

2. Heat-Related Illness

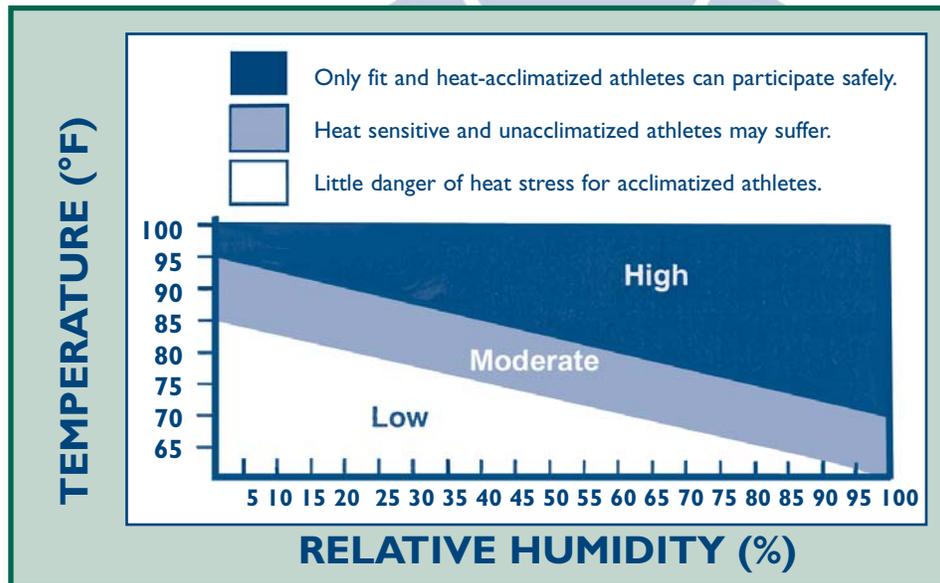


Figure 1

Recognition:

The early warning signs of heat-related illnesses include:

- Exhaustion
- Headache
- Muscle cramping
- Dizziness
- Nausea
- Thirst
- Decreased athletic performance

Other general symptoms include feeling hot or cold, incoherence, visual disturbances, vomiting, stomach cramps, and heart palpitations. Predisposition to heat-related illness should be recognized before it occurs, by making coaches, administrators, officials and athletes aware of individuals at-risk for heat-related pathologies.

Management:

The key to management is early recognition of symptoms, and immediate and effective treatment and referral. Symptoms of heat illness represent a continuum, and can worsen quickly if proper care is not rendered. In all cases, appropriate actions include:

- Cessation of activity.
- Remove the athlete from the sun at the first sign or symptom of heat illness.

- Assist in cooling the body.
- Use ice packs on sides of neck, armpits, groin and the crease at the top of the thigh.
- Administer fluids; cool water or an electrolyte drink with a low sugar content.
- Monitor vital signs.
- Under no circumstances should an athlete with symptoms be allowed to return to play the same day.
- **The best management of heat related illness is PREVENTION.**

Prevention:

- Ensure the athlete is well hydrated prior to the start of any and all activity.
- Allow frequent periods of rest and hydration during activity.
- Allow unrestricted fluid replacement; encourage fluids before, during and after activity.
- Weigh athletes before and after activity to monitor body water loss from the activity and to insure adequate rehydration has occurred prior to next session.
- Gradually increase activity in the heat over a period of 7-10 days to allow adequate acclimatization.
- Wear light-weight and light-colored clothing.
- Protect against sun exposure, i.e., use sun screen.
- Schedule activities at the coolest time of day
- Routinely perform mandatory temperature and humidity readings on playing surfaces (indoor/outdoor).
- Routinely monitor changing weather conditions with close attention to temperature and humidity on playing surfaces (indoor/outdoor).
- Strongly consider postponing or canceling for extreme heat and humidity conditions (see Figure 1).

For more detailed information and a complete list of references, please see:

Zinder, S.M. and Shultz, S.J. *Heat-Related Issues. National Federation of State High School Associations Resource Document.* <http://www.nfhs.org>

More on Recognition, Management and Prevention of Heat-Related Illness

Significance:

Heat-related illness has been a concern to participants in outdoor activity for centuries. Hot, humid weather is one of the leading causes of environmental distress in athletes. Heat stroke, second only to spinal cord injury, is one of the primary causes of activity-related death in high school athletes. Football players wearing full pads and uniform, combined with the hot, humid weather in many regions in the late spring and early autumn, are particularly susceptible to heat-related pathologies. **However, athletes practicing indoors, in non-air conditioned or poorly ventilated gyms are also susceptible.**

Risk Factors:

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. These factors include:

- **Environmental** — Air temperature, combined with humidity, wind speed and the amount of radiant heat can hamper heat dissipation. Humidity influences how readily sweat can evaporate into the atmosphere; high humidity (>60%) will dramatically diminish this mechanism of heat loss.
- **Clothing** — Dark clothing and bulky protective equipment can drastically increase the chance of heat stress. Dark colors absorb heat and protective equipment can make heat dissipation very difficult.
- **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.
- **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 body fat have greater difficulty in dissipating heat.
- **Poor Acclimatization/Fitness Level** — Those not yet acclimatized to the heat or inadequately conditioned are at increased risk.
- **Febrile Illness** — Any individual with a current or recent fever may be at increased risk.
- **Medications** — Medications with a diuretic effect or that act as stimulants may increase risk.
- **Sickle Cell Trait** — Poses an increased susceptibility to heat illness, particularly if optimal hydration and electrolytes are not maintained.

Recognition

Heat-related illnesses are typically classified, in increasing order of severity, as heat cramps, heat syncope, heat exhaustion and heat stroke:

Heat Cramps

- Painful cramping of abdominal and extremity muscles
- Elevated body temperature

Heat Exhaustion/Heat Syncope (Can progress rapidly to heat stroke unless managed properly)

- Exhaustion, nausea, vomiting and dizziness
- Weakness, fatigue and fainting
- Elevated body temperature

Heat Stroke

- Acute medical emergency due to thermoregulatory failure
- Nausea, seizures, disorientation and possible unconsciousness or coma
- Hot, dry skin and high body temperature (105°F)

Management:

Heat Cramps

- Cessation of activity
- Gentle passive stretching of affected muscles
- Drinking cool water or an electrolyte solution (low in sugar)
- For severe symptoms treat as heat exhaustion

Heat Syncope and Heat Exhaustion

- Remove the athlete from the hot environment and rest in a cool, shaded area
- Remove restrictive clothing
- Give fluids orally, if the athlete is conscious
- Apply active cooling measures such as a fan or ice towels if the core temperature is elevated
- Refer to a physician to assess the needs of fluid/electrolyte replacement and further medical attention, especially if nausea and vomiting are present

Heat Stroke

- This is a **MEDICAL EMERGENCY**
- Activate EMS immediately
- Monitor core body temperature and lower it as quickly as possible
- Remove as much clothing as possible
- Immersion in an ice bath has been shown to be the best method to decrease core temperature
- Apply ice packs in the armpits, groin and neck areas
- Continue cooling efforts until EMS arrives

Prevention:

- **Educate** all participants, coaches, officials and administrators regarding the signs and symptoms of heat-related illness
- Individuals with a previous history of heat illness, with sickle cell disease, or on certain medications may be at higher risk for heat injury and should be monitored closely.
- Allow adequate **acclimatization** to the heat. (Acclimatization is achieved by gradually increasing activity in the heat over a period of 7-10 days.)

- Wear **light-weight and light-colored clothing**
- Provide frequent periods of **rest and hydration** during activity
- Allow unrestricted **fluid replacement** before, during and after activity:
 - ◀ Before Exercise:
 - ⇒ Drink 17-20 ounces of water or sports drink 2-3 hours before exercise
 - ⇒ Drink an additional 7-10 ounces of water or sports drink 10-20 minutes before exercise
 - ◀ During Exercise:
 - ⇒ Drink early
 - ⇒ As a general guide, drink 7-10 ounces of water or sports drink every 10-20 minutes.
 - ⇒ Do not wait until thirsty; to maintain hydration, need to drink beyond thirst.
 - ◀ After Exercise:
 - ⇒ Drink enough fluids to replace any weight loss within two hours of completion of activity.
 - ⇒ For each pound of weight loss, drink 20-24 ounces of a sports drink.
- Schedule activities at the coolest time of day
- Weigh each athlete before and after each practice to monitor body water loss during the practice. During two-a-days, athletes should gain back at least 90 percent of the water weight lost in the first practice before being allowed to participate in the second.
- Every institution should have a plan and means to assess environmental conditions.
 - ◀ The environment should be monitored for both temperature and humidity prior to activity, with the practice schedule adjusted accordingly. (See Figure 1)
 - ◀ The use of the WBGT Index is the most widely used to assess the combined impact of humidity, ambient temperature, solar radiation and air movement. The following guidelines are recommended when using the WBGT Index:

<65°F	Low risk
65-73°F	Moderate risk
73-82°F	High risk
>85°F	Very high risk

- ◀ An alternative method for assessing heat and humidity is the weather guide or heat index. Figure 1 is an example of a heat-humidity index table that defines low, moderate, high and extreme risk zones.
- ◀ Considerations for Games
 - ⇒ Check the environment one hour before the scheduled contest
 - ⇒ If a high risk is present, consider altering game conditions
 - ⇒ If a very high risk is present, consider postponing or canceling the contest
- ◀ Considerations for Practices
 - ⇒ When a dangerous heat index is indicated, consider canceling or shortening the practice session, or rescheduling to early morning or late practice sessions.

References:

- American College of Sports Medicine: Prevention of thermal injuries during distance running. Position Statement. *Phys Sports Med.* 1984;12:7.
- Casa, D. et al. National Athletic Trainers' Association Position Statement: Fluid Replacement for Athletes. *Journal of Athletic Training.* 35(2):212-224, 2000
- Mueller F, Cantu R. National Center for Catastrophic Sports Injury Research. <http://www.unc.edu/depts/nccsi/>; 1999.

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