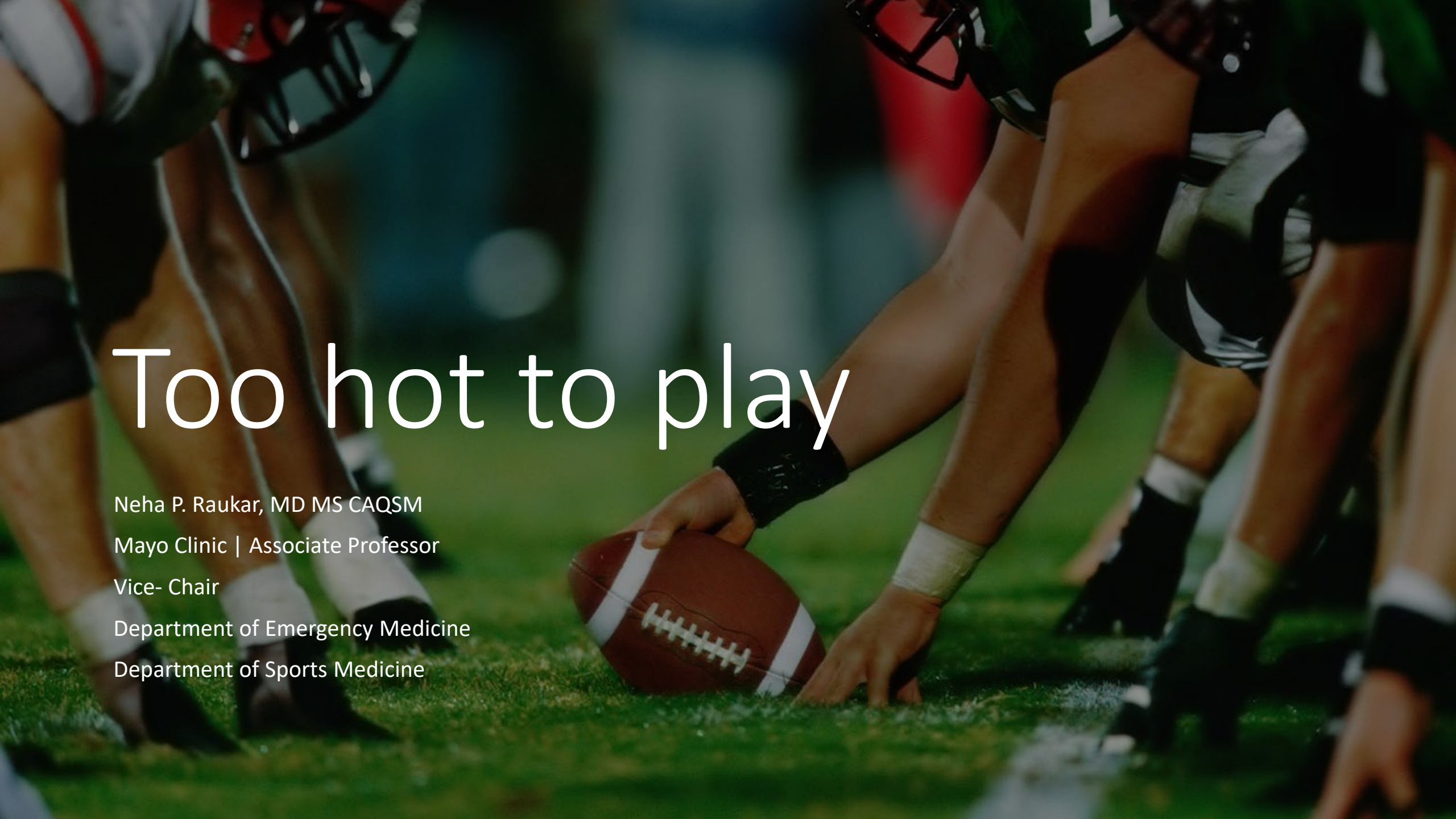


A photograph of American football players in a three-point stance on a green field. The players are wearing helmets and jerseys. One player in the foreground is holding a brown football with white laces. The background is blurred, showing other players and the field.

Too hot to play

Neha P. Raukar, MD MS CAQSM

Mayo Clinic | Associate Professor

Vice- Chair

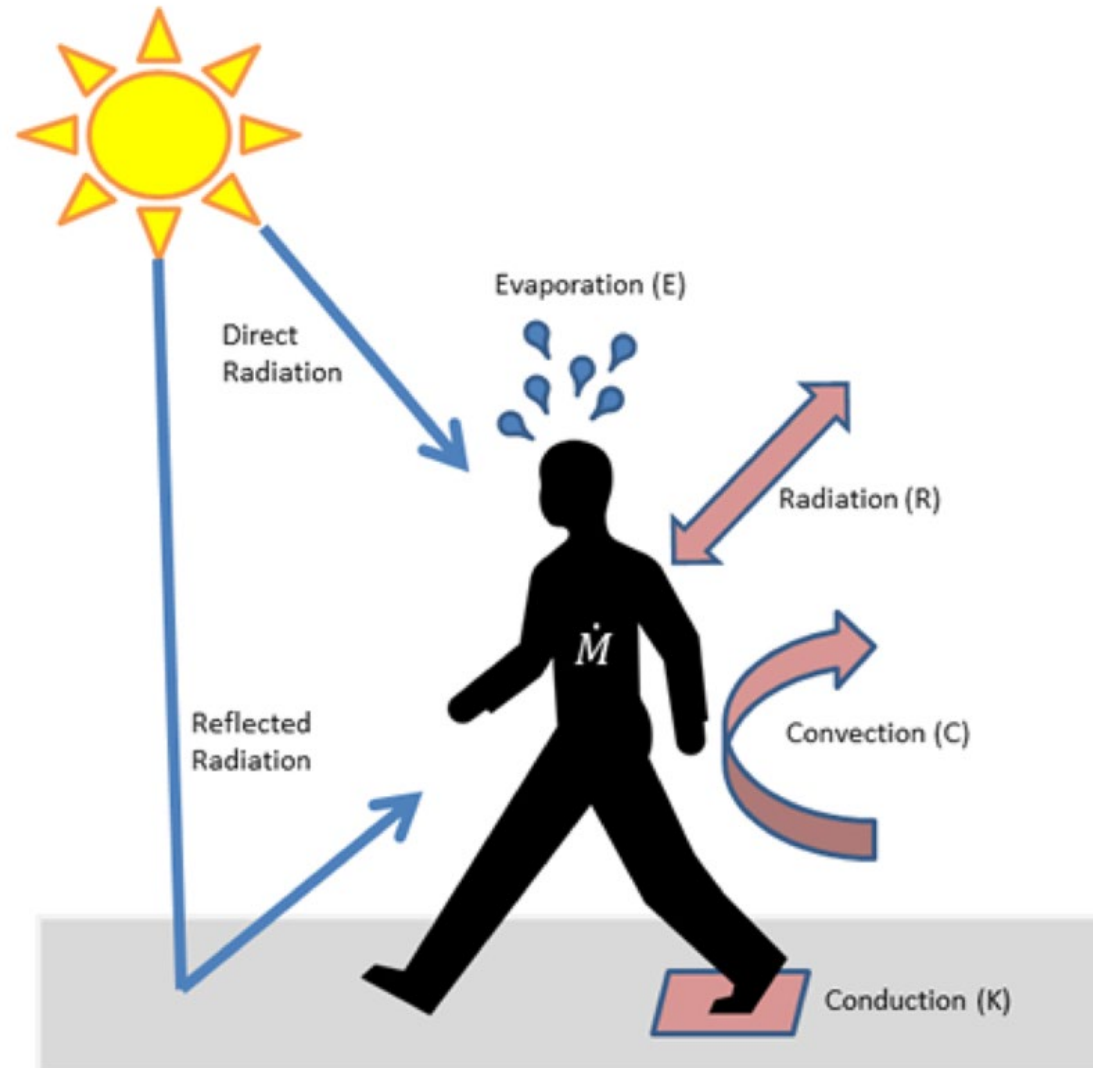
Department of Emergency Medicine

Department of Sports Medicine

Topics

- What is Wet Bulb Globe Thermometer
- How do we protect athletes from heat

Exposure and Release of Heat





NWS Heat Index

Temperature (°F)

Relative Humidity (%)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

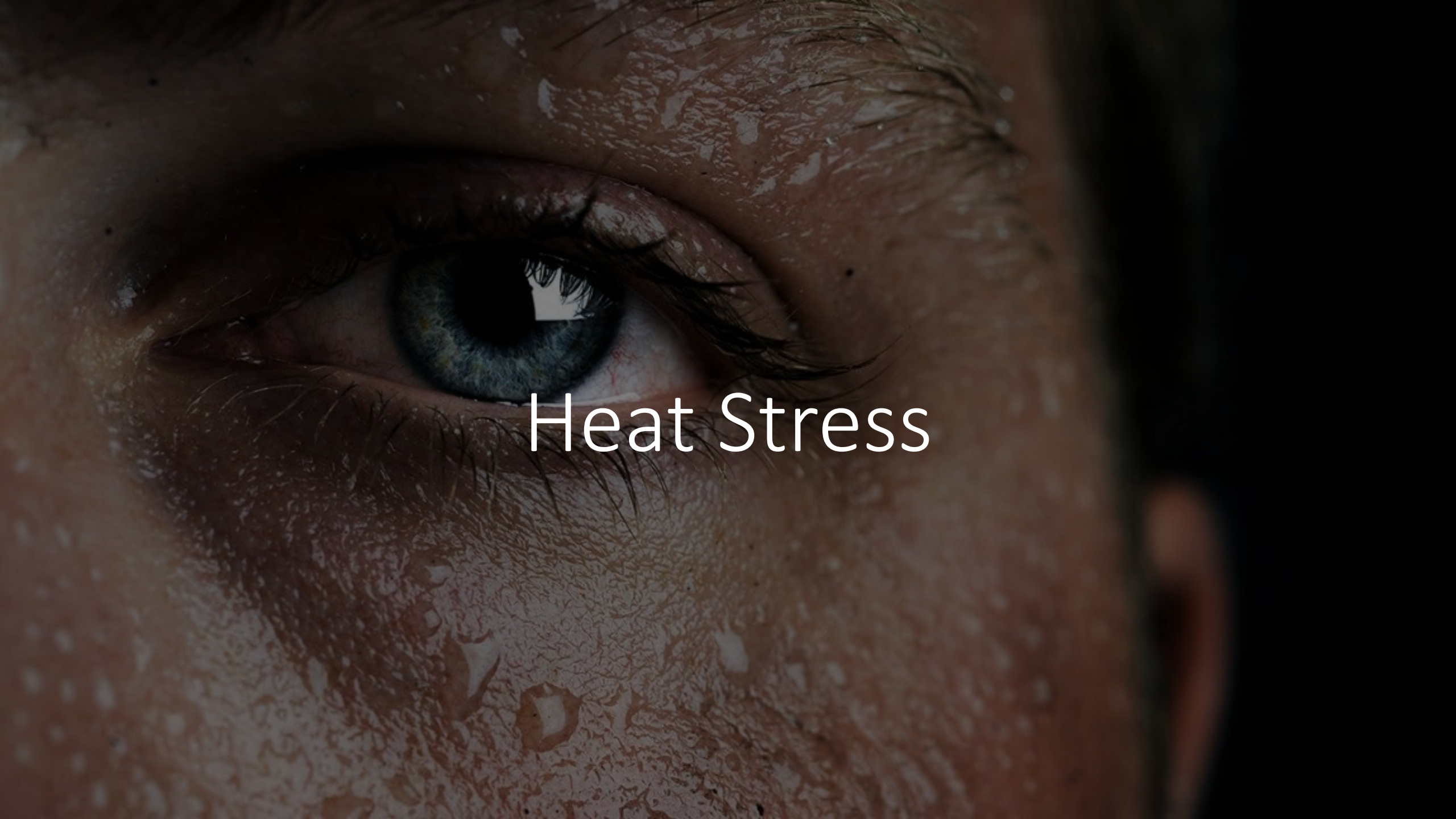
Caution

Extreme Caution

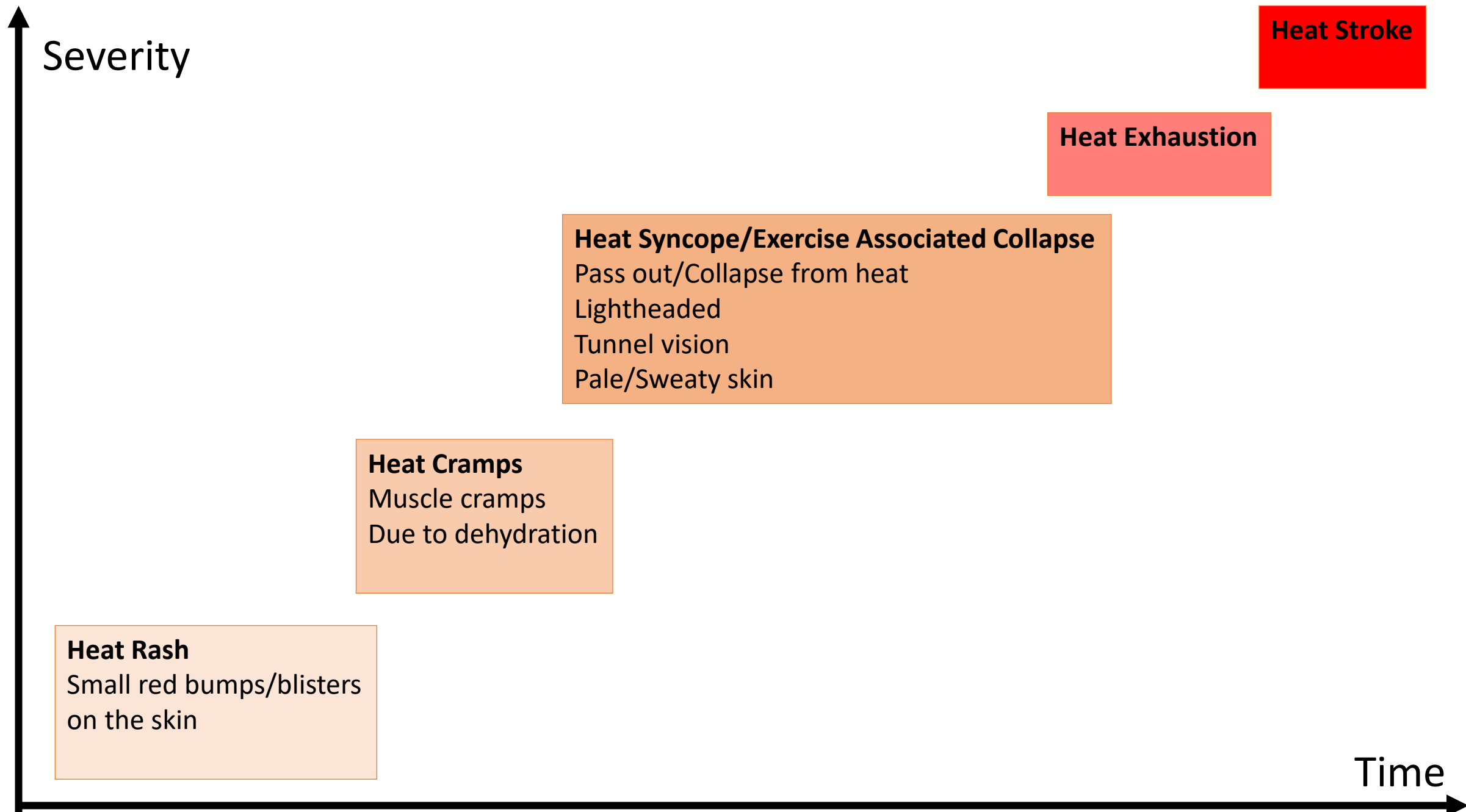
Danger

Extreme Danger

	WBGT	HEAT INDEX
Measured in the sun	✓	✗
Measured in the shade	✗	✓
Uses temperature	✓	✓
Uses relative humidity	✓	✓
Uses wind	✓	✗
Uses cloud cover	✓	✗
Uses sun angle	✓	✗

A close-up photograph of a person's eye. The skin around the eye is severely irritated, showing significant peeling, cracking, and redness. The person has light-colored eyes. The text "Heat Stress" is overlaid in white, sans-serif font across the middle of the image.

Heat Stress



HEAT EXHAUSTION

OR

HEAT STROKE

Faint or dizzy



Throbbing headache



Excessive sweating



No sweating



Cool, pale,
clammy skin

Body temperature
above 103°
Red, hot, dry skin



Nausea or vomiting



Nausea or vomiting

Rapid, weak pulse



Rapid, strong pulse



Muscle cramps



May lose
consciousness

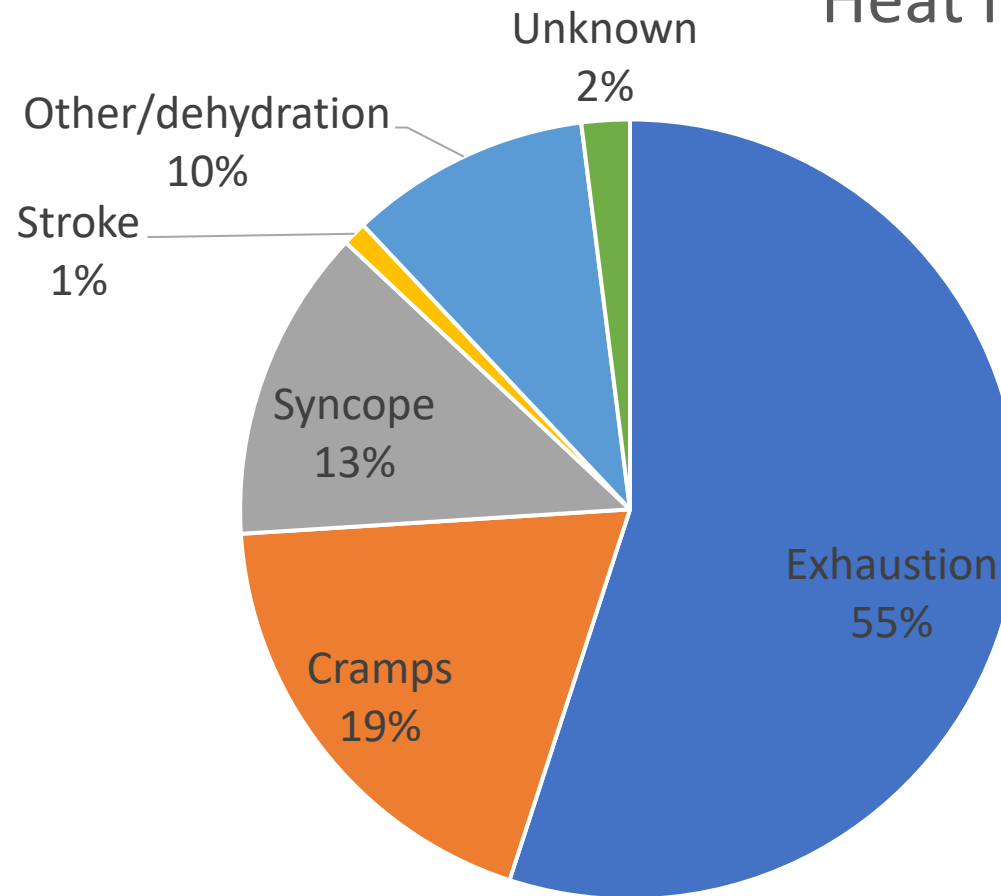


- Get to a cooler, air conditioned place
- Drink water if fully conscious
- Take a cool shower or use cold compresses

CALL 9-1-1

- Take immediate action to cool the person until help arrives

Heat illness 2012/13 – 2020/21



■ Exhaustion ■ Cramps ■ Syncope ■ Stroke ■ Other/dehydration ■ Unknown

Heat illness 2012/13 – 2020/21

- 7% of heat illnesses were recurrent
- Type of aid the athlete received (as reported by the AT; check all that apply):
 - Athlete removed from play: 85%
 - Given fluids via mouth: 79%
 - Cooled by wet towels/ice bags: 61%
 - Equipment removed: 59%
 - Athlete moved to shade: 58%
 - Athlete taken into air conditioning: 38%
 - Clothing removed: 21%
 - Athlete transported to hospital: 16%
 - Given IV fluids: 12%
 - Cooled by ice bath/cold water immersion: 12%
 - Cooled by fans: 10%
 - Athlete received no aid 1%
 - Other 7%

Heat illness Trends

Rate

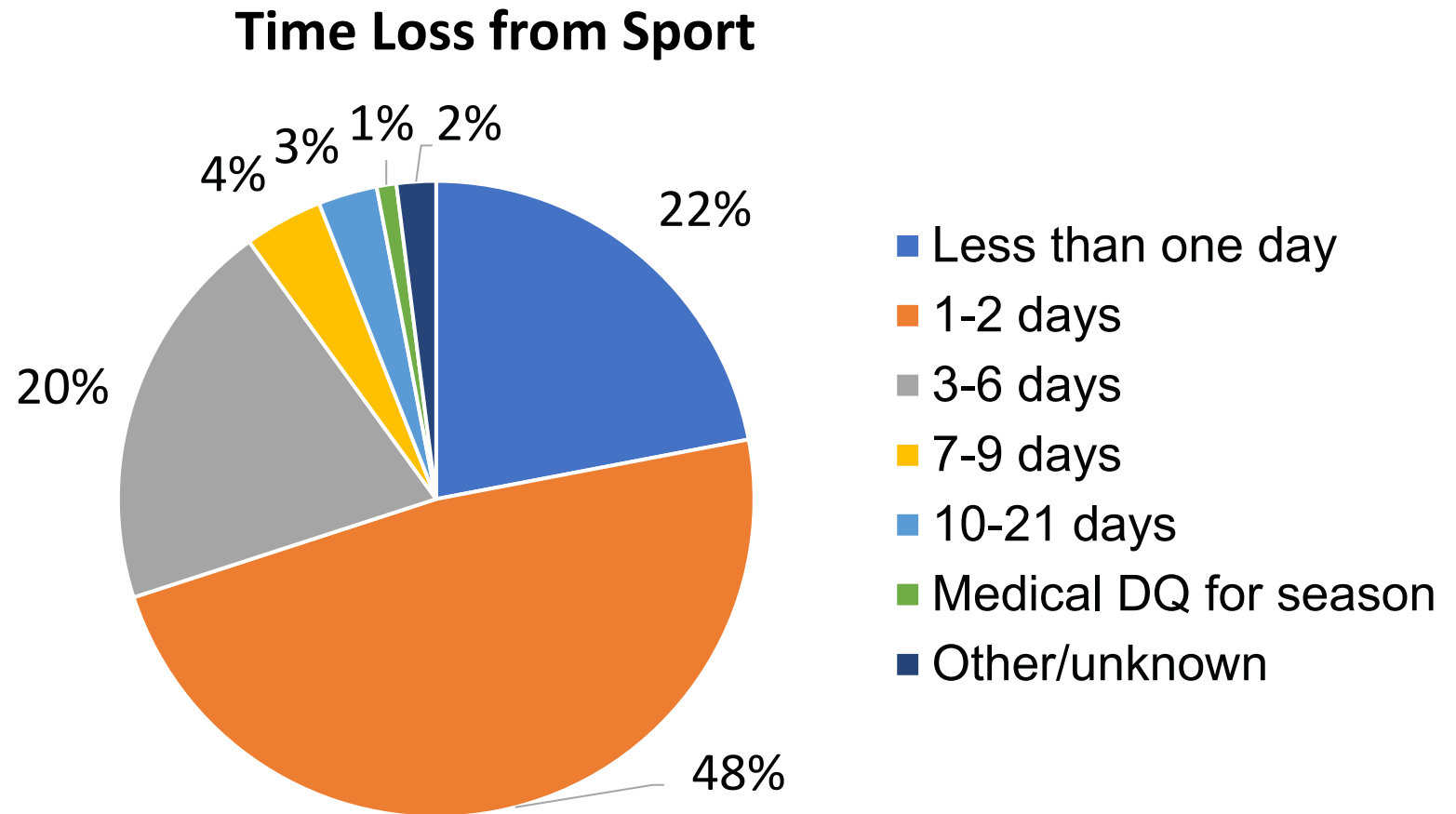
- 2012/13-2020/21:
 - 1.16 injuries per 100,000 AEs.
- 2005/06-2010/11:
 - 1.20 injuries per 100,000 AEs

Setting

- 2012/13-2020/21:
 - Competition = 1.33
 - Practice = 1.10
- 2005/06-2010/11:
 - Competition = 1.05
 - Practice = 1.26

Sport*	Overall Heat Illness Rate per 100,000 Athlete Exposures
Boys' football	4.58
Girls' field hockey	3.99
Girls' cross country	2.32
Girls' soccer	1.18
Boys' cross country	1.16
Girls' tennis	0.76
Cheerleading	0.40
Girls' lacrosse	0.40
Boys' soccer	0.38
Girls' track and field	0.28

Heat illness Time loss 2012/13 – 2020/21



The ongoing COVID-19 pandemic may have affected these results.

Note: Data from convenience sample

DEATH IS 100% PREVENTABLE

Prevention of Death



Primary

Hydrate
Know the
environmental
conditions



Secondary

*Cool
appropriately
based on
presentation
*EAP

Hydration



BEFORE EXERCISE

- Begin exercise well-hydrated
- Drink 16-20 oz. of water or sports beverage at least four hours before exercise
- Drink 8-12 oz. of water 10-15 min. before exercise

DURING EXERCISE

- Drink water or sports beverage every 15-20 min. during exercise
 - 3-8 oz. of water (2-3 large gulps) for exercise <60 min.
 - 3-8 oz. of sports beverage for exercise >60 min.

AFTER EXERCISE

- Rehydrate
- 16-24 oz. of fluid for every pound lost within 2 hours of exercise
 - Chocolate milk is a great option to help rehydrate and refuel after a workout





We have included a 6-minute video that walks you through the step-by-step process of using your Kestrel 5400 Heat Stress Tracker. Please scan this QR Code to watch the video.



bit.ly/nfhswbgt

2:58



-- Please Select --

Choose a free WBGT guideline insert (Kestrel programmed with all guidelines listed) *

NATA Guidelines (Athletics)

-- Please Select --

ed? *

ACSM Guidelines
(Athletics)

Georgia State High School
Guidelines (Athletics)

✓ NATA Guidelines (Athletics)

North Carolina State High
School Guidelines
(Athletics)

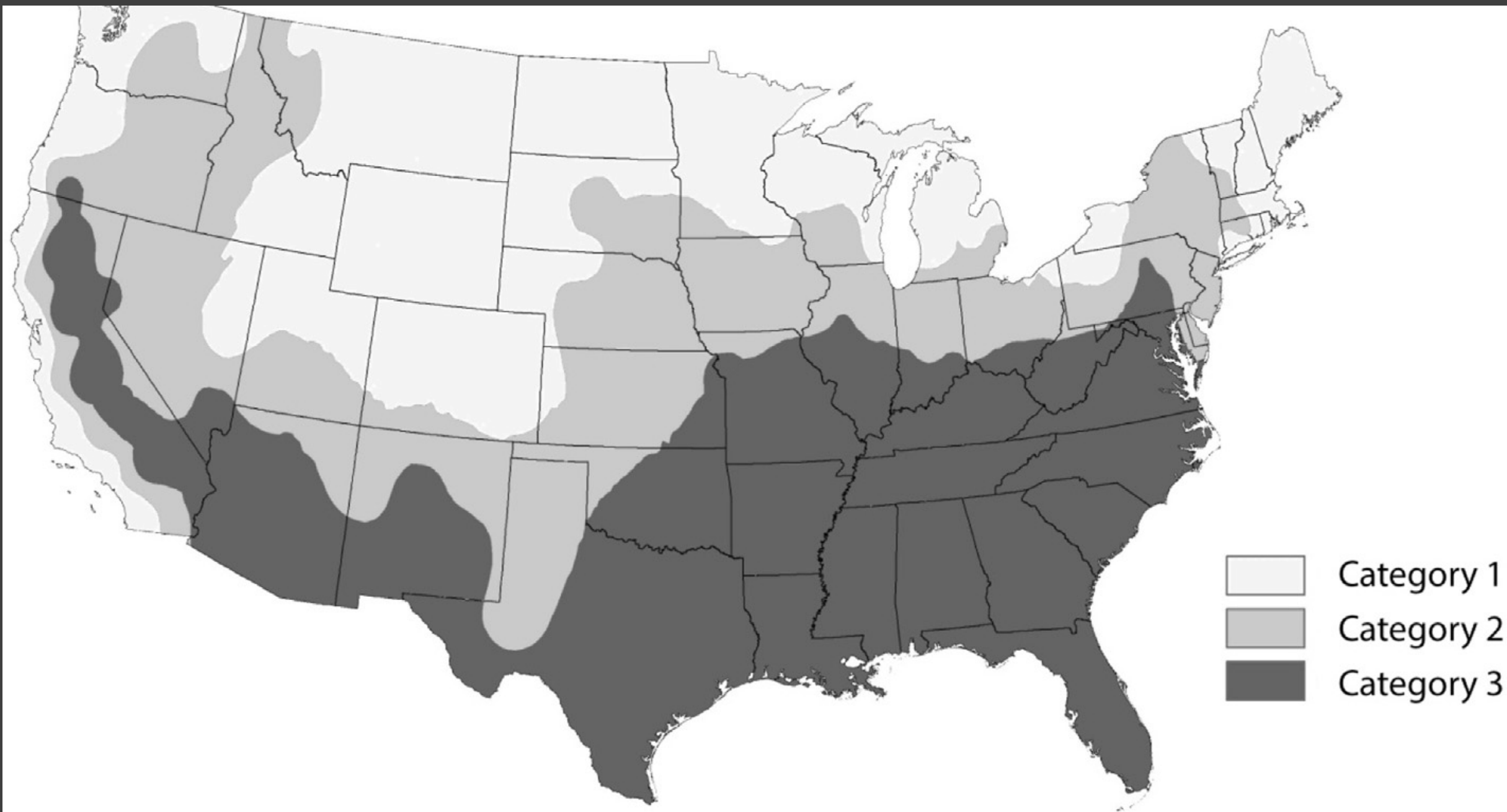
Vermont State High School
Guidelines (Athletics)

TB Med 507 Guidelines
(Military)

ACGIH Guidelines
(Industrial)

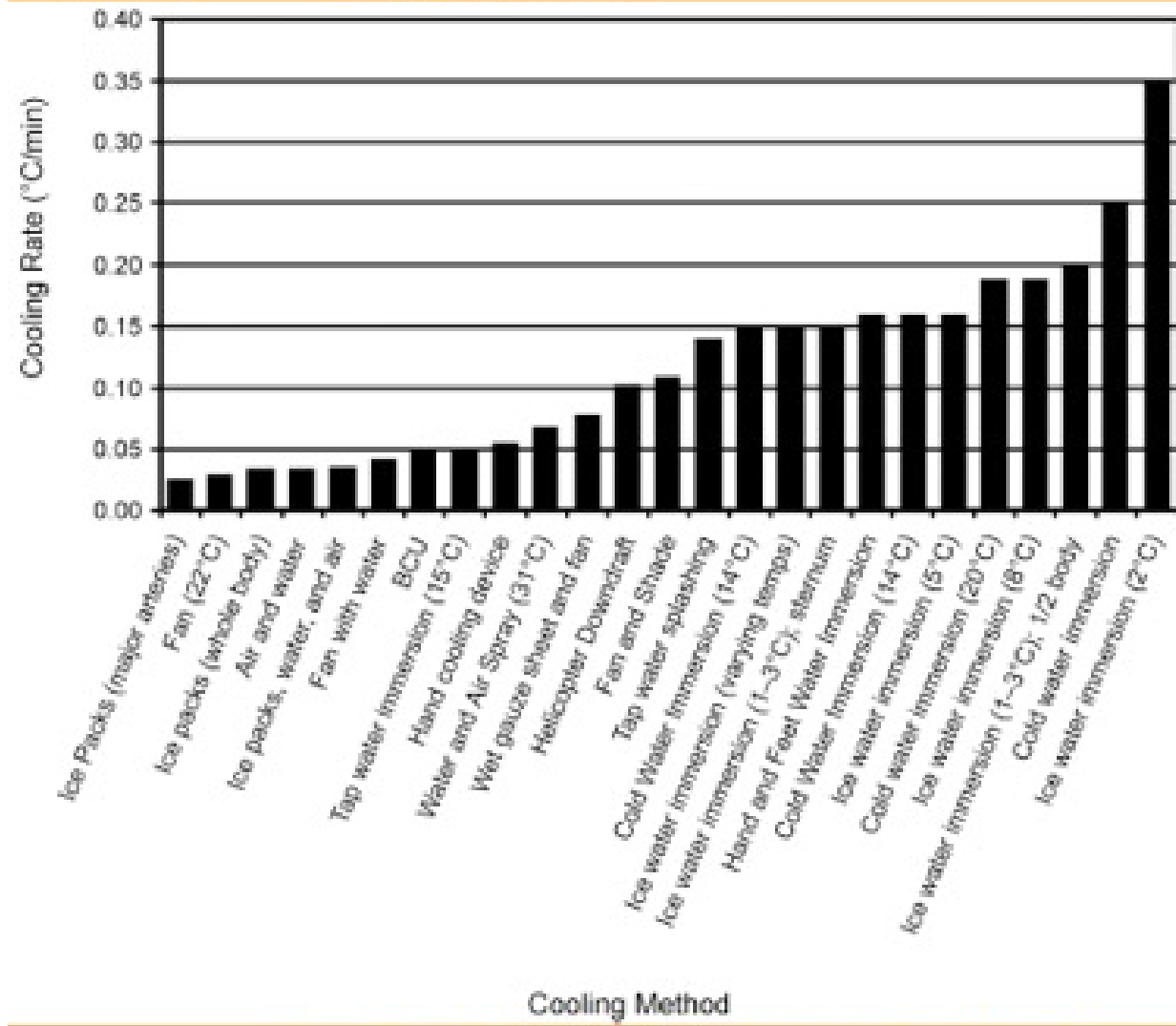
New Jersey State High
School Guidelines
(Athletics)





Georgia Guidelines

Cat 3	Cat 2	Cat 1	Activity Guidelines
< 82.0°F <27.8°C	< 79.7°F <26.5°C	< 76.1°F <24.5°C	Normal Activities – Provide at least three separate rest breaks each hour with a minimum duration of 3 min each during the workout.
82.2 - 86.9°F 27.9-30.5°C	79.9 - 84.6°F 26.6-29.2°C	76.3 - 81.0°F 24.6-27.2°C	Use discretion for intense or prolonged exercise; Provide at least three separate rest breaks each hour with a minimum duration of 4 min each.
87.1 - 90.0°F 30.6-32.2°C	84.7 - 87.6°F 29.3-30.9°C	81.1 - 84.0°F 27.3-28.9°C	Maximum practice time is 2 h. <u>For Football</u> : players are restricted to helmet, shoulder pads, and shorts during practice. If the WBGT rises to this level during practice, players may 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 min each.
90.1 - 91.9°F 32.2-33.3°C	87.8 - 89.6°F 31.0-32.0°C	84.2 - 86.0°F 29.0-30.0°C	Maximum practice time is 1 h. <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 min of rest breaks distributed throughout the hour of practice.
≥ 92.1°F ≥ 33.4°C	≥ 89.8°F ≥32.1°C	≥ 86.2°F ≥30.1°C	No outdoor workouts. Delay practice until a cooler WBGT is reached.







The Emergency Action Plan

- Who knows CPR?
- Who retrieves all necessary emergency equipment?
- Who calls EMS, flags them down, and directs them to the scene?
- Who takes care of the rest of the team?
- Who dissuades “Looky Lous”?



*By failing to plan, you are
planning to fail.* Benjamin Franklin

A photograph of a busy hospital operating room. Several medical professionals in green and blue scrubs, masks, and hairnets are visible. A large text overlay in the center reads "It's a HEAT ATTACK!!". The scene is brightly lit, and various medical equipment and supplies are visible in the background.

It's a HEAT ATTACK!!

ONS

Review

- HS Football accounts for most deaths due to exertional heat stroke
- Once heat stroke occurs, have 30 min to cool the athlete
- Prevention takes many shapes but most important, have to know the heat the body is exposed to so can react
- Death from Heat Stroke is 100% preventable
- Use the WBGT to help guide your practices/games
- Make and practice an EAP – every quarter

Contact for Questions

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Bob Colgate

BColgate@NFHS.org

Air Temperature

Humidity + Wind + Radiation

Radiation + Wind

Dry-Bulb
Temperature
(DB)



Natural
Wet-Bulb
Temperature
(NWB)



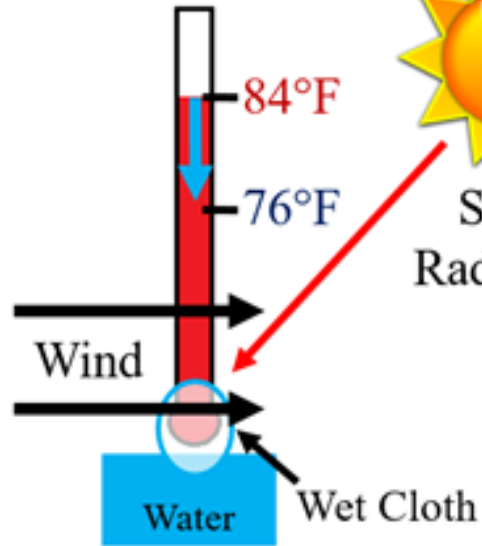
Globe
Temperature
(GT)



WBGT



84°F



84°F

76°F

Wind

Water

Wet Cloth



Solar
Radiation



Globe
Thermometer

$$WBGT = 0.1 * DB + 0.7 * NWB + 0.2 * GT$$