Exertional Heat Illness

Jason Cates ATC/L
Exertional Heat Illness

- Heat illness is inherent to physical activity and its occurrence increases with rising ambient temperature and relative humidity.

- Potential Signs and Symptoms to Recognize:
  1. Heat (Muscle) Cramps
  2. Fatigue
  3. Profuse or NOT Sweating
  4. Confusion
  5. Lightheadedness
  6. Dizziness
  7. Nausea/Vomiting
Exertional Heat Illness

• If an athlete is displaying any of these signs or symptoms remove from participation immediately. Begin to cool & rehydrate as quickly as possible and **DO NOT** let the athlete return to participation.
Symptoms of Heat Illness

Heat (muscle) Cramps:

Exercise-associated muscle (heat) cramps represent a condition that presents during or after intense exercise sessions as an acute, painful, involuntary muscle contraction. Proposed causes include fluid deficiencies (dehydration), electrolyte imbalances, neuromuscular fatigue or any combination of these factors.
Symptoms of Heat Illness

Treatment:
1. Remove athlete from participation to a cool area
2. Try to rehydrate orally, preferably with electrolyte solution
3. Apply ICE to the affected area
Symptoms of Heat Illness

Treatment:

4. Encourage athlete to counter contract opposing muscle group

5. Light stretching or massage is permissible

6. If cramps do not subside or if the athlete is vomiting; the athlete may need I.V. fluids
Heat Syncope - Orthostatic Dizziness: 
May occur when a person is exposed to high environmental temperatures. Usually occurs within first five days of acclimatization, before blood volume expands.
Treatment:
1. Remove athlete from participation to a cooler place
2. Try to rehydrate orally; preferably use electrolyte solution
3. Monitor vital signs and cognitive status
Exercise (heat) exhaustion: The inability to continue exercise associated with any combination of heavy sweating, dehydration, sodium loss and energy depletion. Occurs most frequently in hot, humid conditions. Without measuring rectal temperature, it can be difficult to distinguish from exertional heat stroke.
Treatment:
1. Activate EAP and call 911
2. Remove equipment and clothing
3. Remove athlete from participation to an air conditioned space
Treatment:
4. Try to rehydrate orally
5. Begin aggressive cooling (ice packs, cold shower, cold water immersion)
6. Monitor vital signs and cognitive status
**Exertional heat stroke:**
Involves an elevated core temperature (usually > 104 Degrees F) associated with signs of organ system failure due to hyperthermia. Condition is life threatening and can be fatal unless promptly recognized and treated.
Treatment:
1. Activate EAP and call 911
2. Remove equipment and clothing
3. Remove athlete from participation to an air conditioned space
Treatment:
4. If conscious, try to rehydrate orally
5. Begin aggressive cooling (ice packs, cold shower, cold water immersion)
6. Monitor vital signs and cognitive status
Preventing Heat Injuries

- Acclimatization is a must
- Good coaches will have a number of strategies to minimize the risk of heat injuries.
Preventing Heat Injuries

• If possible, arrange training for coolest part of day or go indoors. If not possible; suggest:

• Warm up in shade to avoid raising body temperatures too quickly. Don't over do warm up to keep core temperature low before exercise intensifies.

• Rest in the **shade** during breaks. Remove excess clothing; take advantage of wind, fans or cooling devices.
Preventing Heat Injuries

• Use minimal, loose-fitting clothing made from natural fibers to promote heat loss. Use SPF 30+ sunscreen, and when possible, wear hat and sunglasses.
Preventing Heat Injuries

• Ensure players are fully hydrated prior to participation. 16-20 oz of fluid, 2 hours before, at least 8-10 oz every 15 minutes during is a must. Showers or hosing with water will not prevent the rise in body temperature.

• Drink properly formulated sports drinks to delay onset of fatigue and to provide carbohydrates. Especially important as muscles favor carbohydrate metabolism in warm conditions.
References
**Heat Injury by Fall Sports**

*AE: athlete-exposure meaning 1 athlete participating in 1 practice or competition.*
# NOAA's National Weather Service

## Heat Index

**Temperature (°F)**

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## Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- **Caution**
- **Extreme Caution**
- **Danger**
- **Extreme Danger**
Fluid Replacement

• Athletes should begin all exercise sessions well hydrated.

To ensure proper pre-exercise hydration, athletes should consume 17 to 20 oz of water or sports drink 2 to 3 hours before exercise and 7 to 10 oz of water or sports drink 10 to 20 minutes before exercise.
Fluid Replacement

- During practice make fluids readily available. Every 15 minutes athletes should consume 7 to 10 oz of fluids. *(DO NOT DENY WATER BREAKS)* Remember to calculate your rest/break sessions based on temperature to humidity forecast. Provide some sort of shade to allow the athletes to get out of direct sun exposure.

- Post-exercise hydration should aim to correct any fluid loss accumulated during the practice or event. Ideally completed within 2 hours, rehydration should contain water to restore hydration status, carbohydrates to replenish glycogen stores, and electrolytes to speed rehydration.
How to Determine Dehydration

- **Urine Color:**
  - Urine color of a well hydrated individual should be clear to slightly tinted. If the urine output is the color of "Apple Juice", the individual is dehydrated and should be rehydrated before participating.
How to Determine Dehydration

• **Weight Loss:**
  – Weigh athletes prior to first practice. *(DO NOT go by weight listed on the athletes’ pre-participation physical)*
How to Determine Dehydration

• **Weight Loss:**
  
  – Weigh athletes pre- and post-practice.
  
  1. +1 to -1 % total body wt. loss = Well Hydrated
  2. -1 to -3 % total body wt. loss = Minimal
  3. -3 to -5 % total body wt. loss = Significant
  4. > 5 % total body wt. loss = Serious
  
  – Athlete should not be allowed to participate until rehydration is established.
### AM I HYDRATED? - Urine Color Chart

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>If urine matches 1, 2, or 3, you are properly hydrated.</td>
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<tr>
<td>2</td>
<td>Continue to consume fluids at the recommended amounts.</td>
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<tr>
<td>3</td>
<td>If urine color is below the RED line, you’re DEHYDRATED and at risk for cramping and/or a heat illness!</td>
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<tr>
<td>4</td>
<td>YOU NEED TO DRINK MORE WATER!</td>
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</tbody>
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**Legend:**
- **1**: Clear or straw-colored
- **2**: Light yellow
- **3**: Medium yellow
- **4**: Deep yellow
- **5**: Very dark yellow
- **6**: Brown
- **7**: Red
- **8**: Black
Implement a Hydration Protocol

• Educate athletes AND parents on effects of dehydration on physical performance.

• Inform athletes on how to monitor hydration status.
Implement a Hydration Protocol

• Convince athletes to participate in hydration protocols based on sweat rate, drinking preferences, and personal responses to different fluid quantities.

• Encourage coaches to mandate rehydration during practices and competitions, just as required other drills and conditioning activities.
Implement a Hydration Protocol

• Have scale accessible to assist athletes in monitoring weight before, during, and after activity.
• Provide optimal oral rehydration solution (water, CHOls, electrolytes) before, during, and after exercise.
Implement a Hydration Protocol

• Implement hydration protocol during all practices and games, and adapt as needed.

• Finally, encourage event scheduling and rule modifications to minimize the risks associated with exercise in the heat.
Exertional Hyponatremia

• Exertional hyponatremia is a relatively rare condition defined as a serum-sodium level less than 130 mmol/L.

• Two, often-additive mechanisms are proposed: an athlete ingests water or low-solute beverages well beyond sweat losses (also known as water intoxication), or an athlete’s sweat sodium losses are not adequately replaced.
Exertional Hyponatremia

• Ultimately, the intravascular and extracellular fluid has a lower solute load than the intracellular fluids, and water flows into the cells, producing intracellular swelling that causes potentially fatal neurologic and physiologic dysfunction.
Why Is Treatment So Critical?

- The Golden Hour?
- The Golden $\frac{1}{2}$ Hour – the first 30 minutes of heat illness are the most crucial for treatment!
“The key determinant for an exertional heat stroke outcome is the time above a critical temperature, not the maximum temperature obtained.”
(key temperature ~ 105.5-106°F)

Pope L. Mosley, MD, FACSM
University of New Mexico School of Medicine
Quote from May 29, 2003, ACSM Annual Meeting in San Francisco, CA
“Provided that adequate emergency medical care is available on-site (i.e. ATC, EMT, or physician), it is recommended to cool first via cold water immersion, then transport.”

From The Inter-Association Task-Force on Exertional Heat Illnesses Consensus Statement, 2003
Cold Water Immersion Cooling Guidelines

Practical guidelines for implementing cold water immersion for an exertional heat stroke patient.

Initial response
Once exertional heat stroke is suspected, prepare to cool the patient and contact 911.
Cold Water Immersion Cooling Guidelines

Prepare ice water immersion
>On field or medical tent, half-fill tub/wading pool with water and ice (before use, check water source to see how quickly tub fills).
>Stock tank can be filled with ice and cold water before event; have tub half-filled with water and coolers of ice near to prevent keeping tub cold throughout the day.
Cold Water Immersion Cooling Guidelines

Prepare ice water immersion

> Ice should cover the surface of the water
> If the athlete collapses near an athletic training room, a whirlpool tub or cold shower may be used.
• **Determine vital signs** - Before immersing patient, take vital signs.
  • Assess core body temperature with a rectal **thermistor** (flexible thermometer that stays in during cooling; allows for continuous monitoring during therapy).
  • Check airway, breathing, pulse, and blood pressure.
  • Assess level of central nervous system dysfunction.
• **Begin ice water immersion**

Place the athlete in ice water immersion tub. Assistance may be needed to provide a smooth and safe entry and exit.
• Total body coverage
• Cover as much of the body as possible with ice water while cooling.
• If full body coverage is not possible, cover the torso as much as possible.
• **Total body coverage**
  • Keep the athlete’s head and neck above water, an assistant may hold the victim under the armpits with a towel or sheet wrapped across the chest and under the arms.
  • Place an ice/wet towel over head and neck while body is being cooled in tub.
  • Use a water temperature below 60°F.
Vigorously circulate water
During cooling, water should be continuously circulated or stirred to improve the water-to-skin temperature gradient, which optimizes cooling. Have an assistant stir the water during cooling.
• Continue medical assessment
Vital signs should be monitored at regular intervals.

• It may be helpful for an assistant to stand nearby in case the athlete becomes combative.
• Other assistants may be needed to lift or roll the athlete if vomiting occurs.
• **Fluid administration**
If a qualified medical professional is available, an intravenous fluid line can be placed for hydration and support of cardiovascular function.

Rest the arm to be used on the side of the water immersion tub.
• Cooling duration
  Continue cooling until the patient’s rectal temperature lowers to 39°C (102°F)
• If rectal temperature cannot be measured and cold water immersion is indicated, cool for 10-15 minutes and then transport to a medical facility.
• Cooling duration
• An approximate estimate of cooling via cold water immersion is 1°C for every five minutes or 1°F every 3 minutes (if the water is aggressively stirred).
• For example, if someone is in tub for 15 minutes they would cool approximately 3°C or 5°F during that time.
• Patient transfer
Remove the patient from immersion tub only after rectal temperature reaches 39°C (102°F) and then transfer to the nearest medical facility via EMS as quickly as possible.
• Cooling is primary goal before transport

If an aggressive cooling modality is readily available (i.e., Cold water immersion, ice/wet towel rotation, high flow cold water dousing); and no other emergency medical services are needed besides the rapid lowering of temperature, then always follow the "Cool-first, Transport second" doctrine.
• **Advanced medical support**  
During transportation, maintain the rectal thermistor, which allows body temperature to be monitored continuously.

• Once athlete has arrived at the hospital, tests and other treatments will address issues resulting from hyperthermia.
If cold water immersion is not available, given constraints of task performed, cool via best available means. A good (although not optimal) highly portable alternative is cooler filled with ice, water, and 12 towels. Place six ice/wet towels over body; leave for 2-3 minutes, exchange towels; put the six others on the patient. Continue rotation every 2-3 minutes. Another alternative; dousing from a locker room shower or from a hose.

These recommendations are adapted from:
In the Dog Days of Summer remember;
Always Play it Cool
STIR THE WATER AGGRESSIVELY!
Emergency Action Plans
EAP’s

• Emergency situations may arise at any time
• Expedient action must be taken in order to provide the best possible care
• The development and implementation of an emergency plan will help ensure the best care will be provided
Components of the EAP

1. Emergency Personnel
2. Emergency Communication
3. Emergency Equipment
4. Roles of Staff
5. Venue Directions (Map)
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Emergency Communication

- Communication; key to quick response
- Administration, Coaches, and Medical Staff must work together
- Local EMT/EMS should have current EAP’s on file
- Access to fixed or mobile phone should be assured
Activating the EMT/EMS System

• Making the Call - 911
• Providing Information
  – Name, address, phone number of caller
  – Nature of emergency
  – Number of athletes
Activating the EMT/EMS System

• Providing Information
  – Conditions of athletes
  – First aid treatment initiated
  – Specific directions to scene
  – Other information as requested by dispatcher
Emergency Equipment

• Equipment (AED, 1st Aid, Phone, Water bath, etc.) should be at site and easily accessible

• Personnel should be familiar with function and operation of equipment – DO NOT exceed level of training

• Equipment should be checked on a regular basis
Roles of Staff

1. Establish scene safety and immediate care of athlete
2. Activation of the Emergency Medical System
3. Emergency equipment retrieval
4. Direction of EMS to scene
Venue Directions - Script

• Main Gymnasium at _________________________: Take Olympus Drive to Fairway. Go east on Fairway, across Bench Road and turn into faculty parking lot adjacent to the school’s tennis courts. Enter “D” Building through doors on southwest end of parking lot. Main Gymnasium is located in the center of “D” building.
Sample Map
Sample Emergency Action Plan for Basketball, Volleyball, and Wrestling

- **Emergency Personnel** - Administration, certified athletic trainer, and coaches
Sample Emergency Action Plan for Basketball, Volleyball, and Wrestling

- **Emergency Equipment** - Supplies and equipment brought to the gym for games include taping and bracing supplies, general trauma and wound kits, AED. Additional supplies stored in locker room: splint kit, spine board, crutches, various wound care necessities, and any items deemed necessary.
Roles of Staff

– Immediate evaluation and care of the more seriously-injured or ill students

• Activate emergency medical system (EMT/EMS)

• Call 911 (Provide appropriate information as requested)
Roles of Staff

- Direct EMS personnel to scene
- Emergency equipment retrieval
- Ensure entrance is clear and accessible
- Scene control of bystanders
- Contact student’s parents or guardian
Venue Directions – Per Script

• Take Olympus drive to Fairway. Go east on Fairway, across Bend Road and turn into the faculty parking lot adjacent to the school’s tennis courts. Enter “D” building through doors on southwest end of parking lot. Main gym is located in the center of building “D”, 
Sample Map
Procedures for Hot Weather Practices
Sample Procedures for Hot Weather Practices

1. Choose a heat index chart
Relative Humidity (%)

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With Prolonged Exposure and/or Physical Activity

- **Extreme Danger**
  - Heat stroke or sunstroke highly likely
- **Danger**
  - Sunstroke, muscle cramps, and/or heat exhaustion likely
- **Extreme Caution**
  - Sunstroke, muscle cramps, and/or heat exhaustion possible
- **Caution**
  - Fatigue possible
Apparent temperature is how hot the heat-humidity combination makes it feel.
Resources

• Sample heat index charts from state associations:
  • Tennessee
  • Kentucky
    • [http://www.khsaa.org/sportsmedicine/heat/heatindex\ chartcolor.pdf](http://www.khsaa.org/sportsmedicine/heat/heatindex\ chartcolor.pdf)
  • Oregon
    • [http://www.osaa.org/heatindex/](http://www.osaa.org/heatindex/)
Components to Consider with Varying Levels of Heat Index

- Monitor Heat Index every 20-30 minutes via internet weather report as needed
- Minimize warm up time in heat
- Conduct warm ups in the shade or cooler (indoor) environments when possible
- Communication with coaching staff
Components to Consider with Varying Levels of Heat Index

• Increase breaks (frequency & duration)
• Lower intensity of workout based on heat
• Minimal equipment and clothing
• Ice, water, towel availability
Components to Consider with Varying Levels of Heat Index

• Injured athletes observe practice from cool/shaded areas
• Cold tubs (Athletic Training Room and football practice field)
• Access athletic training room with cart to transport student athletes from practice field.
Components to Consider with Varying Levels of Heat Index

- Cart access to entrance of athletic training room
- Ice towels on practice field for use during transport
- Sports Medicine Staff field communication (cell phones, radios)
Components to Consider with Varying Levels of Heat Index

- Heat Illness recognition
- Athletes who display signs and symptoms of heat illness must have participation restricted based on the judgment of the sports medicine staff/administrator/coach/parent
Components to Consider with Varying Levels of Heat Index

• Practice modification
• Rest breaks planned to match conditions and intensity of activity
• Minimize the amount of equipment and clothing worn in hot or humid conditions
Components to Consider with Varying Levels of Heat Index

- Pre-hydration and hydration during activity
- Reschedule practice at cooler time of day
- Postpone practice
- Cancel practice
Thank you for your attention and efforts. Have a great summer!