Sports Nutrition Through the Lens of the Strength & Conditioning Coach

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Abstract
Nutrition plays a mission critical role in optimizing sport performance and is a foundational piece of an athlete's overall training program. By infusing sound nutritional practices into a comprehensive sport performance program, athletic potential can be realized, performance enhanced and recovery accelerated. To this end, Strength & Conditioning coaches are often a source of nutritional information for their athletes. This article: 1) examines the scope of nutritional practice for Strength & Conditioning Coaches and 2) provides specific nutritional information within said scope of practice that the Strength & Conditioning Coach can relay to their athletes.

Introduction

At the elite and professional levels, the primary responsibilities of a Strength & Conditioning Coach are to: 1) prevent injuries, and 2) improve performance. To this end, the Strength & Conditioning Coach is tasked with monitoring their athletes' physical readiness over the course of the training year. Frequently they are the de facto, in-house nutrition experts.

Due to the nature of their position Strength & Conditioning Coaches can become responsible for providing broad recommendations for a team's nutrition program. Strength & Conditioning Coaches collaborate with their athletes in a quest to develop a nutritious diet that will: 1) support their physical training, 2) enhance recovery from taxing training sessions, and 3) optimize competitive performance. The purpose of this article is to: 1) examine the scope of nutritional practice for Strength & Conditioning Coaches and 2) provide specific nutritional information within said scope of practice that the Strength & Conditioning Coach can relay to their athletes.

Scope of Practice

First and foremost, Certified Strength & Condoning Coaches are not Physicians or Registered Dieticians. They cannot: 1) diagnose or treat medical conditions resulting from, or related to, nutrition, 2) prescribe supplements or medication, or 3) provide medical nutrition therapy; nutrition-based treatments that focus on addressing an individual's nutritional status and providing an individualized nutritional plan [1].

Strength & Condoning Coaches can provide basic nutrition advice and broad recommendations which includes: 1) meal planning, 2) developing and maintaining healthy nutrition habits, and 3) hydration. Other recommendations within their scope of practice include: 1) appropriate food choices, 2) macronutrient ratios, 3) timing of meals to optimize training, competition and recovery [2].

It is imperative that the nutritional advice provided by the Strength & Conditioning Coach be evidence based and supported by the conceptual framework of scientific research. This entails staying current with the most recent nutritional guidelines and avoiding the promotion of unproven supplements and fad diets [1].

To eliminate the specter of professional malpractice, it is mission critical for the Strength & Conditioning Coach to refer their athlete to the appropriate professional when faced with conditions such as: 1) anorexia, 2) bulimia, 3) the female athlete triad and 4) the need for individualized meal planning. Furthermore, the professional scope of practice for a Certified Strength & Conditioning Coach prohibits creating specific nutritional plans [1].

In sum, the scope of practice for a Strength & Conditioning is rather limited but can be beneficial to athletes seeking basic nutritional advice. To prevent litigation for professional malpractice, Strength & Conditioning Coaches need to adhere to their areas of certified professional expertise and stay within their scope of practice. If a Strength & Conditioning Coach is in doubt as to the scope of practice issue, it is best to refer the athlete to a licensed professional such as a Nutritionist or a Physician.

The Strength & Conditioning Coach Within a Team's Hierarchy

In the business of college sports, the Head Sport Coach is the most important hire. Interestingly, the Strength & Conditioning Coach is the second most import hire. This is because the Strength & Conditioning Coach runs the team in absentia of the Head Coach. Since athletes spend so much time with the Strength & Conditioning Coach their fitness-based expertise becomes evident, and they become the go to resource for all things fitness and nutrition.

Within their scope of practice, the Strength & Conditioning Coach, as an extension of their professional responsibility to prevent injury and improve performance, are also on the front line for overseeing the team's nutrition program and monitoring their players' body composition throughout the season. This involves the following steps: 1) giving broad nutritional recommendations, 2) monitoring food intake, 3)

monitoring changes in body composition, 4) making data driven decisions rooted in the aforementioned roles and responsibilities [3].

The Strength & Conditioning Coach assists the team's sports dietitian/nutritionist by providing input when developing a nutrition program to meet the specific needs of the team and individual players. This process involves: 1) providing athletes with guidelines for healthy eating, 2) ensuring that athletes have access to nutritious foods, and 3) advising athletes on the proper use of supplements, meal replacements or other dietary aids [2].

Since the Strength & Conditioning Coach is with their athletes daily, they may have the responsibility of monitoring the players' daily nutritional habits. This is typically done using daily athlete questionnaires. This information can be used to improve athletes' food choices and to provide early warning for potential chronic nutritional issues [3].

Body composition is the ratio of various tissues that make up the body. It is a measurement of the relative amount of body fat and lean tissue (muscles, bones & organs) expressed as percent body fat. This metric is important because it impacts overall health and such athletic performance metrics as: 1) strength to weight ratio, 2) power to weight ratio and 3) VO_2 Max[3]. To this end, the Strength & Conditioning Coach identifies and monitors key metrics related to body composition throughout the season. This may include tracking changes in 1) body weight, 2) body composition, 3) other physical measurements and 4) performance in physical tests and sport specific drills [3].

Based on the information obtained related to body composition, sport performance and nutritional habits, the Strength & Conditioning Coach may adjust the training program or nutrition plan in order prevent injury and maximize competitive performance. By overseeing their team's nutrition program and monitoring the players' physical progress throughout the training year, the Strength & Conditioning Coach ensures that athletes are receiving the nutrients they need to optimally perform. This is a keystone to the athletes' overall health and well-being and serves to improve their on-field performance [1,2].

Macronutrients

Nutrition, like all other aspects of athletic performance, is governed by the principle of individual response. This maxim postulates that no two athletes are the same. When designing a nutrition plan for a competitive, high performing athlete, the overarching objectives are to meet specific energy and nutrient needs. In turn, these objectives are moderated by: 1) body size, 2) acute and chronic training demands, and 3) sport and position played [3]. Within the Strength & Conditioning Coach's scope of practice, general recommendations can be made regarding: 1) caloric intake, 2) macronutrient consumption, 3) hydration, and 4) meal timing [1].

At the most macroscopic level, adequate caloric intake is paramount to meet the caloric needs of high performing athletes. Their elevated consumption of calories is directly proportional to the physical demands and recovery needs derived from training and competition. Additionally, it is essential that an athlete's daily caloric and macronutrient intake promote a healthy body weight in addition to meeting energy demands. The macronutrients are: 1) carbohydrates, 2) protein and 3) fat.

<u>Carbohydrates</u>

Carbohydrates fuel the high intensity activity that typically characterizes athletic performance. From the metabolic perspective they: 1) are the easiest energy substrate to access when energy is needed immediately, 2) spare the use of proteins as energy, and 3) support fat metabolism. Coaches should educate athletes to choose complex carbohydrates over simple carbohydrates. Complex carbohydrates have significant advantages over simple carbohydrates; they: 1) provide a sustained source of energy, 2) are higher in vitamins, minerals and fiber, and 3) are nutrient dense. Good carbohydrate choices include: 1) whole grains, 2) vegetables, and 3) beans. When consuming fruits, the darker the fruit, the more complex carbohydrates it contains. Carbohydrate intake for athletes varies according to: 1) type of sport played, 2) training intensity, and 3) training volume. It is further moderated by individual response [3].

Typically, athletes should consume between 6 and 10 grams of carbohydrates per kilogram of body weight depending on the sport and intensity of competition and training. Aerobic, endurance athletes will need more carbohydrates in their diet as compared to anaerobic, high-power athletes.

Proteins

Proteins are essential for maintaining optimal health and play vital roles in the body's metabolic functions. First and foremost, they are responsible for growth and repair of cells, tissues and organs. They also play an imperative role in blood clotting, fluid balance and immune response. Furthermore, proteins: 1) are the building blocks of hormones, enzymes and antibodies, 2) promote satiation, and 3) prevent dramatic fluctuations in blood sugar. The high thermic effect produced during protein digestion has been shown to contribute to fat loss [4]. Quality sources of protein include: 1) fish, 2) poultry, 3) beef, 4) pork and 5) dairy products. Plant-based protein options include: 1) nuts, 2) soy products and 3) legumes. As a general guideline, athletes should consume approximately 1 gram of protein per pound of body weight [3]. This value is moderated by the type and intensity of activity the athlete engages in and their individual goals.

Fat

Fat is the most concentrated form of energy in the diet. Each gram yields nine calories. By comparison, protein and carbohydrates each provide four calories per gram. Fats perform the following metabolic functions: 1) delivering fuel for energy at low intensities, 2) insulation, 3) protection of the body's organs and 4) absorption of fat-soluble vitamins. High performing athletes need dietary fats since they provide a concentrated source of energy which is necessary to fuel aerobic metabolism during long-duration practices and games. The athletes' diet should include healthy fats that contain Omega-3 fatty acids; essential to reduce inflammation and enhance recovery. Fish, nuts, seeds, olive oil, and avocados are examples of quality dietary fat sources. Approximately 20% to 35% of an athlete's daily caloric intake should come from healthy fats [2].

Hydration Considerations

Water is often the missing ingredient for optimal human performance since hydration plays a crucial role in human performance. Specifically, water: 1) is used in body temperature regulation, 2) maintains proper muscle function since dehydration can be traced to an increased incidence of cramps, fatigue and decreased strength, 3) improves cardiovascular functioning via the maintenance of blood volume, 4) improves processing, decision making at competitive speed, by improving concentration and reaction times, and 5) reduces the incidence of injuries by maintaining optimal joint lubrication [1,2,3].

Hydration is essential for high performing athletes. It is especially important during games and practices since a 2% loss in body weight due to dehydration results in a 10% loss of muscular power [5]. Another consequence of dehydration is electrolyte imbalance. The electrolytes sodium, potassium and magnesium play critical roles in promoting proper muscle function and are lost during sweating. Muscle cramps, weakness and fatigue accompany the significant loss of electrolytes via dehydration. Consequently, athletes must drink enough fluids, to replace what is lost through sweat. It is recommended that 8 oz of water and 8 oz of a sports drink that contains electrolytes be consumed for every pound of water lost due to sweating.

When considering serving size and daily intake, water and vegetables are the only two nutrients in an athlete's diet that can be consumed in unlimited quantities. A common rule of thumb is to consume a minimum of 1.5 oz of water per day per pound of body weight. To help attain this mark, athletes should be encouraged to drink 16 oz of water before and after each meal [3].

It is interesting to note that food cravings often result from dehydration. Athletes will attempt to fill the void left by dehydration with calories from salty and/or sweet foods low in nutrient density [3].

Supplementation

The Principle of Individual Response specifies that every athlete is unique. Dietary needs vary according to: 1) age, 2) body size, 3) body composition, 4) individual preferences and 5) energy expenditure. Strength Coaches should recommend that athletes looking for specific nutritional advice work with either a sports dietitian or nutritionist to develop an individualized nutritional plan [2].

Micronutrients, vitamins and minerals are mission critical when examining the effect of nutrition on athletic performance. For instance, being deficient in one vitamin can: 1) prevent an athlete from performing at their peak, 2) hinder recovery from competition and training, and 3) shorten the length of an athlete's career [3]

Supplements use by high performing athletes is a controversial issue [6]. Although the FDA regulates dietary supplements, it is the manufacturer's responsibility to

ensure the quality and safety of their products. Furthermore, some supplements produce side effects or have a negative interaction with some medications. To wit, it is important to: 1) read and understand labels, and 2) consult with health care professionals such as a sports dietitian or nutritionist before taking any dietary supplements. Coaches and athletes must remember that dietary supplements are not a substitute for a well-balanced diet and that athletes should get most of their nutrients from food sources [2].

Bearing the aforementioned caveats in mind, there are a several supplements that have been shown to benefit high performing athletes. This list includes: 1) multivitamins, 2) Omega-3 Fatty Acids, 3) Vitamin D, 4) Creatine, 5) Protein Powders and 6) Electrolyte Drinks [2].

Multivitamins can help ensure that athletes are getting the essential vitamins and minerals needed to support health and performance. Omega-3 Fatty Acids, help reduce inflammation while also supporting heart health. Natural sources of Omega-3 Fatty Acids include: 1) salmon and tuna, and 2) flaxseed, soybean and canola oil. Vitamin D promotes bone health and has been shown to improve muscle function [7]. Creatine has been shown to increase muscular strength and power. Athletes can use Protein Powders to help meet daily protein needs. They are particularly effective when consumed following a taxing training/competitive session. As previously discussed, electrolyte (Sports) Drinks help replace fluids and electrolytes lost via sweating during practice and competition [3.]

Meal Timing

The timing of meals is an important consideration for the high performing athlete. They should aim to consume a pre-activity meal 2-3 hours before scheduled practices/competitions. It should contain a balanced assortment of complex carbohydrates, protein, and healthy fats. Additionally, a post-activity meal should be eaten 30 to 60 minutes after practice/competition. This will help replace glycogen stores and support muscle recovery. Since food performs both physiological and psychological functions, athletes should be encouraged to develop an eating routine revolving around practice/competition. They should be educated to eat the same foods before practice and competition in accordance with sound nutritional decisions. Their choices should be foods they like and that they believe will help maximize their athletic performance [3].

Catabolism following high intensity and high duration competitions and practices may be attributed to failing to nutritionally prime the body. Prior to these events it is necessary for the athlete to have full muscle and liver glycogen stores. Consequently, it is necessary to prime the body for this activity by increasing the intake of complex carbohydrates up to a day prior to the event [3].

Nutrition in the Parlance of the Coach and the Athlete

The Strength & Conditioning Coach has the responsibility to educate their athletes that they need to care for the body which allows them to perform their sport skills with virtuosity. The athlete's body needs to be properly fueled to leverage the advantages gained in training. A collective embrace of, and action taken on, this philosophy should be woven into a team's culture.

Ultimately it is the responsibility of the athlete to take care of their body since it allows them to perform at a high level of performance. The first concern of Strength & Conditioning Coaches is the overall health of their athletes, including proper recovery. To maximize the effect of physical training, bodies need to be properly fueled and ready to go in competition and practice. Athletes and to be educated on how to leverage sound nutritional practices to prevent disease, deficiencies, illness & injury.

From the dietary perspective, the Strength & Conditioning Coach's first concern is collaborating with their athletes to develop nutritional practices that address general health. This in turn will help athletes perform at their peak. Simple heuristics for evaluating the quantity and quality of nutrients ingested include asking each athlete: 1) how many meals did they eat each day, 2) how much food was consumed, 3) how many colors made up the meal, and 4) how much water was consumed. Strength & Conditioning Coaches can effectively monitor these four parameters using survey based daily athlete questionnaires delivered via on-line platforms such as Qualtrics [3].

It is mission critical for the Strength & Conditioning Coach to have one on one conversations with their athletes to determine each athlete's best nutritional practices. The athlete is the one who knows best what sits well in their stomach and what does not [3].

Technology such as nutritional analysis software can be used to provide feedback to athletes regarding caloric intake and the macronutrient composition of each meal. The Strength & Conditioning Coach, in concert with a Sports Nutritionist can use this information to: 1) develop a player specific nutrition plan, and 2) monitor an athlete's nutritional progress over time [3].

Additional Considerations

Body Composition

An athlete's muscle mass impacts: 1) strength and their potential to develop strength, as well as 2) metabolism, including calories burned at rest. Consequently, it is necessary for the athlete to use their athletic goals as a guide for caloric intake. Athlete caloric intake needs to be synchronized with their fitness goals be it caloric deficit for weight loss, caloric surplus for weight gain or caloric balance for maintenance [3].

The body prefers to use carbohydrates for energy. If weight loss (caloric deficit) is desired, and the body's glycogen reserves are constantly being refilled via food intake, the body will not tap into its fat reserves for energy. In this scenario, if fat loss is desired, increase protein intake and decrease carbohydrate intake while achieving the caloric intake goals for the day [3].

To promote an increase in lean muscle mass a caloric surplus is needed. In this condition it is necessary to pair anaerobic training (resistance training and sprinting) with an increase in both calories and protein to create an anabolic environment in the body. Additionally, moderate intensity aerobic training two to four times per week is recommended to keep the body lean [3].

Travel to Away Contests

Approximately half of a team's contests are played away from their home facilities. Consequently, eating a balanced and nutritious diet while traveling can pose a challenge since athletes may have limited access to healthy foods. Coaches should plan and encourage athletes to select meals that fit their sports nutrition plan. Additionally, athletes should bring nutritious, easy to carry, foods such as granola and protein bars with them. Since travel has been shown to upset the digestive system, athletes should be encouraged to stay hydrated and eat fiber rich foods [8].

Conclusion

Strength & Conditioning Coaches are responsible for educating athletes on how to take care of their bodies away from the weight room, training facility and their respective playing surfaces. Typical concerns include: 1) proper nutrition and 2) hydration. Through building a culture of self-care, Strength & Conditioning Coaches create an environment in which empowers athletes to perform at their best. By infusing sound nutritional practices into a comprehensive sport performance program, athletic potential can be realized, performance enhanced and recovery accelerated; ultimately contributing to long term success in the chosen sport.

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