

The background of the slide is a top-down view of a green soccer field. A white and black soccer ball is positioned in the lower right quadrant. Faint white tactical markings, including 'X' and 'O' symbols with arrows, are scattered across the grass. Two large, semi-transparent green circles are overlaid on the field: one on the left containing the title and text, and one on the right that is empty.

Environmental Conditions

Emory Soccer Medicine Conference

Courtney Gleason, MD

January 6th, 2018

Exertional Heat Illness




Exertional heat illness (EHI) is a spectrum of conditions ranging from heat cramps and heat exhaustion to exertional heat stroke (EHS), which is potentially life threatening

Exertional heat illness is 100% preventable

Important to recognize early signs and symptoms of heat illness (including headache, nausea, and dizziness) to allow for proper treatment with hydration and rapid cooling of the body

Exertional heat stroke has two key components:


- Altered mental status (confusion, irritability, aggressive behavior, dizziness, or collapse)
- A rectal temperature $>104^{\circ}\text{F}$



In 2008, Georgia led the nation in heat-related deaths among high school-age athletes

GHSA and UGA partnered in a study comparing heat-related illnesses from 2008-2012 (before the GHSA implemented practice guidelines) to 2012 to 2015

Preliminary findings: the number of exertional heat illness incidents was reduced by about 70 percent after the rules were in place and no heat strokes or heat-related deaths were reported



Preliminary findings: risk of exertional heat illness (EHI) was the greatest during the first six days of practice, when the practice lasted more than two hours, and when weather conditions were “hot”

Overall, the first two weeks of practice presented the greatest of EHI to the student-athlete

Modification to practice sessions such as the length or intensity of the workouts, the amount of equipment worn, and the number of rest or hydration breaks may help to reduce the risk of exertional heat illness



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Practice Policy for Heat and Humidity

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The following heat-related policies are in effect for the 2017-18 school year:

["Practice Policy for Heat and Humidity"](#)

[GHSA Heat Index Measurement & Record Chart](#)

[Heat Policy Document Distribution](#)

[Wet Bulb Globe Temperature Devices](#)

[Frequently Asked Questions Re: GHSA Heat Policy](#)

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Acclimatization

Acclimatization is the body's natural adaptation to exercising in the heat

Takes 10-14 days

Gradual graded progression of exercise in the heat

Typically applies at the start of pre-season (summer months) where athletes are beginning fitness training and progressive training exposure in heat

US Soccer Guidelines for Heat Acclimatization



Avoid the hottest part of the day for training sessions (11am-4pm)

Days 1-5

- One formal practice a day
- Maximum 3 hours of training time (including warm up, stretches, and cool down)

Days 6-14

- Double practice days can begin on day 6 and not exceed 5 hours in total practice time between the two practices
- There should be a minimum of a 3 hours rest period between each training session during double practice days
- The 3 hour rest period should take place in a cool environment to allow the body to fully recover
- Each double practice day should be followed by a single practice day in which practice time on single practice days not exceeding 3 hours
- Athletes should receive one day rest following 6 days continuous practice

Activity Modification Guidelines In Hot Weather From US Soccer



Step 1: Find the Web Bulb Globe Temperature (WBGT)

WBGT is a measure of the heat stress in direct sunlight, which takes into account: temperature, humidity, wind speed, and solar radiation (sun angle and cloud cover)

The reading is expressed in degrees, but should not be equated with degrees of air temperature

WBGT differs from the heat index, which takes into consideration temperature and humidity and is calculated for shady areas



Examples of WBGT monitors



WBGT Monitoring

Recommend using WBGT on-site at time of training and check as often as possible

If no on-site temperature measures are available, use temperature and humidity from local weather station measures and use the chart below to predict WBGT

Wet Bulb Globe Temperature (WBGT)



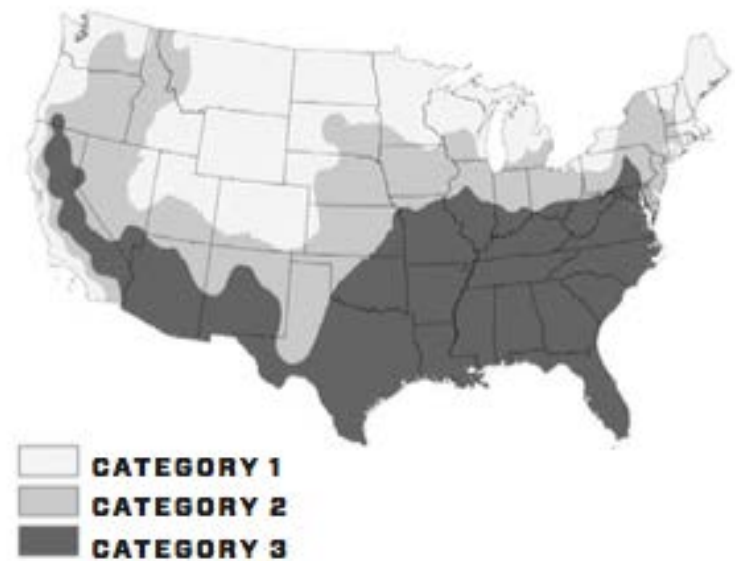
Wet Bulb Globe Temperature (WBGT) from Temperature and Relative Humidity

		Temperature in Degrees Fahrenheit																														
		68.0	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2	104.0	105.8	107.6	109.4	111.2	113.0	114.8	116.6	118.4	120.2	122.0
Relative Humidity (%)	0	59.0	60.8	60.8	62.6	64.4	64.4	66.2	66.2	68.0	68.0	69.8	71.6	71.6	73.4	73.4	75.2	75.2	77.0	77.0	78.8	80.6	80.6	82.4	82.4	84.2	84.2	86.0	87.8	87.8	89.6	89.6
	5	60.8	60.8	62.6	64.4	64.4	66.2	66.2	68.0	69.8	69.8	71.6	71.6	73.4	75.2	75.2	77.0	78.8	78.8	80.6	80.6	82.4	84.2	84.2	86.0	87.8	87.8	89.6	91.4	91.4	93.2	95.0
	10	60.8	62.6	62.6	64.4	66.2	66.2	68.0	69.8	69.8	71.6	73.4	73.4	75.2	77.0	77.0	78.8	80.6	80.6	82.4	84.2	86.0	86.0	87.8	89.6	89.6	91.4	93.2	95.0	96.8	96.8	98.6
	15	62.6	62.6	64.4	66.2	66.2	68.0	69.8	69.8	71.6	73.4	73.4	75.2	77.0	78.8	78.8	80.6	82.4	84.2	84.2	86.0	87.8	89.6	91.4	91.4	93.2	95.0	96.8	98.6	100.4	102.2	
	20	62.6	64.4	64.4	66.2	68.0	69.8	69.8	71.6	73.4	75.2	75.2	77.0	78.8	80.6	80.6	82.4	84.2	86.0	87.8	89.6	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2			
	25	64.4	64.4	66.2	68.0	68.0	69.8	71.6	73.4	75.2	75.2	77.0	78.8	80.6	82.4	82.4	84.2	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2					
	30	64.4	66.2	68.0	68.0	69.8	71.6	73.4	73.4	75.2	77.0	78.8	80.6	82.4	84.2	84.2	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	102.2							
	35	64.4	66.2	68.0	69.8	71.6	73.4	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2								
	40	66.2	68.0	69.8	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2									
	45	66.2	68.0	69.8	71.6	73.4	75.2	77.0	78.8	80.6	80.6	82.4	84.2	86.0	89.6	91.4	93.2	95.0	96.8	98.6	100.4											
	50	68.0	69.8	71.6	73.4	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	91.4	93.2	95.0	96.8	98.6	102.2												
	55	68.0	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	89.6	93.2	95.0	96.8	98.6	100.4													
	60	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	89.6	91.4	95.0	96.8	98.6	100.4														
	65	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	87.8	89.6	91.4	93.2	96.8	98.6	100.4															
	70	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	87.8	91.4	93.2	95.0	96.8	100.4	102.2															
	75	71.6	73.4	75.2	77.0	78.8	80.6	84.2	86.0	87.8	89.6	91.4	95.0	96.8	98.6	102.2																
80	73.4	75.2	77.0	78.8	80.6	82.4	84.2	86.0	89.6	91.4	93.2	96.8	98.6	100.4																		
85	73.4	75.2	77.0	78.8	82.4	84.2	86.0	87.8	89.6	93.2	95.0	98.6	100.4	102.2																		
90	75.2	77.0	78.8	80.6	82.4	84.2	87.8	89.6	91.4	95.0	96.8	98.6	102.2																			
95	75.2	77.0	78.8	80.6	84.2	86.0	87.8	91.4	93.2	95.0	98.6	100.4																				
100	75.2	78.8	80.6	82.4	84.2	87.8	89.6	91.4	95.0	96.8	100.4	102.2																				

NOTE: This table is compiled from an approximat formula which only depends on temperature and humidity. The formula is valid for full sunshine and a light wind. Table adapted from Bureau of Meteorology

Step 2: Find your Regional Category

Determine regional category based on the map, to determine which WBGT guidelines in the table to follow



Step 3: Determine Your Conditions, Alert Level, and Recommendations



Alert Level	WBGT by Region (°F)			Event Conditions	Recommended Actions & Breaks
	Cat 1	Cat 2	Cat 3		
Black	>86.2°	>89.8°	>92.0°	Extreme Conditions	<ul style="list-style-type: none"> No Outdoor Training, delay training until cooler, or Cancel Training
Red	84.2-86.1°	87.8-89.7°	90.1-91.9°	High Risk for Heat Related Illness	<ul style="list-style-type: none"> Maximum of 1 hour of training with 4 by 4 minute breaks within the hour. No additional conditioning allowed.
Orange	81.1-84.1°	84.7-87.7°	87.1-90.0°	Moderate Risk for Heat Related Illness	<ul style="list-style-type: none"> Maximum of 2 hours of training with 4 by 4 minute breaks each hour, OR a 10 minute break every 30 minutes of training
Yellow	76.3-81.0°	79.9-84.6°	82.2-87.0°	Less than Ideal Conditions	<ul style="list-style-type: none"> 3 Separate 4 minute breaks each hour, OR a 12 minute break every 40 minutes of training
Green	<76.1°	<79.8°	<82.1°	Good Conditions	<ul style="list-style-type: none"> Normal Activities 3 Separate 3 minute breaks each hour of training, OR a 10 minute break every 40 minutes

Step 4: Determine the Work to Rest Ratios – Modifications in Training



Alert Level Black – No outdoor training, delay training until cooler or cancel

Alert Level Red – Maximum of 1 hour of training with 4 separate 4 minute breaks within the hour. No additional conditioning allowed.

Alert Level Orange – Maximum 2 hours of training time with 4 separate 4 minute breaks each hour, or a 10 minute break after 30 minutes of continuous training

Alert Level Yellow – Use discretion, provide 3 separate 4 minute breaks each hour, or a 12 minute break every 40 minutes of continuous training

Alert Level Green – Normal Activities, provide 3 separate 3 minute breaks each hour of training, or a 10 minute break every 40 minutes

Training and Match Play Limits From US Soccer

Cancelation of Training

Depending on region category, recommend cancelation of training or delay until cooler when WBGT for

Cat 1 >86.2°F Cat 2 >89.9°F Cat 3 >92.0°F

Match Play Hydration Breaks

Provide hydration breaks of 4 minutes for each 30 minutes of continuous play (i.e., minute 30 and 75 of 90 minute match)

Management of Exertional Heat Illness



Heat Illness (Heat Exhaustion, Heat Cramps)

Remove from training and source of heat

Cool in a shaded area using ice towels

Provide access to fluids/electrolytes and encourage rehydration

Exertional Heat Stroke **** Medical emergency****

Immediately call EMS (911) and prepare hospital for heat related emergency

Athlete may have confusion or altered mental status and a rectal temperature >104°F

Remove excess clothing/equipment and immediately begin cooling the athlete by placing them in an ice-water-tub

If no tub is present, rotate cold wet ice towels (every 2-3 minutes over the entire surface of the body)

Recommended Resources and Equipment

WBGT monitor

Hydration capabilities- water bottles, coolers, hoses, etc.

Ice/Ice immersion tubs

Towels and cooler

Tent or other artificial shade

Communication

Communicate environmental conditions, cooling modalities and other resources to players and all staff

- Planned breaks for hydration
- Duration and time of training

Ensure unlimited access to water and other fluids

Hot Weather Take Home Points

A soccer ball is positioned in the upper right corner of the slide, resting on a green grass field. The ball is white with black pentagonal panels. The background of the slide is a blurred image of a soccer field with white yard lines.

Develop and implement a heat policy as part of an emergency action plan (EAP)

Frequently monitor environmental conditions using Wet Bulb Globe Temperature (WBGT) and make practice modifications as needed

Follow heat acclimatization guidelines during preseason practices and conditioning

Ensure appropriate hydration policies are in place with athletes having unlimited access to water during practice and competition

Educate staff on the signs and symptoms of heat related illness and early management

Consider an on-site health care provider such as an athletic trainer be onsite for all practices and competitions

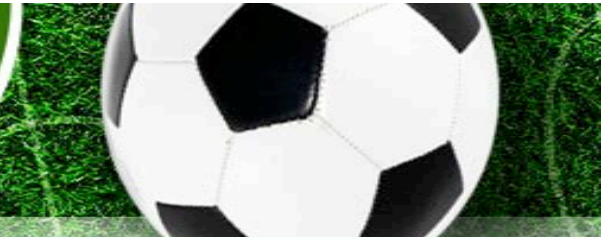
US Soccer Cold Weather Guidelines

A soccer ball with black and white panels is positioned on the right side of the slide, resting on a green grassy field. The background of the slide is a blurred image of a soccer field.

The effects of cold weather can impact health and safety during practices and games

The definition of “cold stress” varies across the United States, depending on how accustomed people are to cold weather

Step One – Determine Wind Chill Temperature



		WIND CHILL TEMPERATURE (WCT) INDEX TEMPERATURE IN DEGREES FAHRENHEIT													
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	
WIND SPEED	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	
	45	27	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	

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Step Two – Find Your Alert Level



ALERT LEVEL	WGT (F)	EVENT CONDITIONS	RECOMMENDED ACTION
BLACK	< 0	Extreme Conditions*	Cancel or attempt to move activities indoors. Frostbite could occur
RED	1-16	High Risk for Cold Related Illness*	Consider modifying activity to limit exposure and allow for more frequent chances to rewarm
ORANGE	16-24	Moderate Risk for Cold Related Illness*	Provide additional protective clothing, cover as much exposed skin as practical, and provide opportunities and facilities for rewarming
YELLOW	25-30	Less than Ideal Conditions*	Be aware of the potential for cold injury and notify appropriate personnel of the potential
GREEN	>30	Good Conditions	Normal activities

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Cold Weather Safety Tips

A soccer ball with black and white panels is positioned on a green grassy field. The ball is in the upper right corner of the slide, partially overlapping a green curved banner that contains the title.

Identify a nearby warming location before the start of training or play

If someone is suffering from a cold-related illness, get him or her into a warm location as soon as possible

During games provide blankets or other items for players to stay warm while they are on the bench and allow additional substitutions or warming breaks

Layer Clothing

Inner Layer 1: wicking layer (wool or polyester)

Middle Layer 2: insulated layer (fleece or wool)

Outer Layer 3: water and wind proof layer

Allow players to wear additional clothing; ie gloves, sweatshirts, sweat pants and/or hats or headbands

Stay Dry

Wet and damp conditions add to the risk of injury or illness during cold weather

Remove wet or saturated clothing and replace it with dry clothing

This is particularly important for players remaining out of play or standing around for a prolonged period of time

Stay Hydrated

Cold weather often reduces the ability to recognize dehydration

Thirst is a sign of dehydration



Frostbite

Swelling/edema, redness or mottled gray skin appearance, tingling or burning, blisters, numbness or loss of sensation

Gradually rewarm affected area with warm water

Do not rub or massage the frostbitten area

Do not use heating pads since affected areas are numb and can be easily burned

*If any of the symptoms persist for longer than a few hours or if symptoms are severe, seek medical attention from emergency department

Hypothermia

Shivering vigorously or suddenly not shivering, lethargy, impaired mental function, slurred speech

Remove damp/wet clothing

Apply heat to the trunk of the body, not limbs

Provide warm fluids

Avoid applying friction massage to tissues

Do not use a hot shower or bath to treat hypothermia

*If symptoms persist seek medical attention from emergency department

Lightning

Lightning is one of the top ten causes of sudden death in sport

Weather alerts can even be sent directly to mobile devices while you are on the field

No place outside is safe when thunderstorms are in the area

Be aware of close safe shelter locations; open fields and open-sided shelters are not safe locations in severe weather

Know how to evaluate when it is safe to resume play after severe weather leaves an area

Lightning

Warning signs of a lightning strike:

Feeling the hair stand on end

Skin tingling

Hearing crackling noises

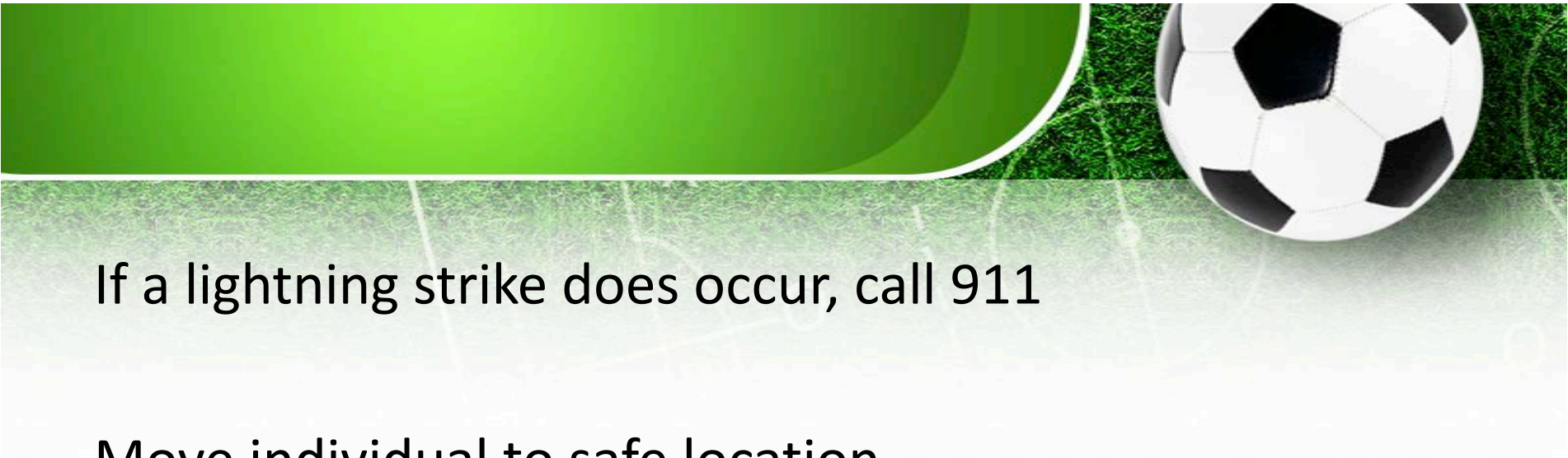
If these occur, assume the lightning safe position:

Crouch on the ground as low as you can

Keep feet together and put weight on the balls of feet

Lower head and cover ears

Do not lie flat on the ground



If a lightning strike does occur, call 911

Move individual to safe location

Initiate CPR if person is unconscious, not breathing, and has no pulse; use AED if available

Resuming Play

Outdoor activity may resume 30 minutes after the last sound of thunder or flash of lightning

The 30-minute clock restarts every time lightning flashes or thunder sounds

Consult weather apps on mobile devices if available

A soccer ball is positioned on the right side of a green field with white yard lines. A bright green curved banner is at the top left. The text "THANK YOU!" is centered in the middle of the slide.

THANK YOU!

A soccer ball is positioned in the upper right corner of the slide, resting on a green field with white yard lines. In the top left corner, there is a large, abstract green shape with a white border. The word "Questions?" is centered on the slide in a black, sans-serif font.

Questions?

References



Binkley et al. National Athletic Trainers' Association Position Statement: Exertional Heat Illnesses. *Journal of Athletic Training* 2002;37(3):329–343

US Soccer Heat Guidelines

US Soccer Cold Weather Guidelines

US Soccer Environmental Conditions

<https://www.ghsa.net/study-says-ghsa-heat-guidelines-very-successful>

<https://www.ghsa.net/practice-policy-heat-and-humidity>