

Environmental and Non-Environmental Risk Factors

Enacting guidelines to fit every situation is problematic when individual and local differences often render unique circumstances. Local school systems should be prepared to make interpretations and err on the side of caution when dealing with unique circumstances.

The guidelines recommended for local consideration are minimum requirements designed to acclimatize student-athletes so they can participate effectively in warm and hot conditions and reduce the risk of heat related illnesses. However, environmental and non-environmental risk factors can increase the risk of heat illness per individual participant and per individual school. Local school systems are recommended to be educated, aware, and enact policy when needed to address environmental and non-environmental risk factors.

Environmental Risk Factors

School systems are encouraged to assess the environmental conditions for each day of practice and have policies in place depending on the assessment of the conditions. The more humid and hot conditions are on any given day of practice, the higher the risk is for heat illness and appropriate modifications to the practice schedule may be necessary.

Air temperature, combined with humidity, wind speed and the amount of radiant heat are all contributing environmental factors that can increase the risk of heat illness.

Resources for Environmental Risk Factors

- [NATA Position Statement: Exertional Heat Illness](#)
- The NOAA national Weather Service's Heat Index Chart: <http://www.nws.noaa.gov/om/heat/index.shtml>

Non-Environmental Risk Factors

The inter-association task force on exertional heat illnesses consensus statement details factors that may increase the risk associated with participation in the heat for individual students. During moderate exercise, 70 to 90 percent of the energy produced by the body is released as heat. There are a number of factors that can hamper heat dissipation and put an athlete at increased risk for heat illness. The NFHS Sports Medicine Advisory Committee (SMAC) lists the following non-environmental risk factors.

Risk Factors:

- **Clothing and Equipment.** Clothing and equipment inhibit heat loss from the body and increase the risk for heat illness. Dry clothing and equipment absorb sweat and prevent evaporative heat loss. Dark clothing or equipment produces radiant heat gain. Clothing and equipment decrease convective heat loss by interfering with air contact with the

body. During periods of high WBGT or Heat Index, the risk of heat illnesses increases when clothing and equipment are worn. Thus, risk may be minimized through removing equipment and participating in drills wearing shirts and shorts only. Given that a great deal of heat is radiated from the head, helmets should be removed early on in hot and humid conditions.

- **Age** — Children acclimatize to heat more slowly and are less effective in regulating body heat than adults.
- **Dehydration** — It has been shown that moderate levels of dehydration (3-5% of body weight) can cause a significant decrease in performance and predispose an athlete to exertional heat illness. Lack of sufficient water to be released by the sweat glands makes it very difficult for the body to dissipate heat through evaporation. Thirst is a poor indication of hydration. (See more in the Hydration Section)
- **Pre-activity Hydration Status** — Athletes who begin activity in an already dehydrated state are at increased risk for exertional heat illness. Pre-activity hydration status may be compromised by inadequate rehydration following previous session, alcohol consumption, rapid weight loss regimes (i.e., wrestling), and febrile or gastrointestinal illness (vomiting or diarrhea).
- **High Body Fat** — Athletes with a high percentage of body fat are at increased risk for heat illness, as fat acts to insulate the body and decreases the body's ability to dissipate heat.
- **Poor Acclimatization/Fitness Level** — Those not yet acclimatized to the heat or inadequately conditioned are at increased risk.
- **Febrile Illness** — A fever increases core temperature and decreases the ability of the body to compensate. It is dangerous to exercise with a fever, especially when Wet Bulb Globe Test (WBGT) is high. Athletes with a fever, respiratory illness, vomiting or diarrhea should not exercise, especially in a hot environment.
- **Medications** — Amphetamines (including ADHD medications), ephedrine, synephrine, ma huang and other stimulants increase heat production. Some medications have anti-cholinergic actions (amitriptyline, Atrovent) resulting in decreased sweat production. Diuretics can produce dehydration. Athletes taking medication for ADHD should be monitored closely for signs and symptoms of heat illness.
- **Sickle Cell Trait** — Athletes with sickle cell trait (SCT) are at increased risk for a sickling crisis with exercise during hot weather. Special precautions should be taken in hot and humid conditions for athletes with SCT

- **Prior Heat Illness History** – the risk factor for individuals with a prior history of heat related illnesses is higher. Decreased heat tolerance may affect 15 percent of athletes with a history of previous heat illness.

Additional non-environmental risk factors can be found in the consensus statement by the inter-association task force. Education and understanding of these considerations is recommended for school systems.

Resources for Non-Environmental Risk Factors

- [NATA Position Statement: Exertional Heat Illness](#)
- [NFHS SMAC Heat Related Illness](#)