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Exertional Heat Illness



Why is knowledge of heat illnesses important?

There are many types of heat illness, with heat cramps and heat exhaustion being the most common, but not severe. Exertional heat stroke (EHS) is the most severe form of exertional heat illness (EHI) with implications for potential death. Unlike other potentially fatal conditions, death from EHS is completely preventable if rapidly recognized and appropriately treated. Having appropriate medical staff, and enforcing an exercise heat acclimatization policy and wet bulb globe temperature (WBGT) policy are major strategies for preventing EHI.

Interesting Statistics:

- Heat Illness is one of the top three causes of sudden death in sport
- According to the University of North Carolina's National Center for Catastrophic Injury Research (NCCSIR), 2005 to 2009 was the worst 5-year block for deaths due to EHS in football since the 1970s
- 39 of 243 (16%) reported football deaths from 1990 to 2010 were heat related
- This past summer alone, about 27% of all athlete deaths can be attributed to EHS

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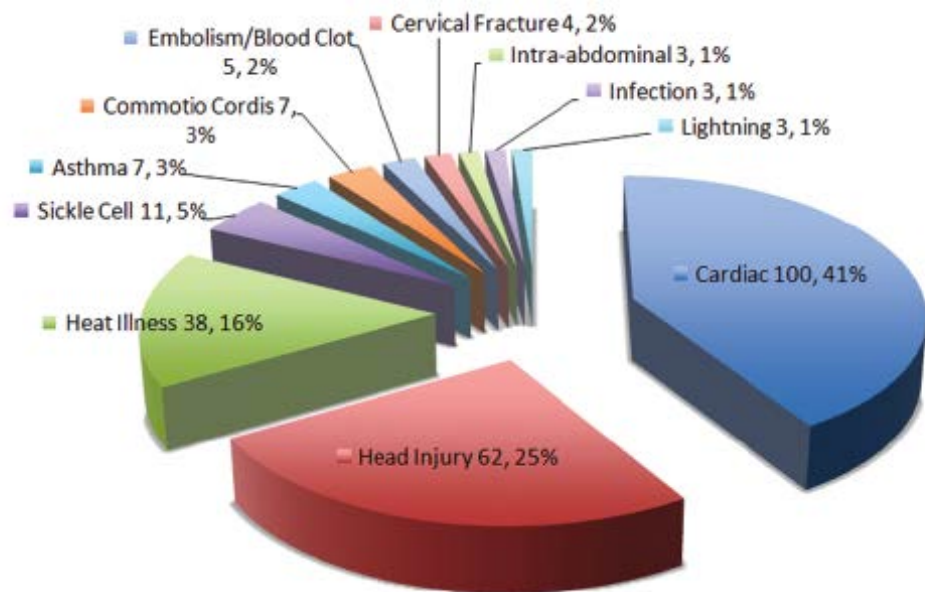
What does the research say?



Grundstein et al. reports football hyperthermia deaths, 1980-2009.

Filled circles represent deaths occurring in locations with meteorological stations within 50 km.

Boden et al. reports number and percentage of high school and college football fatalities by diagnosis from July 1990 through June 2010.



Cause of Fatality Distribution



Best Practice Recommendations

Evidence-Based Practice Recommendations Exercise Heat Acclimatization Policy Points	Meets Best Practice Recommendation
1. <i>Days 1-5 are the first formal practices. No more than 1 practice occurs per day.</i>	
2. <i>Total practice time should not exceed 3 hours in any 1 day.</i>	
3. <i>1-hour maximum walk-through is permitted on days 1-5; however, there must be a 3 hours minimum break between practice and walk-through (or vice versa).</i>	
4. <i>Football only: on days 3-5, contact with blocking sleds and talking dummies may be initiated. Full contact sports: 100% life contact drills should begin no earlier than day 6.</i>	
5. <i>Day 6-14, 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.</i>	
6. <i>On a double-practice day, neither practice should exceed 3 hours in duration, with no more than 5 total hours of practice in the day. Warm-up, stretching, cooling down, walk-through, 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.</i>	
7. <i>Because of the high risk for exertional heat illness during the preseason heat acclimatization period, we strongly recommend an athletic trainer be onsite before, during and after all practices.</i>	

Notes:



Best Practice Recommendations

Evidence-Based Practice Recommendations Extreme Weather Policy Points	Meets Best Practice Recommendation
1. <i>State requires all schools to have a heat modification policy for any sanctioned activity.</i>	
2. <i>The recommended heat policy is based off of WBGT (not heat index or any other methods) Heat Index is only acceptable for schools without funding for WBGT, and the state is actively petitioning for funding to supply a WBGT.</i>	
3. <i>The WBGT temperature guidelines are based off of epidemiological data specific to that state/region (for bigger states a more comprehensive analysis may be needed). State required to seek alternative ways to obtain WBGT for their area via weather station WBGT or other valid local sources.</i>	
4. <i>The heat policy has at least a 4-step progression of modifications (does not include the limit that dictates normal practice).</i>	
5. <i>Policy includes specific modification of equipment (if applicable to the sport).</i>	
6. <i>Policy includes specific modification of work:rest ratios.</i>	
7. <i>Policy includes specific modification of total practice time.</i>	
8. <i>Policy includes specific modification of water breaks.</i>	
9. <i>Policy mentions the use of a shaded area for rest breaks.</i>	

Notes:

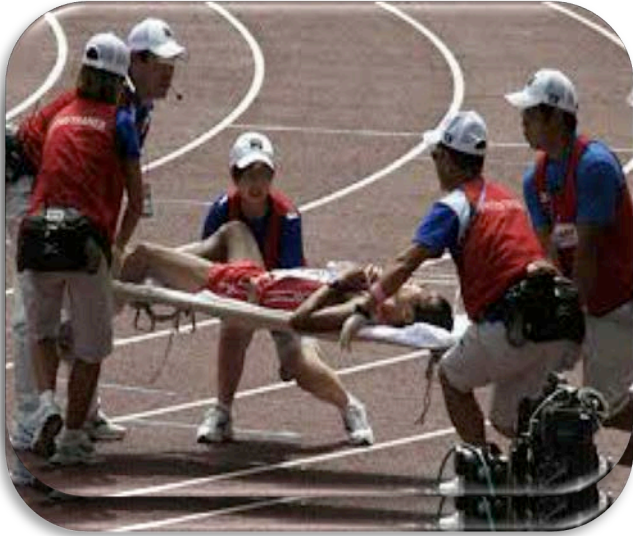


Best Practice Recommendations

Evidence-Based Practice Recommendations Treatment Policy Points for Treating Exertional Heat Stroke	Meets Best Practice Recommendation
<i>1. Take athlete's rectal temperature.</i>	
<i>2. Remove all equipment and excess clothing from the athlete, if possible (cut clothing if necessary).</i>	
<i>3. Cool the athlete as quickly as possible via whole body ice-water immersion in a large tub that covers the athlete's trunk and limbs. Water should be approximately 35-58°F. Continually stir the water and add ice throughout cooling process.</i>	
<i>4. Wrap a towel under the athlete's arms and hold to ensure an upright position while sitting in the tub.</i>	
<i>5. Maintain airway, breathing, and circulation, while continuing to monitor core temperature.</i>	
<i>6. After cooling is initiated, call 911. You must COOL BEFORE TRANSPORT. Do not transport the athlete until rectal temperature reaches 102°F.</i>	
<i>7. Cease cooling when rectal temperature reaches 102°F.</i>	

Notes:

+ Key Considerations...



How do I keep athletes safe?

- Developing and implementing proper policies and procedures is key in the prevention of heat-related illness in sport
- Policies for heat acclimatization and monitoring extreme weather conditions will mitigate risk factors for suffering an EHI
- Having an athletic trainer onsite before, during, and after all activity will allow for prompt recognition and treatment of EHI

How is heat-related illness prevented?

- Ensure proper medical coverage is provided. It is highly recommended to have an athletic trainer onsite for all activity
- Monitor environmental conditions using WBGT
- Ensure hydration and establish hydration policies that involve the following:
 - Work:rest ratios
 - Weigh-ins before and after activity
 - Encourage drinking water and fluids containing sodium
- Follow acclimatization guidelines. Implement the policy if there is not already one in place
- Practice and perform conditioning drills at appropriate times, avoiding the hottest part of the day (10am-5pm)
- Slowly progress length and intensity of practices and conditioning throughout the season
- Educate medical staff, athletes, coaches, and parents about exertional heat illnesses and proper hydration



+ Why is it important to...

1

Know what heat acclimatization is?

- Heat acclimatization is a period of 7 to 14 days where the body adapts to exercising in the heat
- This plays a large part in the body's physical responses to exercise under stressful conditions and its ability to cope with heat exposure
- Heat acclimatization decreases heart rate, body temperature, and fatigue
- Heat acclimatization decreases the risk of an athlete suffering from a heat-related illness



2

Know what a heat acclimatization policy looks like?

- It is helpful to be familiar with an example of a heat acclimatization policy in order to develop and implement one of your own
- This is of highest importance for sports with athletes exercising outdoors in the heat, where there is an increased risk for developing heat-related illnesses

Preseason Heat-Acclimatization Guidelines

Area of Practice Modification	Practices 1-5		Practices 6-14
	Days 1-2	Days 3-5	
# of Practices Permitted Per Day	1		2, only every other day
Equipment	Helmets only	Helmets & Shoulder Pads	Full Equipment
Maximum Duration of Single Practice Session	3 hours		3 hours (a total maximum of 5 hours on double session days)
Permitted Walk Through Time	1 hour (but must be separated from practice for 3 continuous hours)		
Contact	No Contact	Contact only with blocking sleds/dummies	Full, 100% live contact drills

This heat acclimatization policy is specific to football, and is used by many organizations and schools.

Changes to the policy may need to be addressed depending on the individual sport.

NOTE: warm-up, stretching, cool-down, walk-through, conditioning, and weight-room activities are included as part of practice time

+ Why is it important to...

3

Know when it is too hot to practice, and how to modify practices/games?

- Exercising in a high heat stress environment can lead to heat-related illness
- Cancelling activity when it is too hot protects the health and safety of the athletes
- Making modifications to the following components will help prevent heat-related illness
 - Work to rest ratios
 - 40 minutes of exercise followed by a 10-minute break is a good place to start
 - Equipment to be worn
 - Remove unnecessary equipment when applicable (helmet, shoulder pads, etc.)
 - Length of activity
 - Level in which activity is cancelled
 - WBGT of 92 or above is an example, but this will depend on your geographical region
 - Hydration breaks



WBGT monitor

4

Know how to monitor environmental conditions if I do not have a WBGT device?

- Monitoring environmental conditions is key to preventing heat illness, regardless of device availability
- The next best alternative is to reference the chart below

		Wet Bulb Globe Temperature (WBGT) from Temperature and Relative Humidity																																																																		
		Temperature (°C)																																																																		
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This is used to estimate WBGT derived from temperature and relative humidity.

Note: This table is compiled from an approximate formula which only depends on temperature and humidity. The formula is valid for full sunshine and a light wind

+ Why is it important to...

5

Know how to properly recognize/treat an athlete suffering from EHS?

- Death from EHS is completely preventable with prompt recognition and treatment
- EHS has a 100% survival rate when immediate cooling via cold-water immersion or aggressive whole body cold water dousing is initiated within 10 minutes of collapse
- To initiate emergency treatment for EHS, follow the steps in the chart below

Treatment Steps
1. Take athlete's rectal temperature.
2. Remove all equipment and excess clothing from the athlete, if possible (cut clothing if necessary).
3. Cool the athlete as quickly as possible via whole body ice-water immersion in a large tub that covers the athlete's trunk and limbs. Water should be approximately 35-58°F. Continually stir the water and add ice throughout cooling process. (Note: if immersion is not possible, take athlete to cold shower or move to shaded area and use rotating ice towels to cover the body surface.)
4. Wrap a towel under the athlete's arms and hold to ensure an upright position while sitting in the tub.
5. Maintain airway, breathing, and circulation, while continuing to monitor core temperature.
6. After cooling is initiated, call 911. You must COOL BEFORE TRANSPORT . Do not transport the athlete until rectal temperature reaches 102°F.
7. Cease cooling when rectal temperature reaches 102°F.

6

Summary Action Items: Strongly consider if it is relevant to your setting.

- Appropriate medical coverage at events
- Heat acclimatization policy
- Wet Bulb Globe Temperature policy
- Modified work:rest ratios based on WBGT reading
- Hydration policy for practicing in extreme weather conditions
- Rectal thermometer for accurate core temperature assessment
- Equipment/supplies to treat EHS properly: immersion tub, ice, access to water

Example Heat Policy

Georgia High School Association

2.67 Practice Policy for Heat and Humidity

- a) Schools must follow the statewide policy for conducting practices and voluntary conditioning workouts (including during the summer) in all sports during times of extremely high heat and/or humidity that will be signed by each head coach at the beginning of each season and distributed to all players and their parents or guardians. The policy shall follow modified guidelines of the American College of Sports Medicine in regard to:
 - b) A scientifically-approved instrument that measures the Wet Bulb Globe Temperature must be utilized at each practice to ensure that the written policy is being followed properly. WBGT readings should be taken every hour, beginning 30 minutes before the beginning of practice.
 - c) Practices are defined as: the period of time that a participant engages in a coach-supervised, school-approved sport or conditioning-related activity. Practices are timed from the time the players report to the practice or workout area until players leave that area. If a practice is interrupted for a weather-related reason, the “clock” on that practice will stop and will begin again when the practice resumes.
 - d) Conditioning activities include such things as weight training, wind-sprints, timed runs for distance, etc., and may be a part of the practice time or included in “voluntary workouts.”
 - e) A walk-through is not a part of the practice time regulation, and may last no longer than one hour. This activity may not include conditioning activities or contact drills. No protective equipment may be worn during a walk-through, and no full-speed drills may be held.
 - f) Rest breaks may not be combined with any other type of activity and players must be given unlimited access to hydration. These breaks must be held in a “cool zone” where players are out of direct sunlight.
-

WBGT	ACTIVITY/REST BREAK GUIDELINES
Under 82.0	Normal Activities – Provide at least three separate rest breaks each hour with a minimum duration of 3 minutes each during the workout.
82.0 - 86.9	Use discretion for intense and prolonged exercise; watch at-risk players carefully. Provide at least three separate rest breaks each hour with a minimum duration of 4 minutes each.
87.0 – 89.9	Maximum practice time is 2 hours. <u>For Football</u> : players are restricted to helmet, shoulder pads, and shorts during practice, and all protective equipment must be removed during conditioning activities. If the WBGT rises to this level during practice, players must continue to work out wearing football pants without changing to shorts. <u>For All Sports</u> : Provide at least four separate rest breaks each hour with a minimum duration of 4 minutes each.
90.0 – 92.0	Maximum practice time is 1 hour. <u>For Football</u> : no protective equipment may be worn during practice, and there may be no conditioning activities. <u>For All Sports</u> : There must be 20 minutes of rest breaks distributed throughout the hour of practice.
Over 92.1	No outdoor workouts. Delay practice until cooler WBGT level is reached.



Essential Framework

Key Personnel

- Athletic Trainers
- Team Physician, and other trained medical personnel
- Coaches
- Parents
- Administrators
- Emergency Medical Services

Equipment

(WBGT) Device	\$800
Work-Rest-Water Break Chart	\$0
Heat index chart (if WBGT is not available)	\$0
Rectal thermometer	\$25-\$500
Lubricating gel	\$5
Immersion tub (or kiddie pool, clean trash can)	\$15-\$200
Towels	\$15
Cooler	\$50
Water source	\$0
Tent or source of shade	\$0-\$25
Ice	\$2/lb

Implementation Sequence

Implementation Strategy	Complete
Identify what your school does well	
Identify what your school can improve upon	
Increase knowledge by reviewing example documents (such as heat acclimatization and wet-bulb globe temperature policies)	
Draft and develop a functional heat illness prevention policy that fits the needs of your school	
Identify a plan for the materials to be purchased	
Identify if the materials fit into the budget and who will do the purchasing	
Identify the person responsible for implementing the aforementioned policies	
Revisit the policy annually and revise if necessary	

Potential Barriers and Solutions

Problem: Unable to purchase WBGT device

Solutions:

- Although WBGT is the gold standard and most accurate way to assess environmental conditions and environmental stress, the next best alternative is to use a chart that estimates WBGT based off temperature and humidity



Problem: Unable to purchase rectal thermometer

Solutions:

- Medical supply companies offer a DataTherm II continuous rectal thermometer for about \$300
- Use an oral thermometer with a sanitary plastic cover for rectal temperature



Problem: No place to store equipment and materials

Solutions:

- Transportable Rubbermaid shed or storage locker with key and/or combination lock
- Utilize buildings or facilities close in proximity (ie. snack stand, irrigation room, custodial closet, general storage room)



Problem: No medical staff present at practices and/or games

Solutions:

- Explore costs of medical staff on an 'as needed' basis
- Consider scheduling games back-to-back for efficiency
- Train coaches and staff on prevention, recognition, and treatment of EHI



Problem: Limited access to water and ice

Solutions:

- Extra coolers of water
- Add ice machine to budget or use another one in building if available

