidized by skeletal muscle tissue during prolonged (endurance-type) exercises

The relative contribution of these major fuel sources largely relies on the exercise intensity and duration. Endurance performance and endurance capacity are largely ordered by endogenous carbohydrate availability. As such, meliorate carbohydrate availability during prolonged exercise through carbohydrate ingestion has dominated the area of sports nutrition research. As a result, it has been well established that carbohydrate intake during prolonged more than two hours moderate-to-high intensity exercise, increase endurance performance

Championship season leads to significant performance benefits for most athletes. Both intra and extracellular buffering agents may enhance performance, but more researches are in demand to various power sports having different body compositions activity and body weight requirements, but increasing the power-to-weight ratio during the examination, the potential long-term effect of buffering agents on training adaptation. Interactions between training desired physiological adaptations, competition, nutrition requirement an individual approach must be continuously adjusted and adapted

Low pre-exercise muscle glycogen decreases high-intensity performance, so intake of carbohydrates should be emphasized during whole training and competition phases. Training for major power sports includes various routines that place a wide range of physiological demands on the athlete. There are strong grounds to suggest that the timing, type and amount of protein intake determines the post-exercise recovery and adaptations. This requires a miscellaneous nutritional strategy to hold general training needs. Most power sports feature requires Competition agenda, which require aggressive nutritional recovery strategies to make optimal muscle glycogen re-synthesis

An athlete's carbohydrate ingestion can be evaluated by his total daily intake and the timing of uptake in relation to exercise maintains enough carbohydrate substrate for the muscle and central nervous system. Carbohydrate availability is enhanced by consuming carbohydrate in the hours or days prior to the session or activities, intake during exercises and provides additional fuel during recovery between sessions. This is an important for the competition arrangements or for high-intensity training where optimal performance is required. Carbohydrate intake during exercise must be increased according to the requirement of the event or games. During sustained high-intensity sports lasting more than one hour, small amounts of carbohydrate (Simple and Complex) including even mouth-rinsing (like carbohydrate rich juice) increase performance via central nervous system effect. While 30-60 gm h<sup>-1</sup> is a suitable target for sports of longer duration, events more than 2.5 hours may promote benefit from higher ingestion of up to 90 gm h<sup>-1</sup>. Products containing special mixture of different carbohydrates may increase absorption of carbohydrate at high rates. In real life, athletes attempt training sessions with varying carbohydrate accessibility whether applying additional strategies to increase the training adjustment

Holway and Spriet in 2011 states that implementation of a nutrition program for team sports involves a diligent effort of scientific research together with the social acquirement necessary to work with a sports medicine and coaching staff. The demand of energy is high during pre-season training and matches and is moderate during training in the competitive season. Dietary planning must include enough carbohydrate on a moderate energy requirement, while also completing protein needs. Strength and power team sports require muscle-building program that must be accompanied by enough nutrition and anthropometric measurements (including height and weight) can help the nutrition practitioner to monitor and assess body composition analysis periodically.

The function of protein in promoting athletic performance is split along the lines of how much aerobic-based versus resistance-based activity the athlete attempts. Athletes seeking to gain muscle mass and strength are likely to have higher quantity of dietary protein than their endurance-trained trainers

Protein needs have been compared across several population groups, including athletes and other exercising individuals. Many studies have examined the effects of taking animal and vegetable protein sources and their effects on sports performance. Recently mixture of dairy protein and soy protein has appeared in commercial sports nutrition products such as nutrition bars and ready-to drink and powdered beverages. This study states that the potential nutritional advantages of combining whey protein, casein and isolated soy protein. All supplement industries spotted a growing market

Nutrition (ISSN) Position Stated that Protein and Exercise reviewed general literature on renal and bone health. There is lack of scientific evidence about protein intake, that ingestion of protein within the limit (1.4-2.0 gm/kg body weight per day) is unhealthy for an athlete

People who do not include adequate protein in daily diet may show slower recovery and training adjustments Protein supplements or ergogenic aids offer a convenient way to ensure that athletes take quality protein in the diet and complete their protein needs. However, ingesting additional protein beyond the daily requirement does not help in additional gain in strength and muscle mass. The research focus over recent years has been to influence whether different types of protein (e.g. whey, casein, soy, milk proteins, colostrums, etc) and various biologically active protein subtypes and peptides (e.g.  $\alpha$ -lactalbumin,  $\beta$ -lacto globulin, glycol macro peptides, immunoglobulin's, lacto per oxidizes and lacto ferrin, etc) have varying effects on the physiological, hormonal and immunological responses to training

In addition, a significant amount of research has examined whether timing of protein intake and provision of specific amino acids may play a role in protein synthesis or training adaptations, conducted mostly in untrained populations Although more research is necessary in this area, evidence shows that protein requirement of individuals busy in intense training are elevated, various types of protein have different effects on anabolism and catabolism. It was observed that different types of protein subtypes and peptides have unique physiological effects and timing of protein intake may play a significant role in optimizing protein

synthesis following exercise. Therefore, it is simplistic and misleading to suggest that there are no data supporting contentions that athletes need more protein in their diet and there is no possible ergogenic value of incorporating various types of protein into the daily diet

It is the position stand of ISSN that exercising individuals require approximately 1.4 to 2.0 grams of protein per kilogram of bodyweight per day. This is greater than the RDA (Recommended Dietary Allowance) for sedentary person According to the current literature we know that the addition of protein and BCAA (Branch Chain Amino Acid) before or after resistance training can increase protein synthesis and increase in lean mass beyond normal adjustment. However, it should be noted that gains have primarily been observed in untrained populations unless the supplement contained other nutrients like creatinine monohydrate

### **Impact of other factors responsible for food choices during an event**

Shriver et al. discovered that failing to meet overall nutritional needs or to provide specific nutritional support to a session of exercise is likely to affect acute performance and decrease the effectiveness of training or recovery

Muslim athletes who fast during Ramadan should use overnight opportunities to consume foods and drinks that can supply the nutrients require enhancing performance, adaptation and recovery in their sports or activity. Because of the benefits of being able to consume at least some of these according to the nutritional needs of athletes, their exercise and nutrition plan should be revised

The use of weight loss diet, selection of foods and frequent weight fluctuation among athletes preparing for competition in weight classes and leanness sports have shown various problem for years, but the extent of the problem and the health and performance results have yet to be fully examined

A review article by Wescott concluded that standard resistance exercise is effective in reversing muscle loss, recharging resting metabolic rate and reducing fat, alleviate physical activity, improving blood glucose levels, better cardiovascular health, increasing bone mineral density, enhancing mental health and reversing specific aging factors In inactive adults, muscle mass reduces by 3% to 8% per decade after age 30 years and by 5% to 10% per decade after age 50 years, averaging about 1 lb of muscle loss per year after the fifth decade of life. Reduced lean weight is responsible for decreased resting metabolic rate, which is typically accompanied by increased fat accumulation.

Wescott made two groups for his study, the Exercise/Protein Diet group focused on identical Exercise/Protein protocol along with a restricted daily caloric intake (1200-1500 Kcal/day for women; 1500-1800 Kcal/day for men). Wescott found that after 10 weeks of training, the Exercise/Protein group reached greater increases ( $P < 0.05$ ) in muscle mass weight and greater decreases ( $P < 0.05$ ) in diastolic blood pressure rate than the Exercise-Only group. The Exercise/Protein/Diet group experienced reduction ( $P < 0.05$ ) in body composition analysis including body weight, body mass index (BMI), percent fat, fat weight, waist circumference (WC), systolic blood pressure (SBP) rate and DBP (Diastolic blood pressure) rate than the Exercise-Only group, as well as greater reductions ( $P < 0.05$ ) in body weight, BMI, percent fat, fat weight and WC (waist circumference) than the Exercise/Protein group. It was concluded that a high protein diet may enhance the effects of exercise for increasing subject lean weight and decreasing DBP rate. It was further indicated that a higher protein and lower calorie diet plan enhance the effects of exercise for reducing person body weight, BMI, percent fat, fat weight, WC, SBP rate and DBP rate, while accomplishing similar gains in lean body mass

Assessment and promotion of exercise and physical activity which is beneficial in achieving desired benefits across several populations. Most work suggests that exercise and physical activity are associated with good quality of life and health outcomes. Therefore, assessment and encouragement of exercise and physical activity may promote well-being in achieving desired benefits across several populations

## Ergogenic Aid

An ergogenic aid is any training techniques, mechanical devices, nutritional practice, pharmacological method or psychological techniques that can improve exercise performance capacity or enhance training adaptations. It helps in individual to tolerate heavy training to a greater degree by helping them recover, faster or help them stay injury free and healthy during intense training. Some studies show that supplement significantly enhances exercise performance e.g. helps athletes run faster, lift more weight or carry out more work during a given exercise task. On other hand it prepares an athlete to perform or enhance recovery from exercise. It has the potential to improve training adjustment and therefore must be considered ergogenic

The quickest method of increasing muscle creatine stores is by consuming 0.3 grams/kg/day of creatine monohydrate for at least three days followed by 3-5 gram/day thereafter to maintain elevated stores

Creatine products are readily available as a dietary supplement and are regulated by the US Food and Drug Administration. Specifically, in 1994 US President Bill Clinton signed in to law the dietary supplement Health and Education Act (DSHEA). Which allows manufactures/companies/brands to make structure function claim, the law strictly prohibits disease claims for dietary supplements

Bhasin et al. shows that testosterone and growth hormone are two primary hormones in the body that serve to promote gains in muscle mass (i.e., anabolism) and strength while reducing muscle breakdown (catabolism) and body fat mass

Testosterone also elevates male sex characteristics (e.g., hair, deep voice, etc). Low level anabolic steroids are often prescribed by doctors to prevent loss of lean weight for people with various diseases and illnesses

It is widely known that athletes have tested large doses of anabolic steroids in an effort to enhance training adjustments, increase muscle mass and/or promote recovery during intense training. Research has generally shown that use of anabolic steroids and growth hormone during training can promote increase in strength and lean weight. However, a number of potentially life threatening contrary effects of steroid abuse have been reported including liver and hormonal dysfunction, hyper lipidemia (high cholesterol), increased risk to cardiovascular disease and behavioral changes (i.e., steroid rage) and mood swings .

For this cause, anabolic steroids have been banned by most sport organizations and should be avoided unless prescribed by a physician to treat an illness

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## Conclusion

Diet is of great importance to athletes, the key to achieving an optimal sports diet in relationship to peak performance and good health is balance. Athletes must fuel their bodies with the appropriate nutritional foods to meet their energy requirements in competition, training and recovery. If these nutritional needs are not met, there is an increased risk of poor performance and health issues. The use of a nutritional supplement within established guidelines is safe, effective and ethical. Hundreds of studies have shown the effectiveness of creatine monohydrate supplementation in improving anaerobic capacity strength and lean body mass in conjunction with training, but still there is sports specific variation in the food fads and practices indicating the strong influence on coaches and peers. It is vital to educate the sportsmen about the dietary pattern. Failure to consume right diet during competition due to false belief in markets and constant fear of eating prohibited foods may hamper performance.

Finally the future of nutritional supplement looks bright in regard to the areas of transport mechanism, improved muscle retention as well as treatment of numerous clinical maladies through supplementations.

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