

## VHSL HEAT GUIDELINES

Proper heat-acclimatization plans in secondary school athletic programs are essential to minimize the risk of exertional heat illness (EHI) during the preseason practice period. Gradually increasing athletes' exposure to the duration and intensity of physical activity and to the environment minimizes exertional heat illness risk while improving athletic performance. Progressive acclimatization is especially important during the initial three to five days of preseason practices,<sup>1</sup> and when an athlete progresses through a proper heat-acclimatization progression, physiological function, exercise heat tolerance, and exercise performance are all enhanced. In comparison, athletes who are not exposed to a proper heat-acclimatization progression are at increased risk for EHI.<sup>1</sup>

### PREVENTION OF EXERTIONAL HEAT ILLNESS

In conjunction with the pre-participation exam, student-athletes should be screened for risk factors or a history of EHI. Athletes should be acclimatized to heat gradually over a 7-14 day period.<sup>2</sup> Special considerations and/or modifications are needed for those wearing protective equipment during days of high heat and humidity. Athletes should remain well hydrated and replace fluids lost through sweat during activity, including conditioning/training sessions, practices and games. It should be emphasized that ***athletes should have free access to readily available fluids at any time***, not just during breaks. It is imperative that relevant personnel be trained in prevention, signs and symptoms, and treatment of EHI.<sup>2</sup>

When high temperatures and/or humidity is forecasted, those supervising practices and competitions should make accommodations based on these conditions, including:

- Increasing frequency and duration of water breaks
- Increasing frequency and duration of rest breaks
- Reducing the amount of equipment worn during activity
- Modifying total amount of time engaged in practice
- Changing activity location

Additional details on participation modifications can be found in the "Exercise in Hot and Humid Environments" section of this document. Forecasting tools, including online resources and/or mobile "apps" can be used to better anticipate if/when activity modifications may be required. Examples include:

- <http://www.nws.noaa.gov/om/heat/index.shtml>
- [https://www.osha.gov/SLTC/heatillness/heat\\_index/heat\\_app.html](https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html)
- <https://itunes.apple.com/us/app/weatherfx/id539498084?mt=8>

While these services can provide guidance for planning purposes, they should never replace the "real-time" evaluation of environmental conditions on-site at the activity location. Weather forecasts tend to be generalized over a large area, can and do change frequently, and ultimately may not be specific for the athletic venue.

### TYPES OF EXERTIONAL HEAT ILLNESS

Exertional heat illness range in severity from exercise associated muscle cramps to exertional heat stroke.

### Exercise Associated Muscle Cramp<sup>2</sup>

Exercise associated muscle cramps are sudden or sometimes progressively and noticeably evolving, involuntary, painful contractions of skeletal muscle during or after exercise. These cramps are sometimes incorrectly termed heat cramps, as these cramps are not directly related to elevated body temperature and can present during exercise in warm, cool or temperature controlled environments, though excessive sweating is often present. Proposed contributing factors to exercise associated muscle cramps are as followed: dehydration, electrolyte imbalances, altered neuromuscular control, fatigue or any combination of these factors.

#### Signs and Symptoms

- Visible cramping in part or all of the muscle (group)
- Localized pain
- Dehydration
- Thirst
- Sweating
- Fatigue

#### Treatment

- Rest
- Passive Stretching
- Rehydration using a high sodium/carbohydrate beverage

### Heat Syncope<sup>2</sup>

Heat syncope often occurs in unfit or heat-unacclimatized people who stand for a long period of time in the heat or during sudden changes in posture (moving from sitting to standing) in the heat. This condition is often attributed to dehydration, venous pooling of blood and low blood pressure. Heat syncope often occurs in the first five days of unaccustomed heat exposure, before blood volume expands and cardiovascular adaptations are complete, and in those with heart disease or taking diuretics.

#### Signs and Symptoms

- Dizziness
- Tunnel vision
- Pale or clammy skin
- Decreased pulse rate

#### Treatment

- Move athlete to shaded or cool, indoor area
- monitor vital signs
- allow athlete to rest lying on their back
- elevate legs above heart
- cool athlete
- rehydrate

### Heat Exhaustion<sup>2</sup>

Heat exhaustion is the inability to effectively exercise in the heat, secondary to a combination of factors, including cardiovascular insufficiency, low blood pressure, energy depletion and central fatigue. This condition is manifested by an elevated core body temperature, usually less than 105 degrees F, and is often associated with a high rate or volume of skin blood flow, heavy sweating and dehydration. It often occurs in hot or humid (or both) conditions, but it can also occur in normal environmental conditions with intense physical activity. Heat exhaustion occurs most often in individuals who are heat-unacclimatized or dehydrated.

#### Signs and Symptoms

- Excessive fatigue
- Syncope
- Collapse
- Headache
- Dizziness
- Confusion
- Vomiting
- Nausea
- Lightheadedness
- Low blood pressure

#### Treatment

- Remove equipment and clothing to facilitate cooling
- Move to a cool, shaded or indoor area.
- Cool with cold towels and fans as needed
- Monitor vital signs
- Have athlete rest lying on their back
- Elevate legs above heart
- Activate EMS if athlete does not show signs of improvement within 30 minutes

#### Exertional Heat Stroke<sup>2, 3</sup>

Exertional heat stroke is the most severe heat illness and is characterized by neurological impairment combined with a core body temperature above 105 degrees. This condition is a product of the body's heat production due to exercise and or inhibited heat loss. While exertional heat illness most often occurs in hot, humid weather, it can also present due to intense physical activity in the absence of extreme environmental conditions. The risks of morbidity and mortality increase the longer that athletes body temperature remains elevated above 105 degrees, while risk of morbidity and mortality are greatly reduced if body temperature is lowered promptly after onset.

#### Signs and Symptoms

- Central nervous system dysfunction
- Core body temperature above 105 degrees
- Disorientation
- Confusion
- Dizziness
- Loss of balance
- Staggering
- Irritability

- Irrational or unusual behavior
- Apathy
- Aggressiveness
- Hysteria
- Delirium
- Collapse
- Loss of consciousness
- Coma
- Hot, sweaty skin
- Hot, dry skin
- Dehydration
- Hypotension
- Hyperventilation

#### Treatment

- Medical emergency- activate EMS per emergency action plan
- Remove excess clothing and equipment
- Cold water immersion until core body temperature reaches 102 degrees or athlete begins to shiver

#### **FLUID REPLACEMENT RECOMMENDATIONS**

Evaporation of sweat is the primary source of heat dissipation during exercise. Athletes whose sweat loss exceeds rehydration during activity become dehydrated. Dehydration of one to two percent of body weight begins to negatively impact physiological function and athletic performance while dehydration of three percent or greater of body weight puts an athlete at risk for exertional heat illnesses.<sup>4</sup>

#### Signs and Symptoms of Dehydration

- Thirst
- Irritability
- General discomfort
- Headache
- Weakness
- Dizziness
- Cramps
- Chills
- Vomiting
- Nausea
- Decreased performance

#### Recommendations for Fluid Replacement

- Establish a fluid replacement protocol that meets the needs of the athlete and the sport.
- Supervised monitoring of pre and post practice weight
- Restrict or modify activity of those athletes who are not within 1% of their previous day's pre practice weight.

- During activity, 7-10 oz of fluid should be taken in every 10-20 minutes.<sup>4</sup>
- Water should be available at all times and access should never be denied to exercising individuals.
- Athletes should replace fluid at 24 oz per pound lost.

#### Educational Components

- Educate athletes on how dehydration affects physical performance.
- Educate athletes on how to monitor hydration status by monitoring urine color.
- Educate athletes that maintaining hydration is a 24 hour a day process.
- Educate athletes that they should enter each practice session or game well hydrated with a focus on maintaining hydration.

### **EXERCISE IN HOT AND HUMID ENVIRONMENTS**

Exercising in hot and humid environments can predispose a student-athlete to EHI. The higher the temperature, the more heat the body absorbs while higher humidity limits the body's ability to cool itself through evaporation (sweating). Gradually increasing the intensity and duration of activity in hot and humid environments (acclimatization) is an important step in preventing EHI as is assessing the environmental conditions during activity.

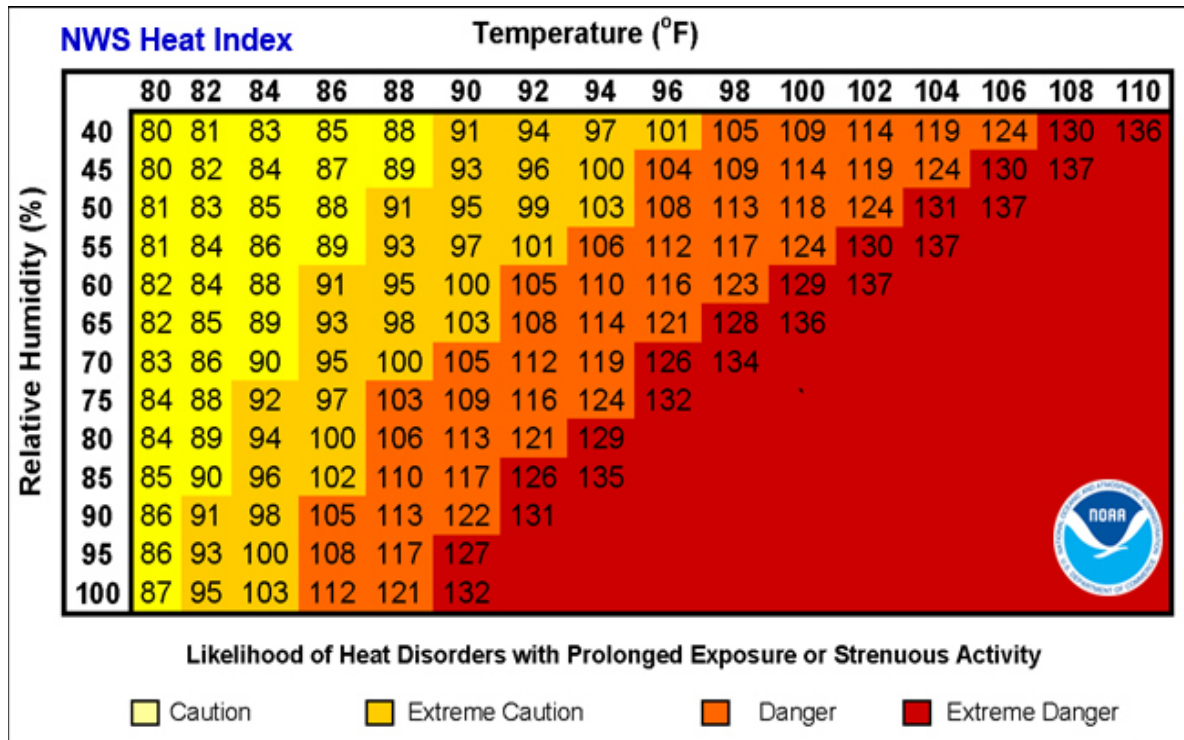
Activities, including practices and competitions, should be modified when environmental conditions are extreme. The Wet Bulb Globe Temperature (WBGT) is the recommended method for assessing environmental conditions and should be used to determine the nature of any modifications.<sup>2</sup> The WBGT takes into account ambient air temperature, relative humidity, and radiant heating from the sun and is utilized extensively in athletics and the US military to modify activity when conditions warrant.<sup>2</sup> While WBGT is preferred, Heat Index can be utilized should WBGT be unavailable.<sup>3</sup> Wet Bulb Globe Temperature (WBT) recommendations are also included as this assessment method may be more familiar to member schools.

The VHSL Heat Guidelines provides participation recommendations based on three assessment mechanisms: WBGT, WBT and Heat Index. While the specific mechanism utilized at the local school level will be determined by local policy and resources, the VHSL SMAC strongly encourages schools to utilize WBGT.

## WET BULB TEMPERATURE (WBT) and WET BULB GLOBE TEMPERATURE (WBGT) PARTICIPATION RECOMMENDATIONS

Level	WBT	WBGT	Duration	Fluid Consumption	Practices
1	<66°	<80°	3 hours maximum	Insist that adequate fluid be ingested	Full gear; minimum of 2 water breaks per hour
2	66.0°-74.9°	80.0°-82.4°	3 hours maximum	Insist that 4 – 6 oz fluid be ingested every 20 minutes	Full gear; minimum of 3 water breaks per hour
3	75.0°-76.9°	82.5°-84.9°	3 hours maximum	Insist that 6 – 8 oz fluid be ingested every 20 minutes	Remove helmets unless active in drill; monitor athletes, rest as needed.
4	77.0°-78.9°	85.0°-87.4°	3 hours maximum, every 45 minutes of work ≥ 15 minutes of rest each hour*	Insist that 8 – 10 oz fluid be ingested every 15 minutes	No equipment during non-contact drills; remove helmet unless active in drill, remove pads when teaching or non-contact portions of practice exceed 10 minutes in length
5	79.0°-80.9°	87.5°-89.9°	3 hours maximum every 45 minutes of work ≥ 20 minutes of rest each hour*	Insist that 8 – 10 oz fluid be ingested every 15 minutes.	Shirt and shorts only, no helmets or equipment; reduce intensity of activity, no equipment or helmets
6	81.0° +	90.0° +	NO OUTDOOR PRACTICES, SCRIMMAGES or COMPETITIONS	Re-hydrate 24 oz for every pound of body weight loss per day.	Practices conducted indoors must follow the Heat Policy

## HEAT INDEX PARTICIPATION RECOMMENDATIONS



[http://www.nws.noaa.gov/om/heat/heat\\_index.shtml](http://www.nws.noaa.gov/om/heat/heat_index.shtml)

Heat Index	Recommendations
105° and up	No outdoor activities
95° to 104°	No equipment (helmets, shoulder pads, etc.) during activity
90° to 94°	Equipment removed as often as possible (during rest breaks, while on sideline, etc.). Careful monitoring for signs of heat illness.
Below 89°	Unrestricted access to water during all practices and competitions; breaks every 20 to 30 minutes.

### REFERENCES

1. Casa, DJ, Csillan D. Preseason Heat-Acclimatization Guidelines for Secondary School Athletics. *J Athl Train.* 2009;44(3):332-333.
2. Casa, DJ, DeMartini JK, Bergeron MF, et al. National Athletic Trainers' Association Position Statement: Exertional Heat Illness. *J Athl Train.* 2015;50(9):986-1000.
3. Casa, DJ, Almquist, JL, Anderson, SA, et al. The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations. *J Athl Train.* 2013;48(4):546-553.
4. Casa, DJ, Armstrong, LE, Hillman, SK, et al. National Athletic Trainers' Association Position Statement: Fluid Replacement for Athletes. *J Athl Train.* 2000;35(2):212-224.