



POSITION STATEMENT AND RECOMMENDATIONS FOR MAINTAINING HYDRATION TO OPTIMIZE PERFORMANCE AND MINIMIZE THE RISK FOR EXERTIONAL HEAT ILLNESS

**National Federation of State High School Associations (NFHS)
Sports Medicine Advisory Committee (SMAC)**

DEHYDRATION – ITS EFFECTS ON PERFORMANCE AND ITS RELATIONSHIP TO EXERTIONAL HEAT ILLNESS RISK:

- Appropriate hydration before, during, and after physical activity is integral to healthy, safe and successful sports participation.
- Weight loss during exercise and other physical activity represents primarily a loss of body water. A loss of just 1 to 2% of body weight (1.5 to 3 pounds for a 150-pound athlete) can negatively impact performance. A loss of 3% or more of body weight during vigorous exercise can also significantly increase the risk for exertional heat-related illness. If an athlete is already dehydrated prior to beginning activity, these effects will occur even sooner.
- To ensure that athletes are hydrated prior to exercise, a pre- and post-activity measurement of body weight will be recorded whenever possible.
- Athletes with high body fat percentages can become significantly dehydrated and over-heat faster than athletes with lower body fat percentages, while working out under the same environmental conditions at the same or similar workload.
- Athletes have different sweating rates and some lose much more water and salt through their sweat than others. “Salty sweaters” will often have noticeable salt stains on their clothing and skin after workouts, and they often have a higher risk of developing exertional muscle cramps.
- Poor heat acclimatization/fitness levels can greatly contribute to an athlete’s heat intolerance and exertional heat illness risk.
- Certain medications or current/recent illness, especially for illnesses involving gastrointestinal distress (e.g., vomiting, diarrhea) and/or fever, can negatively affect an athlete’s hydration status and temperature regulation, increasing the risk for exertional heat illness.

- Environmental temperature and humidity each independently contribute to dehydration and exertional heat illness risk.
- Clothing that is dark or bulky, as well as protective equipment (such as helmets, shoulder pads and other padding and coverings), can increase body temperature, sweat loss and subsequent dehydration and exertional heat illness risk.
- Even naturally dry climates can have high humidity on the field if irrigation systems are run prior to early morning practices start. This temporary increase in humidity will continue until the water completely soaks into the ground or evaporates.
- A heat safety table should be followed to help determine if practices/contests should be modified or canceled. The National Athletic Trainers' Association (NATA) Guidelines for Wet Bulb Globe Temperature (WBGT) can be found at:
<https://kestrelinstruments.com/mwdownloads/download/link/id/356/>
 - On-site WBGT is the “gold standard” for assessing heat stress and should be measured 10-15 minutes before practices or contests. The results should be used with a heat stress to determine if practices or contests should be started, modified, or stopped.
 - If WBGT measurement is not available, the heat index for your approximate location can be determined by entering your postal zip code: <http://www.osaa.org/heatindex/>
 - Best practices may be established for your state and region by your state athletic association. We recommend strict adherence to state or regional guidelines.

The interplay of relative humidity and temperature on sweating and the risk for exertional heat illness:

- A combined relative humidity of 40 percent and a temperature of 95 degrees Fahrenheit are associated with a *likely risk* of incurring significant sweat loss and exertional heat illness during strenuous physical activity. However, even with a *lower air temperature* of only 85 degrees Fahrenheit, for example, the risk for extensive sweating and exertional heat illness would likely be the *same or greater with a higher relative humidity* of 70 percent or more.

WHAT TO DRINK DURING EXERCISE AND OTHER PHYSICAL ACTIVITY:

- For most exercising athletes in most scenarios, water is appropriate and sufficient for pre-hydration and rehydration. Water is quickly absorbed, well-tolerated, an excellent thirst quencher and cost-effective.
- Traditional sports drinks with an appropriate carbohydrate and sodium formulation may provide additional benefit in the following general situations:
 - Prolonged continuous or intermittent activity of greater than 60 minutes
 - Multiple, same-day bouts of intense, continuous or repeated exertion
 - Warm-to-hot and humid conditions
- Traditional sports drinks with an appropriate carbohydrate and sodium formulation may provide additional benefit for the following individual conditions:
 - Poor hydration prior to participation
 - A high sweat rate and/or “salty sweater”

- Poor caloric intake prior to participation
- Poor acclimatization to heat and humidity
- A 6 to 8% carbohydrate formulation is the maximum that should be utilized in a sports drink. Any greater concentration will slow stomach emptying and potentially cause the athlete to feel bloated. An appropriate sodium concentration (0.4–1.2 grams per liter) will help with fluid retention and distribution and decrease the risk of exertional muscle cramping.

WHAT NOT TO DRINK DURING EXERCISE AND OTHER PHYSICAL ACTIVITY:

- Fruit juices with greater than 8 percent carbohydrate content and carbonated soda can both result in a bloated feeling and abdominal cramping.
- Athletes should be aware that nutritional supplements are not limited to pills and powders as many “energy” drinks contain high levels of sugar, caffeine, and other sources of caffeine such as guarana and green tea extract.
 - The high levels of sugar and caffeine may result in increased anxiety, jitteriness, nausea, and upset stomach or diarrhea. Both can also act as a diuretic, leading to increased risk of dehydration.
 - Many of these drinks are being produced by traditional water, soft drink and sports drink companies which can cause confusion in the sports community. As is true with other forms of supplements, these “power drinks”, “energy drinks”, or “fluid supplements” are not regulated by the FDA. Thus, the purity and accuracy of contents on the label is not guaranteed.
 - Many of these beverages which claim to increase power, energy, and endurance, among other claims, may have additional ingredients that are not listed. Such ingredients may be harmful and may be banned by governing bodies like the NCAA, USOC, or individual state athletic associations.
 - See the **NFHS Position Statement and Recommendations for the use of Energy Drinks by Young Athletes** for further information.

HYDRATION AND FLUID INTAKE TIPS AND GUIDELINES:

- Many athletes do not voluntarily drink enough water to prevent significant dehydration during physical activity.
- Drink regularly throughout all physical activities. An athlete cannot always rely on his or her sense of thirst to sufficiently maintain proper hydration. When athletes begin to feel thirsty, they are already in an early state of dehydration.
- Drink before, during, and after practices and games. For example:
 - Drink 16 ounces of fluid 2 hours before physical activity.
 - Drink another 8 to 16 ounces 15 minutes before physical activity.
 - During physical activity, drink 4 to 8 ounces of fluid every 15 to 20 minutes (some athletes who sweat considerably can safely and comfortably tolerate up to 48 ounces per hour).
 - After physical activity, drink 16 to 20 ounces of fluid for every pound lost during physical activity to achieve normal hydration status before the next practice or competition (if there is sufficient time to do this safely and comfortably). Importantly, excessive fluid intake in a short period of time can be dangerous to one’s health (see below on hyponatremia).

- The volume and color of your urine is an excellent way of determining if you're well hydrated. Small amounts of dark urine mean that you need to drink more, while a "regular" amount of light-colored or nearly clear urine generally means you are well hydrated. A Urine Color Chart can be accessed at: <http://www.urinecolors.com/themes/uctheme/assets/dehydration-chart.pdf>
- Hyponatremia is a rare, but potentially deadly disorder resulting from the over-consumption of water or other low-sodium fluid (including most sports drinks). It is most commonly seen during endurance events, such as marathons, when participants consume large amounts of water or other beverages over several hours, far exceeding fluid lost through sweating. The opposite of dehydration, hyponatremia is a condition where there is an excessive amount of water in the blood and the sodium content of the blood is consequently diluted to dangerous levels. Affected individuals may exhibit disorientation, altered mental status, headache, lethargy and seizures. A confirmed diagnosis can only be made by testing blood sodium levels. Suspected hyponatremia is a medical emergency and the Emergency Medical System must be activated (or Call 9-1-1). Hyponatremia is treated by administering intravenous fluids containing high levels of sodium.

References:

<https://ksi.uconn.edu/prevention/hydration>

<https://nfhslearn.com/courses/heat-illness-prevention-2>

Casa, D. J., & Csillan, D. Preseason Heat-Acclimatization Guidelines for Secondary School Athletics. *Journal of Athletic Training*. 2009;44:332–333.

McDermott BP, et al. National Athletic Trainers' Association Position Statement: Fluid Replacement for the Physically Active. *Journal of Athletic Training*. 2017;52:877-895.

Montain SJ. Hydration recommendations for sport 2008. *Current Sports Medicine Reports* 2008;7:187-92.

National Collegiate Athletic Association. Guideline 2c: Prevention of Heat Illness. 2014-15 NCAA Sports Medicine Handbook (25th edition).

Sawka MN, et al. American College of Sports Medicine Position Stand. Exercise and fluid replacement. *Medicine & Science in Sports & Exercise* 2016;39:377-90.

October 2025

April 2022

April 2018

October 2014

October 2011

October 2008

DISCLAIMER – NFHS Position Statements and Guidelines

The NFHS regularly distributes position statements and guidelines to promote public awareness of certain health and safety-related issues. Such information is neither exhaustive nor necessarily applicable to all circumstances or individuals, and is no substitute for consultation with appropriate health-care professionals. Statutes, codes or environmental conditions may be relevant. NFHS position statements or guidelines should be considered in conjunction with other pertinent materials when taking action or planning care. The NFHS reserves the right to rescind or modify any such document at any time.