

Sports Nutrition for Young Athletes

CME EDUCATIONAL OBJECTIVES

1. Identify an effective means to assess the nutritional status of a young athlete during the office visit.
2. Review the most common performance detractors associated with nutritional inadequacies in children and adolescents.
3. Discuss specific nutritional guidelines for the young athlete and how best to motivate the affected child to improve their overall nutritional health.

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Optimal nutrition is a critical component of growth and development but also plays an integral role in sports performance. The young athlete who is not well-fueled or hydrated may experience deficits in

strength, speed, and stamina, as well as decreased focus, increased fatigue, and increased risk of injury.

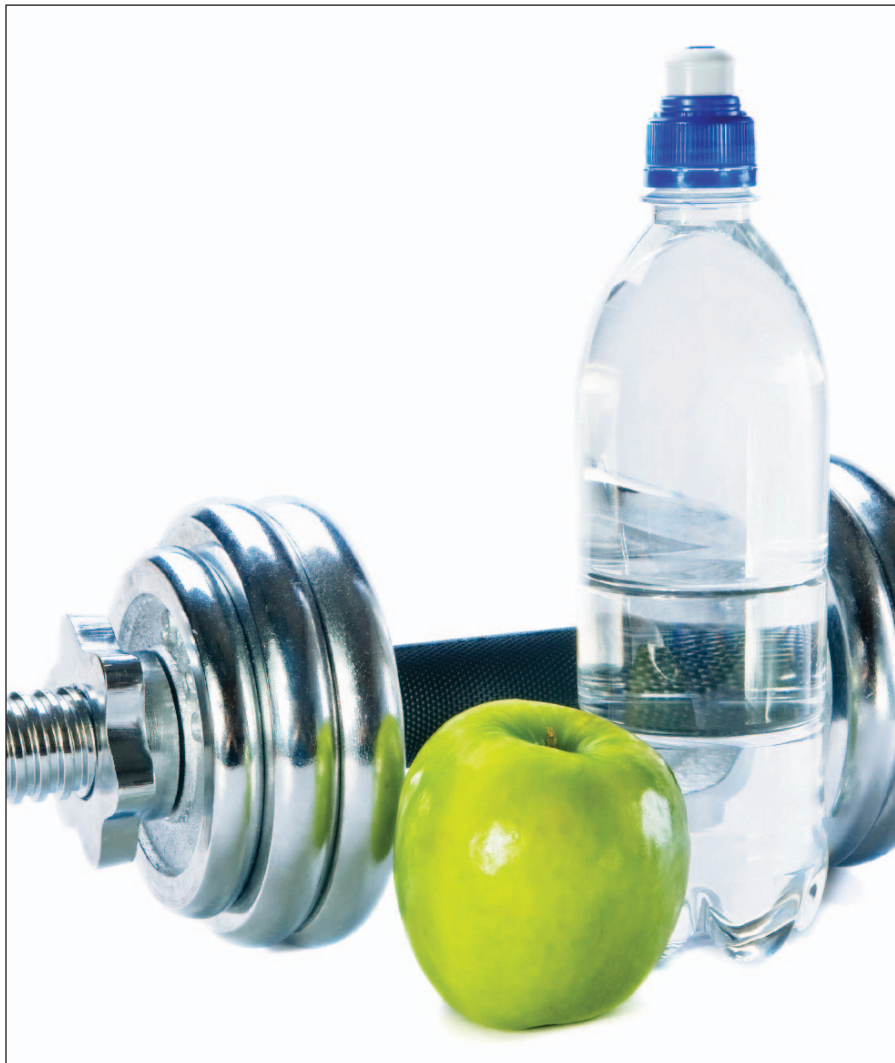
However, the message about eating needs to be pertinent to young athletes; otherwise, it goes unheeded. A focus on nutrition is not as accepted as an emphasis on performance.

The goal of sports nutrition is to help keep athletes playing their sport. To do this, young athletes need to learn not only what to eat and drink, but why, when, and how much they should consume. In addition, it is in the athlete's best interest to educate the family (parents, grandparents, guardians) about fuel for sport.

Team physicians should schedule a time to talk with their teams in advance, during, and after the regular season about the importance of proper hydration and fueling, or better yet, enlist the expertise of a sports dietitian.

As part of a comprehensive sports exam, it is important to ask questions of the athlete and/or caregiver. You can have the athlete or his/her parent/caregiver to fill out a nutrition assessment form in ad-

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vance. A nutrition assessment form can help identify potential areas of concern, which can be addressed during the exam. A sample form can be found online at http://www.teamunify.com/vatst/_doc_/Nutrition%20Screening%20Form.pdf (accessed April 21, 2010).

Preface the “eating” discussion with your athlete by asking him/her to tell you how he/she feels when doing sports (ie, energy levels, strength, speed, recovery).

You can use the questionnaire to provide objective data for your patient. For example, the basketball player who tires early in the game may tell you that he doesn’t eat breakfast, may not drink before or during practices. He reveals that

he is too nervous to eat before games.

This type of “show and tell” can be very useful for your patients, helping them to see what may be performance-impairing behaviors and, subsequently, making recommendations for improvement based on timing, quantity, or choices of foods/fluids.

Many athletes’ “complaints” may have a nutrition-related cause and solution. Table 1 (see page 302) lists some common performance detractors, possible nutrition causes, and solutions.

SPECIFIC GUIDELINES

Many young athletes are inadequately hydrated. Fluid needs for young athletes are 0.5 to 1 L/day above the

baseline requirements.¹ Sweat losses are higher compared with non-athletes, and younger athletes generate more heat. As little as a 1% decrease in body fluid can result in a decrease in endurance.² Although optimal hydration is essential for performance and injury prevention, many young athletes do not get what they need. Fluid may not be available, accessible, or permitted (ie, teachers who do not allow beverages in class). Coaches may not schedule fluid breaks for their athletes. Some athletes may load up on carbonated beverages, sweetened teas, or fruit drinks, which may provide calories in excess of need.

In addition, some of your athletes may opt to abstain from consuming fluids during the day because of fear about needing to use school restrooms, which they may deem unsafe.

Fluid guidelines are listed below, as well as in Table 2 (see page 302).³

FLUID GUIDELINES FOR ATHLETES

Weigh in and out

Encourage athletes to weigh in before and after practice to gauge sweat loss and replace fluid appropriately. Be an advocate for your young athletes and ask that schools purchase scales, or recommend that parents donate old scales to teams.

For exercise of less than 60 minutes’ duration, water is fine. For activities lasting more than 1 hour, recommend a sports drink. Morning void should be light in color and copious. Athletes should drink on a schedule: fluid upon waking, with every meal, and before, during, and after practices/competition. They should consume fluids throughout the day, which may require a hydration prescription from a physician for teachers who do not permit beverages in the classroom. Consume liquid foods, such as applesauce, soup, chili, yogurt, milk, or smoothies, and bring a water/sports bottle to practice.

TABLE 1.

Performance Detractors and Suggested Nutritional Solutions

Performance Detractors	Possible Nutrition Causes	Suggested Nutrition Solutions
Fatigue	No fuel/fluid before or during activity Low iron Insufficient calories	Food/fluid 30-60 minutes prior and regularly during sport Appropriate calories for growth and sport
Muscle cramps	Inadequate or excess fluid; inadequate sodium intake	Adequate fluid and sodium for salty sweaters (those who show signs of salt loss, including cake sweat)
Inability to gain mass	Inadequate calories No protein before lifting, only after	Eating bigger portions and more often during the day Protein and carbs pre- and post-lifts
Inability to lose fat	Skipping meals Too many calorie from beverages Eating more than needed post-exercise	Eating at regular intervals Focus on fat-free foods; include fat, protein, and carbs at every meal Limiting calories from beverages Post-exercise fuel needs are more a snack than meal

TABLE 2.

Fluid Guidelines for Children³

Age/sex	Daily Fluid Needs
4 to 8, boys and girls	5 cups (1.2 L)
9 to 13, boys	8 cups (1.8 L)
9 to 13, girls	7 cups (1.6 L)
14-18, boys	11 cups (2.6 L)
14-18, girls	8 cups (1.8 L)
Gauging Hydration⁴	
Educate your athletes on the WUT principle:	
Weight (loss of >1% after exercise)	
Urine (dark colored and low volume)	
Thirst (increased thirst)	
Hydration for Exercise⁵	
2 hours before exercise: 18-24 oz.	
30 minutes before: 12-16 oz.	
Every 20 minutes during: 5-9 oz.	
After activity: 16-24 oz. of fluid for every pound lost	

Sodium

Although some young athletes may consume sodium in excess of need, others may not ingest what they require. The dietary reference intakes (DRIs) for sodium are listed in Table 3 (see page 303).

Salty sweaters may require more sodium than recommended, especially if they exhibit signs of salt loss, including cake sweat (salt on skin, clothes, inner rim of caps); sweat that stings the eyes; and sweat that tastes salty.

This may be a problem in young athletes whose parents are on sodium-restricted diets. Foods may be prepared without salt, and low-sodium products may be purchased. You can advise your salty sweaters to do the following:

- Add 1/4 of salt to 20 oz of sports drink;
- Eat pickles, crackers, pretzels, or Chex Mix;
- Have rice or pasta cooked in bouillon;
- Add salt to foods; or
- Drink vegetable juice or tomato juice.

CALORIES

You may have patients who consume calories in excess of need; however, young athletes may not consume enough calories. In addition, the concern about one's appearance in certain sports may drive intake.⁶ The DRIs for calories based on age are listed in Table 4. These are general guidelines and must be tailored to the energy demands of the sport, growth, and metabolism. There are several online tools for athletes to use to gauge calorie intake, including www.mypyramid.gov and www.calorieking.com.

Another option is an online tool that focuses on nutrient density by having individuals keep track of foods consumed by food group (www.nutrientrichfoods.org is a great resource). In addition, it is important to remember that calorie adequacy is not only a function of the number of calories consumed but also how those calories are ingested throughout the day.

Encourage your patients to eat throughout the day, instead of uploading calories.

CARBOHYDRATE

Carbohydrate is the primary fuel substrate for sport. However, not all young athletes meet their daily carbohydrate requirements. The minimum needs are 180 g/day for basic body functions, plus additional carbohydrate for the energy expenditure associated with exercise.

Gluconeogenesis from non-carbohydrate sources provides 130 g of carbohydrate/day with the remainder coming from ingested carbohydrates.⁷ The carbohydrate requirements for young athletes may range from 200-500 g/day.¹ Young athletes can benefit from some guidance regarding the more nutrient-rich sources of carbohydrate, including fruits, vegetables, grains such as cereals, bread, rice, pasta, and, of course, potatoes, corn, and corn products, such as grits and tortillas.

Some of your patients may have parents who are on carbohydrate-restricted diets. It would not be out of the question for a young soccer player, who has had school and club team practice, to come home to a meal of chicken and vegetables, which would be suboptimal. You may need to be the one to stress to parents the importance of providing a quality carbohydrate source at all meals, especially at dinner because activity is usually after school or in the evening hours. Listed below are the carbohydrate requirements for various athletic situations.

- 1.5-2.5 g/lb body weight for light training (2 to 3 times per week);
- 2.5-4 g/lb for moderate training (3 to 5 times per week);
- 4-4.5 g/lb for pre-event loading; and
- 0.8 gm/lb for post-event fueling⁸

PROTEIN

Although protein is not the primary fuel substrate for sport, it is important for muscle and bone health and should comprise at least 12% to 15% of the daily caloric intake.¹ The DRIs for protein are listed in Table 5.

These are the recommendations to prevent a deficiency but they may not be adequate for all athletes.⁹ For instance, an athlete who is trying to increase mass or is trying to lose weight may need more protein per day. The recommended amounts of protein for specific sport situations are:

- Training: 0.5 to 0.7 g/lb;
- Endurance athlete: 0.5 to 0.8 g/lb;
- Strength trained athletes: 0.5 to 0.8 g/lb;
- Athletes who are restricting calories: 0.8 to 0.9 g/lb; and
- Maximum usable protein: 0.9 to 1.0 g/lb (body weight).

For athletes who are vegetarian, ask about overall food intake, stressing the importance of replacing animal protein

TABLE 3.
DRIs for Sodium

Age/sex	Sodium (mg)/day
4-8, boys and girls	1,200-1,900
9-13, boys and girls	1,500-2,200
14-18, boys and girls	1,500-2,300

TABLE 4.
DRIs for Calories Based on Age

Age/sex	Daily Calories
4-8, boys and girls	1,400-1600
9-13, boys	1,800-2,200
9-13, girls	1,600-2,200
14-18, boys	2,200-2,600
14-18, girls	2,000

TABLE 5.
Dietary Reference Intakes for Protein

Age/sex	Daily Protein Requirements
4-8, boys and girls	19 g
9-13, boys	34 g
9-13, girls	34 g
14-18, boys	52 g
14-18, girls	46 g

with appropriate and adequate plant-based protein sources. Also, recommend food first, rather than protein powders. If you have athletes who ask about protein, a protein isolates, such as whey protein, are a better choice than a protein powder. Protein isolates provide only protein, not mega doses of micronutrients. Provide guidance about the use of these products (ie, not as a meal replacement but as a supplement to food).

FAT

Fat may be the preferred fuel source for children because of the higher rate of fat oxidation during exercise. Fat should provide 25% to 30% of the daily calories.

Parents may consume a very low-fat diet or offer their children nonfat food choices in an attempt to trim body fat. Many of the fat-free foods are nutrient-poor, or they provide the same number of calories as the full-fat items but are devoid of an essential nutrient. Certainly, low-fat or fat-free dairy foods and lean meats are acceptable; however, full-fat peanut butter and regular or light salad dressings and mayonnaise can be used instead of the fat-free alternatives

SUPPLEMENTS

Many of your patients and their parents may tell you that it is hard to eat right and ask if they should be taking a supplement. A multivitamin/mineral supplement is fine, but as a complement to food, not a replacement. Therefore, there is no need for a mega or ultra supplement; however, there are certain vitamins and minerals that should be stressed.

The recommended daily allowance (RDA) for vitamin D is 400 IU for young athletes, but the need may be much higher, and most young athletes are not going to consume copious amounts of vitamin D-containing foods.

Calcium requirements are 1,300 mg/day for children and adolescents. However, unless your patients are drinking a quart of milk daily, their intake is going to fall short of the recommendations.

Iron is another mineral of concern. Iron deficiency can result in fatigue, somewhat impaired immune function, and impaired cognitive reasoning. Iron is involved in carbohydrate, protein, and fat metabolism and is a substrate for bone health. The prevalence of depleted iron stores (reflected by low serum ferritin) in adolescents is 25% to 50%. Male and female athletes most

likely to be affected are runners, swimmers, gymnasts, tennis, volleyball, and basketball players.^{10,11}

The DRIs for iron are 8 mg/day for age 9 to 13 years; 11 mg/day for boys aged 14 to 18 years; and 15 mg/day for girls aged 14 to 18 years. The diet provides 6 mg of iron for every 1,000



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calories, so to meet needs, it may be necessary for young athletes to be consuming at least 2,000 calories per day, and not all athletes will, especially female athletes in appearance-aesthetic sports, such as gymnastics.¹²

It is important to have a food discussion with vegetarian athletes, as they are at greater risk of developing iron deficiency.

Finally, zinc is imperative for wound healing, tissue growth, immune function, and affects the basal metabolic rate (BMR), thyroid hormone levels, and protein utilization.

HOW DO WE GET ATHLETES TO BUY IN?

The focus should be on the consequences of behaviors. A body that is

too heavy does not move well; a body that is too light may get pushed off the ball. Quick weight loss is more indicative of fluid and lean mass than sport. Showing up at practices and competition without prior fueling and hydration may decrease strength, speed, and stamina, and increase the risk of injury.¹³ Waiting too long to eat after exercise may delay recovery.

Be the voice of reason with your athletes. Help them develop a plan if they want to lose body fat and/or gain muscle and do so by referring them to a sports dietitian. Advocate for your athletes if you see a coach who does not allow fluid breaks during practices. Speak up if you feel that a coach has unrealistic expectations about weight goals for his or her athletes. Educate your athletes using the food-first message, which may be not food alone, but food is always the priority. Supplements are used to meet requirements not to take the place of other nutrients.

CASE 1

Anna is a vegetarian ballet dancer who has a chance to audition for a pre-professional program. Her mother wants Anna to be in top shape for her audition, which is 3 months away.

Although she is tall and long-legged, she has about 10 lb. to lose, concentrating the weight in her abdomen and hips. When asked about her eating, she said she doesn't eat a lot, but what she eats is primarily carbs, and she is starved at night. Anna also attends school from 7 a.m. to noon, and then is at the studio from 1 p.m. to 6 p.m. Often, she is exhausted by her last dance class and has difficulty concentrating. A 24-hour dietary recall is as follows:

- Low-fat granola bar for breakfast;
- Apple before going to dance classes;
- A handful of pretzels throughout the afternoon;

- A few cookies when she gets home from dance classes;
- Some pasta or rice with vegetables for dinner;
- A scoop of fat-free ice cream or a reduced-fat ice cream sandwich later.

Here are some potential nutrition solutions:

- Include protein in the morning meal, such as a hard-cooked egg, half a cup of cottage cheese or a string cheese, or an 8-oz glass of skim milk with the granola bar;
- Add some peanut butter on the apple before going to dance;
- Consider a sports bar with some protein, or a mix of cereal, soy nuts, and some dried fruit in place of the afternoon pretzels;
- Suggest that her mother bring something for her to eat in the car on the ride home, such as yogurt, or a salad with beans and a little shredded cheese, or vegetarian chili;
- Change the look of the dinner plate to include some protein, such as veggie crumbles in the pasta, or tofu, a meat-free frozen meal, or beans added to the stir-fry, and increase the vegetable component of the meal while slightly decreasing the starch.

For an evening snack, consider a small bowl of cereal with milk or a smoothie with frozen fruit and yogurt. These types of recommendations can decrease hunger, improve energy, and result in weight loss.

CASE 2

James is an ice hockey player who has all the speed and skills to be on the varsity squad, but he is too small and wants to gain weight. He is constantly moving, on the ice, playing basketball, riding his bike, and never has much of

an appetite. His coach is concerned that he is going to get hurt because he is not as heavy as some of the other players. His coach told James and his family that he wants him to gain 20 pounds.

James' father bought several protein powders and started making shakes for his son. James hated the taste, and when he did drink the shakes, he was so full that he had no appetite for meals and actually ended up losing some weight.

The coach recommended that James work with someone to develop a plan for weight gain. For this type of athlete, you need to discuss the high-energy demands of hockey and the need to eat to compete.

A 24-hour dietary recall revealed:

- Small bowl of corn cereal before school and water;
- Lunch is at 10:45 a.m.; he really didn't like the food at school, but would eat a slice of pizza and have water;
- Practice was at 3 p.m.; he had nothing to eat before practice;
- Practice ended at 5 p.m.; he ate nothing until he got home around 6 p.m.;
- At 6 p.m., he would eat a small amount of food — a salad-sized plate of whatever was served at dinner, and he would drink two glasses of juice;
- Evening snack: a few cookies.

Because he doesn't eat a lot of food, suggesting that he eat a lot substantially more will not be well received or realistic. However, suggesting ways to increase calories without increasing volume is more practical.

- Breakfast: Choose a higher calorie cereal, such as granola, and have a glass of juice or milk instead of water;
- Lunch: Recommend that his mother start packing his lunch a few days a week, and also send some snacks with him, so if he did have the pizza, he

could have something to eat along with it;

- Suggest that he have juice or milk at lunch instead of water;
- Emphasize having a snack before practice provides energy so that his body doesn't burn so much of its own fuel. This will help move the scale upward. Suggest that he have a sports drink during practice instead of water to provide more calories, and bring a small snack to have after practice.

Make specific suggestions for pre-practice fueling, such a cereal bar, small handful of trail mix, or half of a peanut butter and jelly sandwich while getting ready for practice.

Provide guidance for food choices post-exercise, such as:

- The other half of the peanut butter sandwich,
- Handful of pretzels, and few strips of jerky, or
- A 10-oz. bottle of low-fat chocolate milk.

Ask him to put a little more on the plate at dinner and increase the calories in his evening snack by adding a glass of milk with the cookies.

Slow, gradual increases to daily food intake will result in a calorie increase without the feeling of fullness and increases the likelihood that extra calories will be consumed on a daily basis.

SUMMARY

Sports nutrition is a critical component of a young athlete's health and performance. Have the nutrition discussion with all of your athletes, individually, or in a group setting if you are a team physician. Better yet, consider bringing in a sports dietitian to talk about performance-optimizing strategies and how to build a winning plate. The result: healthier, better athletes who perform at their best in the classroom and on the playing field.

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