

EXERTIONAL HEAT ILLNESS



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EXERTIONAL HEAT ILLNESS (EHI)

- EHI is composed of four different conditions.
 - Heat Cramps
 - Heat Syncope
 - Heat Exhaustion
 - Heat Stroke



HEAT CRAMPS

- Acute, Painful, involuntary muscle contraction usually occurring during or after intense exercise.
 - Lasting approx. 1-3 min.
 - Most often occurring in the abdomen and extremities.



Signs and Symptoms

- Muscle cramping
- Thirst
- Sweating
- Dehydration
- Fatigue



Predisposing Factors

- Exercise-induced muscle fatigue
- Excessive body water loss
- Excessive sodium loss (sweating)



Treatment

- Rest in a cool location out of the sun.
- Fluids such as a sports drink to replenish electrolytes.
- Stretch / Massage the affected muscles with the muscle extended.



Return to Play (RTP)

- Athlete may RTP when fluids have been replaced, and cramping has subsided.



Prevention

- Maintain fluid and electrolyte balance.
- Supplemental / extra sodium may be needed.



HEAT SYNCOPE

- Dizziness, feeling faint or fainting during prolonged exercise in the heat.
- Usually during the initial days of heat exposure.



Signs and Symptoms

- Dizziness
- Weakness
- Tunnel vision
- Pale or sweaty skin
- Nausea
- Decreased pulse rate
- Normal exercising rectal temperature.



Predisposing Factors

- Standing long periods of time (usually wearing uniform)
- Immediately after cessation of activity
- After rapidly standing from prolonged resting or sitting position.



Treatment

- Move to shaded / cooled area
- Monitor vital signs
- Elevate legs to promote venous return
- Rehydrate



Return to Play (RTP)

- Individuals who experience heat syncope will recover relatively quickly (10-15 mins.)
- May RTP when symptoms have resolved and other medical conditions (cardiac) have been ruled out by a physician.



Prevention

- Adapt to exercise in the heat gradually.
- Acclimatize over 10-14 days
- Progressively increasing duration and intensity of work.



HEAT EXHAUSTION

- Most common heat-related condition.
- Inability to continue exercise due to cardiovascular insufficiency and energy depletion that may not be associated with physical collapse.



Signs and Symptoms

- Fatigue
- Weakness
- Heavy Sweating
- Dehydration
- Sodium Loss
- Fainting
- Dizziness
- Irritability
- Headache
- Hyperventilation
- Nausea
- Vomiting
- Core Temp 96.8⁰-104⁰F
- Decreased
 - Urine output
 - Blood pressure
 - Muscle coordination



Predisposing Factors

- Exercising in hot and humid environment (air temp > 91.4°F)
- Inadequate fluid intake (dehydration)
- BMI > 25



Treatment

- Move to cool / shaded area
- Remove excess clothing
- Elevate legs to promote venous return
- Cool w/ fans
- Rotating ice towels or ice bags
- Provide oral fluids for rehydration

Athlete should respond quickly to treatment, if not, heat stroke could be suspected.



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Return to Play (RTP)

- Wait 24-48 hours before RTP.
- Gradually increase intensity and volume of exercise.



Prevention

- Adapt to exercise in the heat gradually.
- Acclimatize over 10-14 days
- Progressively increasing duration and intensity of work.



HEAT STROKE (EHS)

- EHS has had a 100% survival rate when immediate cooling (via cold water immersion or aggressive whole body cold water dousing) was initiated within 10 mins. of collapse.
- EHS is a medical emergency and can be fatal if core temp. remains above 104⁰F for an extended period of time without proper tx.



EHS Cont.

- Severe condition characterized by a core temp. > 104°F.
- Central Nervous System (CNS) dysfunction
- Multiple organ system failure induced by strenuous exercise.



Signs and Symptoms

- Core Temp $>104^{\circ}\text{F}$
- Tachycardia
- Hypotension
- Sweating
- Hyperventilation
- Altered Mental Status
- Dizziness
- Irritability
- Headache
- Irrational Behavior
- Inability to walk
- Loss of balance / muscle function
- Vomiting
- Diarrhea
- Collapse
- Seizures
- Coma



Signs and Symptoms Cont.

- The recommendation for an accurate temperature assessment that only a rectal temperature should be used with a hyperthermic individual where a ingestible thermometer was not used.
- Other devices may give false readings.
 - Tympanic
 - Oral
 - Skin
 - Axillary



Predisposing Factors

- Vigorous activity in hot-humid environment (usually > One hour)
- Lack of heat acclimatization
- Poor physical fitness
- Dehydration
- Sleep deprivation
- Fever / Illness
- Warrior Mentality
- High pressure to perform
- Heavy equipment



Treatment

Rapid and aggressive whole-body cooling is the key to survival of EHS.

- Remove excess clothing and equipment and immerse whole body into cold water. (35⁰-39⁰)
- Should be immersed within 30 mins and until rectal temp. is below 101⁰-102⁰.
- After cooling individual should be transported to hospital for monitoring of possible organ system damage.



Return to Play (RTP)

- RTP must be determined by a physician
- Start with gradual RTP activity under supervision.



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Prevention

- Heat acclimation over 10-14 day period by progressively increasing duration and intensity of work.
- Incorporate rest breaks
- Minimize amount of equipment worn in hot-humid weather.
- Provide and encourage adequate fluid consumption.



Exertional Sickling

- Exertional Sickling occurs when sickled red blood cells “log jam” in the blood vessels, which can cause fatal ischemic / exertional rhabdomyolysis.
- Sickle Cell Trait (SCT)
 - 1-12 African Americans
 - 1-2,000-10,000 Caucasians



Signs and Symptoms

Usually occurs in the first few minutes of high intensity exercise.

- Increasing pain and weakness in the muscles (lower extremity)
- Legs become weak and unstable, athlete will normally collapse. (most likely mistaken for heat stroke, heat exhaustion, or heat cramps)



Predisposing Factors

- Heat
- Dehydration
- Altitude
- Asthma
- High Intensity exercise w/ few rest intervals



Treatment

- Supplemental O₂
- Cool the athlete if needed
- Call 911 for urgent care to prevent explosive rhabdomyolysis



Return to Play (RTP)

- RTP must be determined by a physician



Prevention

- Know family history of SCT, and athlete should be tested
- Allow greater time for build up in training
- Breaks as needed or longer breaks between intervals
- No all out exertion lasting > 2 min.
- Supplemental O₂ if at high altitudes
- Know and teach athlete signs and symptoms, and to report immediately.



COLD WATER IMMERSION COOLING GUIDELINES



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Initial Response

Once EHS is suspected:

- Prepare to cool individual
- Call EMS



Preparation of ice water immersion

- Stock tank, tub, wading pool
- Fill tub half way with water, and 3-4 coolers with ice sitting next to it for easy access.
- Ice should cover the surface of the water at all times.



Vital Signs

- Before immersing take vital signs
- Access core body temp. with a rectal thermistor.
- Check ABCs
- Assess the level of CNS dysfunction.



Ice Water Immersion

- Medical Staff, Coaching Staff, Teammates may be needed to assist with a smooth and safe entry and exit.
- Cover as much of the body as possible with ice water. (Torso most important)
- Place an ice towel over the head and neck while the body is being cooled in tub.
- Individual may need assistance holding head and neck above water.
- Vigorously circulate water
- Monitor vital signs
- Qualified medical professional can start IV fluids.



Cooling Duration

Continue cooling until patient's rectal temp. is below 102⁰F

- Cool for 10-15 mins. and transport to hospital if rectal temp. can not be measured.
- Cooling via cold water immersion is approx. 1⁰F every 3 mins. with aggressively stirred water.



HEAT ACCLIMATION



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Preseason Heat-Acclimation Guidelines

<http://www.ksi.uconn.edu/pdf%20linked/Heat-acclimatizationhighschool.pdf>

Please read the article for understanding of all the definitions.



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Days 1-5

- Days 1 through 5 of the heat-acclimatization period consist of the first 5 days of formal practice. During this time, athletes may not participate in more than 1 practice per day.
- If a practice is interrupted by inclement weather or heat restrictions, the practice should recommence once conditions are deemed safe. Total practice time should not exceed 3 hours in any 1 day.



Days 1-5 Cont.

- A 1-hour maximum walk-through is permitted during days 1–5 of the heat-acclimatization period. However, a 3-hour recovery period should be inserted between the practice and walk-through (or vice versa).



Days 1-2 Sports w/ Helmets

- During days 1–2 of the heat-acclimatization period, in sports requiring helmets or shoulder pads, a helmet should be the only protective equipment permitted (goalies, as in the case of field hockey and related sports, should not wear full protective gear or perform activities that would require protective equipment).



Days 3-5 Sports w/ Helmets

- During days 3–5, only helmets and shoulder pads should be worn. Beginning on day 6, all protective equipment may be worn and full contact may begin.
 - A. Football only: On days 3–5, contact with blocking sleds and tackling dummies may be initiated.
 - B. Full-contact sports: 100% live contact drills should begin no earlier than day 6.



Double Practice Days

- Beginning no earlier than day 6 and continuing through day 14, double-practice days must be followed by a single-practice day. On single-practice days, 1 walk-through is permitted, separated from the practice by at least 3 hours of continuous rest. When a double practice day is followed by a rest day, another double-practice day is permitted after the rest day.



Double Practice Days Cont.

- On a double-practice day, neither practice should exceed 3 hours in duration, and student-athletes should not participate in more than 5 total hours of practice. Warm-up, stretching, cool-down, walkthrough, conditioning, and weight-room activities are included as part of the practice time. The 2 practices should be separated by at least 3 continuous hours in a cool environment.



Temperature Guidelines



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Temperature and Humidity

- The greater the humidity, the more difficult it is for the body to cool itself. Test the air prior to practice or game using a wet bulb, globe, temperature index (WBGT Index) which is based on the combined effects of air temperature, relative humidity, radiant heat and air movement. The following precautions are recommended when using the WBGT Index (ACSM's Guidelines for the Team Physician, 1991):



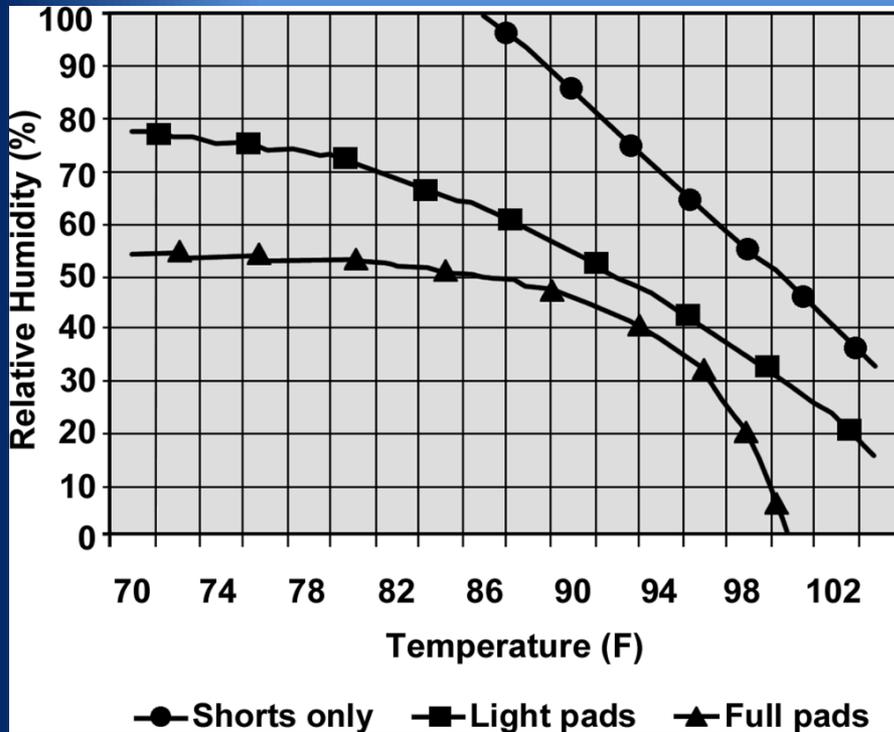
Wet-Bulb Globe Temperature (WBGT)

WBGT	Level of Risk / Flag Color	Comments
<ul style="list-style-type: none">• < 65⁰F	Low	
<ul style="list-style-type: none">• 65⁰-73⁰F	Moderate	<ul style="list-style-type: none">• Risk Level increases through the day
<ul style="list-style-type: none">• 73⁰-82⁰F	High	<ul style="list-style-type: none">• Individuals at risk should not compete
<ul style="list-style-type: none">• > 82⁰F	Extreme	<ul style="list-style-type: none">• Reschedule event or delay until safer conditions prevail.



Relative Humidity (RH)

WBGT not available use relative humidity



<u>Air Temp °F.</u>	<u>Danger RH</u>	<u>Critical RH</u>
70	80	100
75	70	100
80	50	80
85	40	68
90	30	55
95	20	40
100	10	30



Fluid Replacement



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Pre-Exercise Hydration

- Proper pre-exercise hydration,
 - 2-3 hours before exercise athlete should consume 500 to 600 mL (17 to 20 fl oz) of water or a sports drink
 - 10-20 mins. Before exercise athlete should consume 200 to 300 mL (7 to 10 fl oz) of water or a sports drink



Weight Charts

- Daily Weigh in (Pre and Post Practice)
- > 3% weight loss from previous day
 - Must increase salt / fluid intake before practice
 - Monitor athlete for heat illness

maintaining hydration at less than 2% body weight reduction generally requires 200 to 300 mL (7 to 10 fl oz) every 10 to 20 minutes.



Post-exercise Hydration

- Post-exercise hydration should aim to correct any fluid loss accumulated during the practice or event. (Ideally completed within 2 hours)
 - Water to restore hydration status
 - Carbohydrates to replenish glycogen stores
 - Electrolytes to speed rehydration



References

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