

Hydration in Young Athletes
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Know the guidelines so you can educate coaches, youth sports organizations, and parents.

The training intensity and competitiveness associated with youth sports has increased substantially over the last several years. Many children and adolescents competing in sports now have weekend-long tournaments and twice-a-day practices. With the focus on improving sport-specific skills, cardiovascular endurance, and muscle strength to optimize athletic performance, the role of proper hydration is often overlooked.

Recent incidents of severe heat exertion in high school football players have increased awareness of the need to pay attention to hydration and body temperature in hot, humid weather conditions. But in general, hydration isn't viewed as a key factor in athletic performance on a regular basis. Guidelines for hydration in child and adolescent athletes are available, and new research evidence underscores the importance of hydration and hydration education for young athletes, coaches, parents, and youth sports organizations.

The Latest Guidelines

In 2011, the American Academy of Pediatrics (AAP) updated its policy statement on hydration in relation to climate stress for young athletes (see sidebar below). Currently, the policy statement is the only guideline from a professional medical organization that specifically addresses child and adolescent athletes. Although the American College of Sports Medicine (ACSM) has issued general guidelines on exercise and hydration, its focus is on adults.^{1,2} Some youth sports organizations have issued recommendations, which are based on AAP guidelines and related research.^{3,4} These youth sports organizations recognize both the importance of encouraging hydration in young athletes and the importance of educating them to monitor their own hydration.

Effects of Fluid Loss

In adult athletes, loss of 2% of body weight due to dehydration has been shown to have detrimental effects on performance. In children, the negative effects of fluid loss begin to occur at a 1% decrease in body weight.⁵ The negative effect on athletic performance in child athletes isn't well researched, and the adverse effects likely are due to decreases in cardiovascular system functioning, thermoregulation, and central fatigue, says Heather Mangieri, RDN, CSSD, a sports dietitian in Pittsburgh and spokesperson for the Academy of Nutrition and Dietetics (the Academy). "Scientific research regarding fluid turnover or specific fluid needs for active children is limited. Therefore, it's critical for young athletes to monitor and maintain adequate fluid balance to prevent dehydration to sustain normal cardiovascular and thermoregulatory functions required for exercise performance," Mangieri says. Adequate hydration is essential to optimal athletic performance, and the most effective way to ensure hydration is to utilize pre- and postexercise weight measurements to determine and replace fluid loss.⁵

Symptoms of dehydration include noticeable thirst, irritability, fatigue, weakness, nausea, headache, muscle cramping, dizziness or lightheadedness, dark yellow urine or no desire to urinate, difficulty paying attention, and decreased performance. Treating symptoms of dehydration is crucial in preventing the progression to heat exhaustion.² However, children and adolescents may not be aware of these symptoms, or they may be attributed to physical

exertion associated with the sport itself. Additionally, young athletes often are excited or distracted during competitions and don't think to rehydrate during recovery periods.⁴ "Children in athletics haven't yet learned the initial signs of thirst, and therefore, tend to ignore signs of extreme thirst due to excitement or distraction, says Jim White, RD, CPT, ACSM, a spokesperson for the Academy. He advises children to consume 24 oz of water for every pound lost after sports activity, and that AAP recommendations be followed for preactivity hydration.

Although some research suggests that children do in fact rehydrate voluntarily when fluids are available, these studies were conducted in ideal, laboratory experimental settings in nonathletic children. Voluntary fluid intake by young athletes during highly competitive or extended athletic events hasn't been adequately evaluated.⁶ However, the physiologic strain associated with repeated sports practice or tournaments and hydration have been studied by Michael F. Bergeron, PhD, FACSM, executive director of the Sanford Sports Science Institute and the National Youth Sports Health and Safety Institute, and a senior scientist at Sanford Children's Health Research Center. Internationally recognized for his research and leadership in exercise-heat stress and youth athletic health, Bergeron was one of the lead authors of the AAP Policy Statement and has provided individualized and sport-specific training and nutrition/hydration guidance for many young athletes and youth athletic organizations.

In the first study of repeated-bout strenuous exercise in healthy competitive youth soccer athletes, Bergeron and colleagues found that one hour of complete rest, cool down, and rehydration following 80 minutes of strenuous exercise equivalent to a soccer game generally was effective in eliminating residual strain and dehydration during a second exercise session. However, for some study participants, the supervised rest and rehydration was insufficient. In typical outdoor youth soccer tournaments, complete rest and rehydration are less likely to occur due to tournament organization and unavailability of cool settings.⁷ Previous same-day athletic training or competition without adequate time for rest and rehydration can affect performance and increase risk of heat-related illness. In youth tennis and soccer tournaments, rest between bouts may be 30 minutes or less. "The young athlete is 'forced' to begin play again not optimally or sufficiently replenished. Incomplete rehydration and a sodium deficit can prompt lower heat tolerance, greater cardiovascular and thermal strain, and reduced performance, as well as an increased risk of muscle cramping during the next game," Bergeron says. There's still a need for governing bodies of youth sports to address this issue and provide more specific, evidence-based guidelines for minimum rest periods between same-day competitive events for youth sports tournaments, he says.⁸

Prehydration for Performance

Given the importance of hydration for optimal athletic performance, being properly hydrated before practices and competitions also is essential. Prehydration often is a problem for young athletes, due to their potential inability to perceive thirst and rehydrate appropriately. In 2012, a researcher studying hydration in young athletes reported that 50% to 75% of child and adolescent athletes already are dehydrated before beginning sports practice and competition, thereby increasing the risk of further dehydration and its side effects during sport activity.⁹

Attention to prehydration especially is important when young athletes are participating in sports that, due to their competition or training requirements, may hasten dehydration. "Participation in certain sports—those that require heavy equipment during practice and competition, like football and hockey—may put children at increased risk of dehydration," Mangieri notes. In addition, she says level, duration, and intensity of training all influence fluid needs and may be different for individual athletes and sports. The AAP Policy Statement cites the example of a healthy 12-

year-old athlete who's fit, well hydrated, and acclimated to hot weather, and who safely can play soccer on a 95-degree day. Contrast that young athlete with an overweight football player of the same age, who recently has recovered from a gastrointestinal illness, and has to complete two three-hour workouts on the first warm day of preseason football training; he will be at much greater risk of dehydration and heat stress if not properly hydrated during training.

Are Sports Drinks Appropriate?

Heavy marketing of sports drinks as an alternative to water for athletes of all ages has led to much debate about their appropriateness for young athletes. In general, sports drinks are unnecessary for younger child athletes, White says. Because sports drinks often contain high amounts of sugar, children could experience nausea, cramps, and diarrhea when they're dehydrated. Water for rehydrating, in conjunction with a balanced diet that includes sodium, allows child athletes to function optimally without added sports drinks, White says, adding that he recommends the National Food Service Management Institute's Nutrition Fact Sheet "Fueling the School-Aged Athlete—Sports Drinks" as a good resource on sports drink use. It's available at <http://nfsmi.org/documentlibraryfiles/PDF/20090925011512.pdf>.

"More than 60 minutes of sports activity may require a sports drink containing 6% to 8% carbohydrates," White says. "Hydration is dependent on how long the young athlete is involved in strenuous activity; endurance sports like swimming and soccer will require more hydration," he adds.

According to Bergeron, sports drinks will play a proportionately greater and more effective role over water in hotter weather, same-day multiple sports sessions, older youth athletes who work longer and harder, and in sports situations with few opportunities to refuel with food. For young athletes who struggle to drink enough, Mangieri says a sports drink can motivate them to drink more because it may taste better than water. However, sports drinks should follow the 6% to 8% carbohydrate guideline to minimize weight gain and side effects from high-sugar content.

In 2011, the AAP released recommendations for sports drinks. According to its guideline, patients and families must learn that sports drinks have a specific limited function for child and adolescent athletes. Sports drinks should be ingested only when there's a need for more rapid replenishment of carbohydrates and electrolytes in combination with water during periods of prolonged, vigorous sports participation or other intense physical activity. Children and adolescents never should consume energy drinks that contain stimulants such as caffeine and guarana due to associated health risks.¹⁰

Guidance for Dietitians

"Most coaches and parents know that kids should be hydrated during sports in the heat," Bergeron says. "However, the extent of sweat losses and electrolytes (particularly sodium), and thus rehydration needs and challenges are underappreciated, especially as a child athlete transitions through puberty."

Moreover, Bergeron says dietitians can improve awareness of child athlete hydration needs by getting involved with local schools, community activities, and club sports, where they can become trustworthy resources for providing hydration recommendations and helping to implement hydration policies.

Youth sports organizations promote use of urine color charts to get young athletes involved in monitoring their own hydration levels. Instructing them that pale yellow (like lemonade) indicates

being fairly well hydrated, while darker yellow (like apple juice) indicates they're dehydrated, is an easy and accurate way to assess hydration status during training and competition.^{3,4} Dietitians can supply urine color charts for individual athletes and youth sports organizations to be posted in locker rooms and bathrooms.

RDs should emphasize the importance of consuming enough water regularly during sports activity. Counseling parents and coaches to establish a routine of reminding young athletes to drink water is vital, given that children and adolescents often don't recognize dehydration, White says. Diet is another good way to replenish electrolytes and is preferred over sports drinks for young child athletes, White adds. "Teaching the young athlete to consume sodium-containing foods for recovery is a great way for children to retain water and increase thirst in order to drink more fluids," he says. "Depending on how long the child was exercising, this snack or meal could be a peanut butter and banana sandwich, or whole grain pasta topped with chicken, vegetables, tomato sauce, and shredded mozzarella."

Mangieri recommends sports dietitians work with young athletes to establish a hydration and rehydration protocol that considers the athlete's sweat rate and training regimen, availability of fluids, environmental factors, fitness level, and training intensity. Factors such as rest breaks and ability to drink during practice and competitions should be reviewed. "Encourage athletes to begin all training sessions well hydrated and to continue to sip fluids throughout training or competition. As athletes age and their sweat rate increases, they should be made aware that their need for an appropriate sports beverage could increase," Mangieri says.

Prescribed hydration strategies individualized for clients and reinforced by dietitians, parents, and coaches are important. Mangieri cites a 2012 cohort study that assessed hydration status and behaviors of adolescent athletes both before and after a one-time educational intervention vs a prescribed hydration intervention. The single education session wasn't successful in changing hydration behaviors. However, prescribing individualized hydration protocols did improve hydration.¹¹ "This study supports the need for dietitians to go above and beyond simply telling young athletes what to do," Mangieri says, "and showing them exactly how to do it."

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AAP Hydration Recommendations

In 2011, the American Academy of Pediatrics (AAP) published the following key hydration recommendations for children and adolescents:

- Provide and promote consumption of readily accessible fluids at regular intervals before, during, and after activity to offset sweat loss and maintain adequate hydration while avoiding overdrinking. Generally, 100 to 250 mL (3 to 8 oz) every 20 minutes for 9- to 12-year-olds and up to 1 to 1.5 L (34 to 50 oz) per hour for adolescents is enough to minimize sweat-induced body-water deficits during exercise as long as preactivity hydration status is good. Pre- and postactivity body weight measurements can provide more information for individual rehydration needs. Electrolyte-supplemented beverages that emphasize sodium may be warranted during long-duration (≥ 1 hour), repeated same-day sessions of strenuous exercise, sports participation, and hot weather.
- Educate children and adolescents on the merits of ample hydration.
- Youth sports governing bodies, tournament directors, and other event administrators should provide adequate rest and recovery periods of two hours or more between same-day contests in warm to hot weather to allow sufficient recovery and rehydration.

The most notable change in the 2011 policy statement is the inclusion of new research related to the understanding of dehydration in children and adolescents. Research evidence since 2000 indicates that they can tolerate and adapt to exercise in heat as well as adults of similar fitness level as long as adequate hydration is maintained. The 2000 AAP Policy Statement was based on older research that suggested children were less able to tolerate and adapt to heat stress than adults.

— JVP

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