SPORTS MEDICINE: Exertional Heat Illness and Hydration

Exertional Heat Illness
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This document will explain prevention strategies, risk factors for heat illness, preventative measures that should be taken, and the different types of heat illness. Most instances of heat illness can be avoided by using awareness and preventative measures. It is based on the practices of ERAU Sports Medicine, the 2009 NCAA Sports Medicine Handbook, and www.nata.org. Its purpose is to ensure that all ERAU athletics staff members are aware of the types of heat illnesses, proper treatment methods for managing heat illness, and possible ways to prevent these illnesses. The health and safety of our student-athletes is our main goal.

- Acclimatization and Fitness Level: Lack of proper acclimatization or conditioning level.
- Air Temperature and Humidity: Humidity greater than 90% can be dangerous, especially in a hot, sunny environment.
- Clothing: Darker clothing increases heat absorption. Protective equipment can decrease the body's cooling ability.
- Dehydration: Student-athletes who begin practices or competitions already dehydrated increase their risk for heat illness.
- Nutritional Supplements: Nutritional supplements can contain stimulants, which can dehydrate the body and/or increase metabolism and heat production.
- Medications, Drugs, Alcohol: Can have similar effects as nutritional supplements.
- Medical Conditions: Conditions involving fever, gastrointestinal illness, previous episode(s) of heat illness, obesity, or having the sickle cell trait.

Prevention Strategies

- If practice occurs on six consecutive days, student-athletes should have one day of complete rest (no conditioning, walk through, practices, etc.)
- Full contact sports: 100% live contact drills should begin no earlier than day six of the pre-season acclimatization period
- Double session practices should be followed by a single session practice.
- On double session days, the two practices should be separated by at least three continuous hours in a cool environment.
- **The Sports Medicine staff has the authority to alter work/rest ratios, practice schedules, amounts of equipment and remove individuals from participation in sports based on heat conditions and/or athletes' medical conditions.**
- Avoid having two sessions on the same day on consecutive days and allow at least one complete day off each week.
- Schedule practice times in the morning and evening when it is cooler. Avoid practicing during the heat of the day.
- Refer to the heat index chart located in the following pages and follow the guidelines for work/rest ratios. If possible student-athletes should rest in a shaded area. Water/sports drink should have plenty of ice to help cool the body.
- As a coach, if you see a student-athlete is struggling with the heat, allow them to rest, ideally in a cooler shaded area. When a student-athlete becomes dehydrated, their mental status and performance decrease, and unable to give max effort during athletics.
- Ensure that pre-participation physical examinations have been completed, which include specific questions regarding fluid intake, weight changes during activity, medication and supplement use, activity level and training environment over the past month, and history of cramping/heat illnesses.
- Student-athletes who are currently ill with a viral infection (e.g. upper respiratory tract infection, gastroenteritis, have a fever, skin rash, etc.) should not participate until the condition is resolved. Though symptoms have resolved, the student-athlete may still be susceptible to heat illness and should be observed carefully upon return to exercising in the heat.
- **Acclimatization**: Activity intensity and duration should be increased over a period of 10-14 days.
- **Hydrate:** Start all activities well hydrated. Drink 16-24 oz. of fluid one to two hours prior to activity, and continue to drink 4- 8 oz. every 15-20 minutes you are training. Drink before thirst develops.
- **Diet**: Eat a healthy and well balanced diet. Add some salt to meals and incorporate sports drinks into fluid intake to increase electrolyte replacement. Avoid alcohol, carbonated beverages, and beverages containing caffeine.
- **Rest**: To ensure adequate rest, student-athletes should get at least 6-8 hours of sleep each night. Allow three to four hours between workouts for rest, food, and digestion.
- Student-athletes should weigh in and out before each practice/game. They should not lose more than 2-3% of their body weight during a workout. This weight must be replaced before the next session. Any athlete that does not meet their fluid replacement goals will be held out of the next session.
- For each pound of weight lost, drink 16 oz. of water/sports drink. The first hour after the session is the ideal time for rehydration.
- Ice towels should be made available for student-athletes to use during breaks. This helps to cool the body's core temperature.

Treatment Strategies for Exertional Heat Illnesses

DEHYDRATION:

When student-athletes do not replenish lost fluids, they become dehydrated. Dehydration of 1-2% of body weight begins to compromise physiological function and negatively affect performance. Dehydration of 3% or more can lead to heat cramps, heat exhaustion, or heat stroke.

Signs and Symptoms:

- Dry Mouth
- Thirst
- Being irritable or cranky
- Headache
- Seeming bored or disinterested
- Dizziness
- Cramps
- Excessive fatigue
- Not able to run as fast or play as well as usual

Treatment:

- Move student-athlete to a cool environment and rehydrate.
- Maintain normal hydration (as indicated by baseline weight).
- Begin exercise properly hydrated. Any fluid deficits should be replaced within 1-2 hours after exercise is complete.
- Hydrate with a sports drink like Gatorade, which contains carbohydrates and electrolytes (sodium and potassium) before and during exercise is optimal to replace losses and provide energy.
- Hydrate throughout sports practice to minimize dehydration and maximize performance.
- Seek medical attention to replace fluids via an intravenous line if athlete is nauseated or vomiting.

Return to Play Considerations:

- If degree of dehydration is minor and the student-athlete is symptom free, continuing practice is acceptable.

HEAT CRAMPS:

Muscle cramps are not well understood. Heat cramps are often present in student-athletes who perform strenuous exercise in the heat. Conversely, cramps also occur in the absence of warm or hot conditions.

Signs and Symptoms:

- Intense pain (not associated with pulling or straining a muscle)
- Persistent muscle contractions that continue during and after exercise

Treatment:

- Re-establish normal hydration status and replace some sodium losses with a sports drink or water
- Some additional sodium may be needed (especially in those with a history of heat cramps) earlier in the activity
- Light stretching, relaxation and massage of the involved muscle may help acute pain of a muscle cramp

Return to Play Considerations:

- Student-athlete should be assessed to determine if they can perform at the level needed for successful participation.
- General leg cramps can usually be controlled by ice, a light stretch, and fluid hydration. If the condition worsens the athlete may need to be transported to the emergency room for IV fluids. The severity of dehydration will determine when the athlete returns to play.

HEAT SYNCOPE:

Often occurs in unfit or un-acclimated persons who stand for a long period of time in the heat or during sudden changes in posture in the heat. This condition is often attributed to dehydration, venous pooling of blood, reduced cardiac filling, or low blood pressure with resultant cerebral ischemia. Heat syncope usually occurs during the first 5 days of unaccustomed heat exposure before the 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 sweaty skin, a decreased pulse rate while standing in the heat or after vigorous exercise

Treatment:

- Move to shaded area, monitor vital signs, elevate the legs above the heart, cool the skin, and rehydrate

Return to Play Considerations:

- Athletic Trainer should monitor the student-athlete's condition until signs and symptoms have resolved.

HEAT EXHAUSTION:

Heat exhaustion is a moderate illness characterized by the inability to sustain adequate cardiac output, resulting from strenuous physical exercise and environmental heat stress.

Signs and Symptoms:

- Student-athlete finds it hard or impossible to keep playing
- Loss of coordination, dizziness or fainting
- Dehydration
- Profuse sweating or pale skin
- Headache, nausea, vomiting or diarrhea
- Stomach/intestinal cramps or persistent muscle cramps

Treatment:

- Remove student-athlete from play and immediately move to shaded or air-conditioned area
- Remove excess clothing and equipment
- Cool student-athlete until rectal temperature (best practices) is approximately 101°F/38.3°C. When using rectal temperature, clear area of other athletes/spectators and use proper draping.
- Have student-athlete lie comfortably with legs propped above heart level
- If student-athlete is not nauseated, vomiting or experiencing any CNS dysfunction, rehydrate orally with chilled water or sports drink. If student-athlete is unable to take oral fluids, they should be transported to the emergency room to begin IV fluids.
- Monitor heart rate, blood pressure, respiratory rate, core temperature and CNS status
- EMS transport for student-athlete to an emergency facility if rapid improvement is not noted with prescribed treatment

Return to Play Considerations:

- Student-athlete should be symptom free and fully hydrated; recommend physician clearance; rule out underlying condition that predisposed him/her for continue problems; avoid intense practice in heat until at least the next day.

EXERTIONAL HEAT STOKE:

A severe illness characterized by central nervous system (CNS) abnormalities and potentially tissue damage resulting from elevated body temperatures induced by strenuous physical exercise and increased environmental heat stress.

Signs and Symptoms:

- CNS dysfunction, such as altered consciousness, seizures, confusion, emotional instability, irrational behavior or decreased mental acuity
- Nausea, vomiting or diarrhea
- Headache, dizziness or weakness
- Hot and wet or dry skin
- Increased heart rate, decreased blood pressure or fast breathing
- Dehydration
- Combative

Treatment:

- **AGGRESSIVE and IMMEDIATE whole body cooling is the key to optimizing treatment for heat stroke, ideally cold water immersion. It is recommended to COOL FIRST and TRANSPORT SECOND if onsite rapid cooling and adequate medical supervision are available.**
- Rectal temperature should be taken as it is the "gold standard" to get most accurate core body temperature. Be sure to clear area of other student-athletes and spectators and use proper draping to ensure privacy. Rectal thermometer may be used doing cold water immersion.
- The duration and degree of hyperthermia may determine adverse outcomes. If untreated, hyperthermia-induced physiological changes resulting in fatal consequences may occur within vital organ systems (muscle, heart, brain, etc.). Due to superior cooling rates, immediate whole-body cooling (cold water immersion), is the best treatment and should be initiated within minutes of symptoms developing.
- The student-athlete should be removed when core body temperature reaches 102°F/38.9C to prevent overcooling.

Return to Play Considerations:

- The team physician should devise a careful return-to-play strategy that can be implemented with the assistance of a qualified health care professional.

EXERTIONAL HYPONATREMIA:

When a student-athlete's blood sodium levels decrease, either due to over hydration or inadequate sodium intake, or both, medical complications can result in cerebral and/or pulmonary edema. This tends to occur during warm/hot weather activities. Hyponatremia may be completely avoided if fluid consumption during activity does not exceed fluid losses.

Signs and Symptoms:

- Excessive fluid consumption before, during and after exercising (weight gain during activity)
- Increasing headache
- Nausea, vomiting (often repetitive)
- Swelling of extremities (hands and feet)

Treatment:

- If blood sodium levels cannot be determined onsite, hold off on rehydrating student-athlete (may worsen condition) and transport immediately to a medical facility.
- The delivery of sodium, certain diuretics or intravenous solutions may be necessary. All will be monitored in the emergency department to ensure no complications develop.

Return to Play Considerations:

- Physician clearance is strongly recommended in all cases.

Hydration breaks approved by NCAA for Men's and Women's Soccer (Approved 2019):

- The new rule will be applied when the wet-bulb globe temperature is at least 86 degrees Fahrenheit
- The hydration breaks will occur between the 25- and 30-minute marks of the first half and the 70- and 75-minute marks of the second half and last for a minimum of two minutes. Appropriate host personnel (Athletic Trainers) will conduct temperature measurements before and throughout the game.
- Appropriate host personnel (Athletic Trainers) will instruct on-field officials if the threshold for hydration breaks is met. The referee is responsible for informing the head coaches and implementing the hydration breaks. Additional breaks are permissible at the discretion of the referee.

WBGT Reading Activity Guidelines and Rest-Break Guidelines

- Under 82.08F (27.88C) Normal activities: provide greater than or equal to 3 separate rest breaks/hr of minimum duration 3 min each during workout.

- 82.0–86.98F (27.88C–30.58C) Use discretion for intense or prolonged exercise. Watch at-risk student-athletes carefully. Provide greater than or equal to 3 separate rest breaks/hr of minimum duration 4 min each.

- 87.08F–89.98F (30.58C–32.28C) Maximum practice time = 2 hr. For football: players restricted to helmet, shoulder pads, and shorts during practice. All protective equipment must be removed for conditioning activities. For all sports: provide greater than or equal to 4 separate rest breaks/hr of minimum duration 4 min each.

- 90.0–92.08F (32.28C–33.38C) Maximum length of practice = 1 hr. No protective equipment may be worn during practice and there may be no conditioning activities. There must be 20 min of rest breaks provided during the hour of practice. Over

- 92.18F (33.48C) No outdoor workouts, cancel exercise, delay practices until a cooler WBGT reading occurs.

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Heat Index Chart

Relative Humidity	Environmantal Temperature (Degrees Farenheit)									
	70	**75**	**80**	**85**	**90**	**100**	**105**	**110**	**115**	**120**
0%	64	69	73	78	83	87	91	95	103	107
10%	65	70	75	80	85	90	95	100	111	116
20%	66	72	77	82	87	93	99	105	120	
30%	67	73	78	84	90	96	104	113		
40%	68	74	79	86	93	101	110	123		
50%	69	75	81	88	96	107	120			
60%	70	76	82	90	100	114				
70%	70	77	85	93	106	124				
80%	71	78	86	97	113					
90%	71	79	88	102	122					
100%	72	80	91	108						

Heat index less than 90: Heat cramps or heat exhaustion unlikely, but possible. Proceed with normal activity.
Heat index 90-105: Heat cramps or heat exhaustion possible. Five minute break every 15-20 mins.
Heat index 105-120:Heat cramps or heat exhaustion likely. Heat stroke possible. Five minute break every 10-15 mins.
Heat index greater than 120: Heat stroke highly likely, no outdoor activity.