

It Looks Like Exertional Heat Stroke... Now What?




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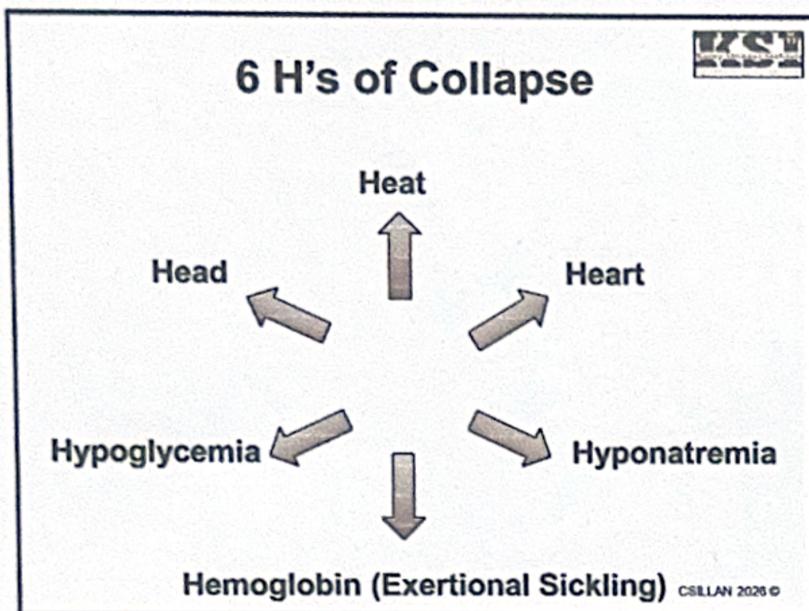
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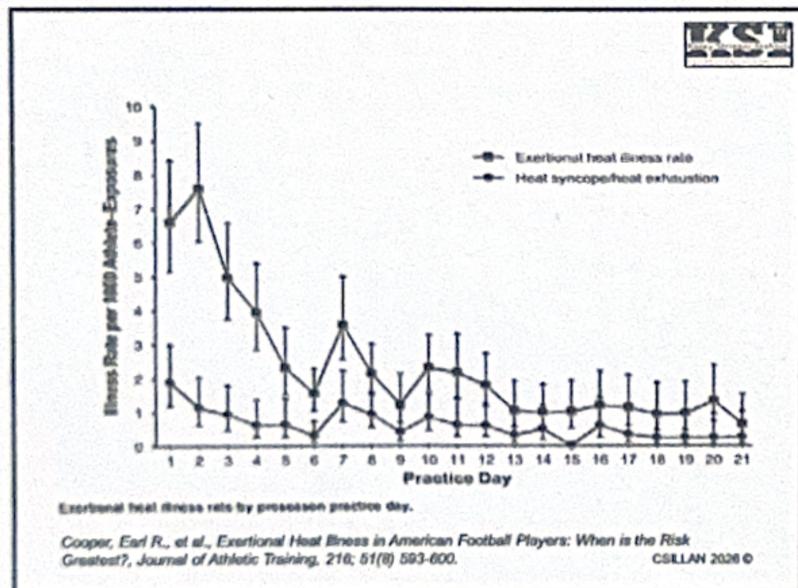
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Types of Heat Illness

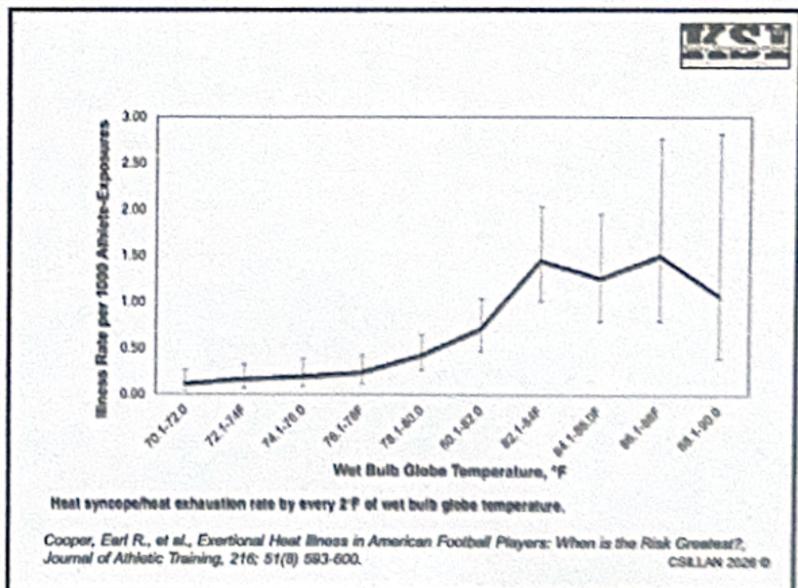
- Exercise-Associated Muscle Cramps
- Heat Syncope
- Heat Exhaustion
- Exertional Heat Stroke

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Differential Diagnosis

| Signs & Symptoms | Cardiac | Exertional Sickling | Hyponatremia | Heat Exhaustion | Exertional Heat Stroke |
|---------------------------|---------|---------------------|--------------|-----------------|------------------------|
| Body Temp <105 F | X | X | X | X | |
| Body Temp >= 105 F | | | | | X |
| Blood Sodium <130mEq/L | | | X | | |
| Blood Sodium >= 130mEq/L | X | X | | X | X |
| CNS Dysfunction | | | X | X | X |
| Loss of Consciousness | X | X | X | | X |
| Diarrhea | | | X | X | X |
| Vomiting | | | X | X | X |
| Nausea | | | X | X | X |
| Peripheral Swelling | | X | X | | |
| Seizures | X | | X | | X |
| Muscle Cramping | X | X | X | X | |
| Fatigue | | X | | X | |
| Inability to Catch Breath | | X | | | |

Casa, DJ, Stearns, RL, Preventing Sudden Death in Sport and Physical Activity, 2nd edition, 2017, Jones and Bartlett Learning. CSLLAN 2026 ©

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Valid

Body Temperature Assessment



Esophageal



Pulmonary Artery



Urinary Bladder



Gastrointestinal

Moran and Mendal, Sports Med, 2002; Casa, et al., JAT, 2009; Gano, Matthew S., et al., Validity and Reliability of Devices That Assess Body Temperature During Indoor Exercise in the Heat., JAT, 2009; 44(2):124-135. CSLLAN 2026 ©

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Logistically Feasible

Body Temperature Assessment



Oral



Temporal



Aural



Axillary

Moran and Mendal, Sports Med, 2002; Casa, et al., JAT, 2009; Gano, Matthew S., et al., Validity and Reliability of Devices That Assess Body Temperature During Indoor Exercise in the Heat., JAT, 2009; 44(2):124-135. CSLLAN 2026 ©

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Importance of an Accurate Temperature

- **Confirm EHS**
 - ? Heat Exhaustion
 - ? Hemoglobin
 - ? Heart
 - ? Hypoglycemia
 - ? Hyponatremia
 - ? Head Injury
- **Decide when to stop cooling**
- **Without a temperature, you are treating an assumption of EHS**

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Assessing Core Temperature

Valid & Logistically Feasible



Rectal

Moran and Mendal, Sports Med, 2002; Casa, et al., JAT, 2009; Gano, Matthew S., et al., Validity and Reliability of Devices That Assess Body Temperature During Indoor Exercise in the Heat., JAT, 2009; 44(2):124-135. CSLLAN 2026 ©

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Journal of Athletic Training, 2014, 49(1):1-10

The Inter-Association Task Force for Preventing Sudden Death in Secondary School Athletics Programs: Best-Practices Recommendations

Douglas J. Casa, PhD, ATC, FHATA, FACSM (Chair); Jon Almquist, VMT, ATC; Scott A. Anderson, ATC; Lindsay Baker, PhD; Michael P. Bergeron, PhD, FACSM; Brian Briggner, EdD; Barry Brubaker, MS; Joel B. Brummett, MS, SPW, FIAAP; William Carroll, MS; LAT, ATC; Bob Crago, MS; Larry Cooper, MS, LAT, ATC; Ron Courson, PE, ATC, MRENTA, CSCS; David Cutler, MS, LAT, ATC; Lisa K. DeBarto, MA, ATC; Jonathan A. DeLeon, MS; Tim Erickson, CAJG; Michael S. Ferron, PhD, ATC, FHATA; Steven J. Fleck, PhD, CSCC, FISSA, FACSM; Rob Franks, DO, FADAP; Kevin M. Guskiewicz, PhD, ATC, FHATA, FACSM; William R. Holcomb, PhD.

Journal of Athletic Training, 2014, 49(1):1-10

Roundtable on Preseason Heat Safety in Secondary School Athletics: Heat Acclimatization

William M. Adams, PhD, ATC; Yuni Hasegawa, PhD, ATC; Douglas A. Casa, PhD, ATC; Julian D. Ponsard, PhD; Sebastian Racineau, PhD; Jonathan E. String, PhD; Susan W. Yeargin, PhD, ATC; Samantha E. Scarnato-Slater, PhD, ATC; Zachary Y. Kerr, PhD, SPH; Luis M. Delval, PhD, ATC, CSCS; Denise Arosa, MS, ATC; David Cutler, MS, ATC; Cynthia LaRocca, MS; Lisa Washen, ATC.

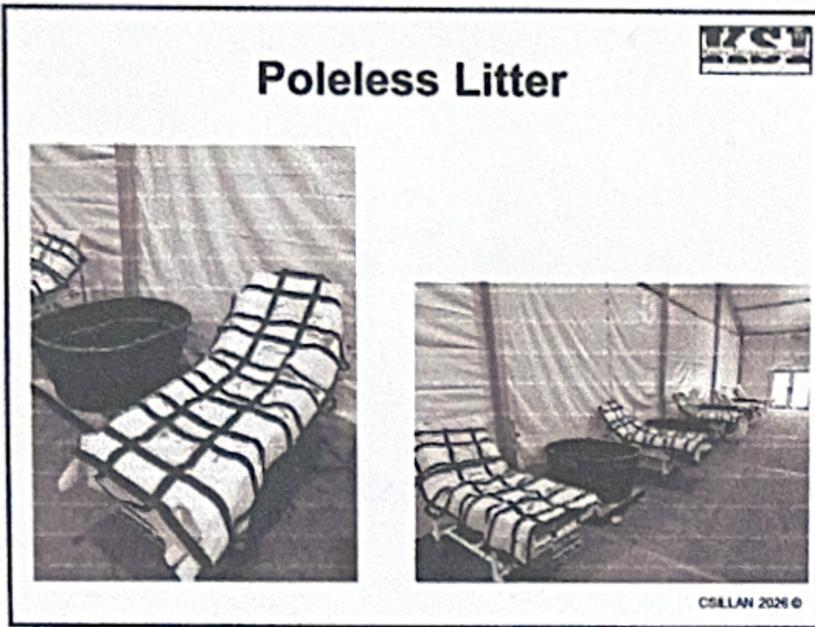
Journal of Athletic Training, 2014, 49(1):1-10

Validity and Reliability of Devices That Assess Body Temperature During Indoor Exercise in the Heat

Matthew S. Gano, MS; Christopher M. Brown, MA, ATC; Douglas J. Casa, PhD, ATC, FHATA, FACSM; Shannon M. Becker, MA, ATC; Susan W. Yeargin, PhD, ATC; Brendon P. McDermott, MS, ATC; Lindsay M. Beata, MS, ATC; Paul W. Boyd, BS, ATC; Lawrence E. Armstrong, PhD, FACSM; Carl M. Maresh, PhD, FACSM.

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Stages of Initial Cooling

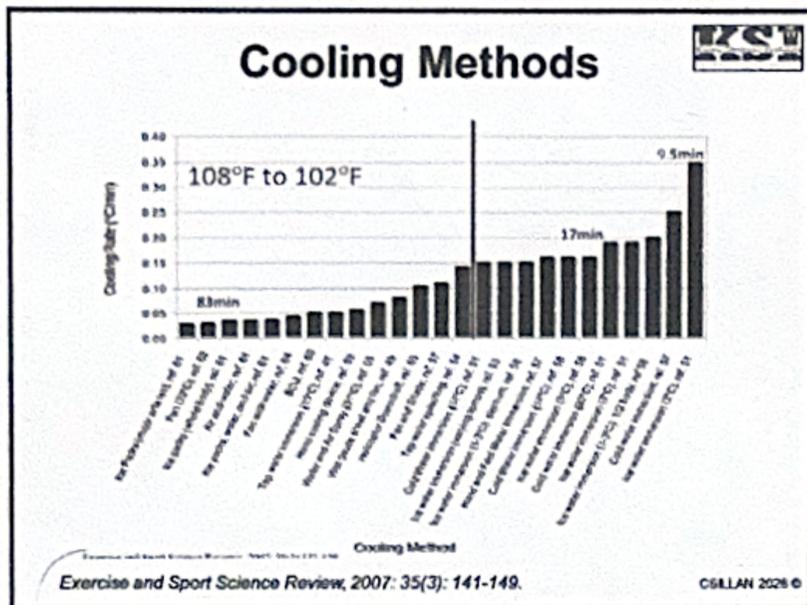
= / > 105° F Immersion Tub

102° F – 104.9° F Cold Towel Rotation

< 102° F Hydrate with Cold Fluids

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Cooling Methods

| Author, Year | Specific Activity | Th Method | Th | Cooling Modality | Patient Outcomes (%) | | Total Patients (n) |
|----------------------|-------------------|--------------|--------------------|--|----------------------|-----------|--------------------|
| | | | | | Fatality | Save SBSC | |
| Wickens et al. 2012 | Marathon | Ice | 40 C | Ice packs | 1 | 0 | 1 |
| Arundson et al. 2018 | Football | NI | 42.87 C | None | 1 | 0 | 1 |
| Rowe et al. 2008 | Marathon | NI | 37.5 C | None | 1 | 0 | 1 |
| Rowe et al. 2008 | Cycling | Rectal | 41.2 C | Ice | 1 | 0 | 1 |
| Rowe et al. 2008 | Cycling | Rectal | 41.8 C | Ice | 1 | 0 | 1 |
| Rowe et al. 2013 | Marathon | NI | 41.87 C | IV Fluids | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Oral | 40.5 | CWI | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Rectal | 40.0 | IV Fluids | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Oral | 39.0 | None | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Oral | 38.0 | None | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Rectal | 38.0 | None | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Rectal | 42.2 C | IV Fluids + Cold Rehydration | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | NI | 42.1 C | None | 1 | 0 | 1 |
| Rowe et al. 2018 | Marathon | Rectal, Oral | 40.8 C +/- 2.4 C | CWI + IV Fluids + Ice packs + Ice Towels | 14 | 0 | 30 |
| Arundson et al. 2018 | Football | Rectal | 41.7 C +/- 0.8 C | CWI | 14 | 0 | 14 |
| Arundson et al. 2018 | Football | Rectal | 41.44 C +/- 0.83 C | CWI | 174 | 0 | 224 |
| Arundson et al. 2018 | Football | Rectal | 42.85 C | CWI + Ice towels | 1 | 0 | 1 |

Filip, Erik M. et al.; Exertional Heat Stroke, Modality Cooling Rate and Survival Outcomes: A Systemic Review. Medicine, 11,2020, 2-25.

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Cold Water Immersion Tub Policy

When treating a potential Exertional Heat Stroke (EHS), schools must be properly *prepared and equipped* to initiate Cold Water Immersion (CWI) or other approved cooling technique. Cooling techniques must be implemented immediately, and concurrently EMS must be contacted. This must be followed during all summer conditioning, pre-season practices/games on school grounds/school designated facility, or when a coach, paid or otherwise, is present. This includes the first 21 days of fall practice, and any day the temperature is greater than 80°F WBGT.

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| WBGT READING | FLAG | COLD WATER IMMERSION TUB GUIDELINES |
|-----------------|--------|--|
| Under 80.0°F | Green | Mandatory alternative cooling measures of a cooler w/ ice & towels or a tarp (taco / burrito method) must be available at the practice/game site. |
| 80.0 F – 85.0°F | Yellow | 150 gallon cold water immersion tub (or a tarp (taco/burrito method) filled with water temperature of 50°- 60°F and accessible for cooling within 5-10 minutes of the practice/game site. Remove external clothing/equipment prior to cooling or immediately after entering tub. Aggressively stir water during cooling process. |
| 85.1 F – 88.0°F | Orange | Same as Yellow. |
| 88.1 F – 90.0°F | Red | Same as Yellow. |
| Over 90°F | Black | NO OUTDOOR WORKOUTS. Delay practice until a cooler WBGT level is reached. If the WBGT rises to this level during practice, same as Yellow. |

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Rate of Cooling

Typical rate of cooling in an immersion tub is 1 degree C every 5 minutes or .37 degrees F per minute (about 1 degree F every 3 minutes).



Average cooling for 15 minutes:
3 degrees C
or
5 degrees F

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CWI Protocol

Medical Staff on-site

- **Cool First, Transport Second**
- Use CWI until core temperature is at 102.5° F.

Medical Staff Not on-site

- Cool immediately a minimum of 20 minutes.

** If an athletic trainer *is not* present, EMS assumes control of the exertional heat stroke athlete upon arrival and continues cooling for the minimum of 20 minutes or until rectal temperature is obtained.

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Immediate Care

Performed in order, these 2 methods will save a life for those suffering exertional heat stroke.

1 Rapid Cooling



2 Transport



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Cold Water Immersion Tub




Cover the tub
Tub under a tent / shaded area
Water Temperature: 50° F - 60° F

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Off-Season Workouts



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TCS NYC Marathon





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Falmouth Road Race

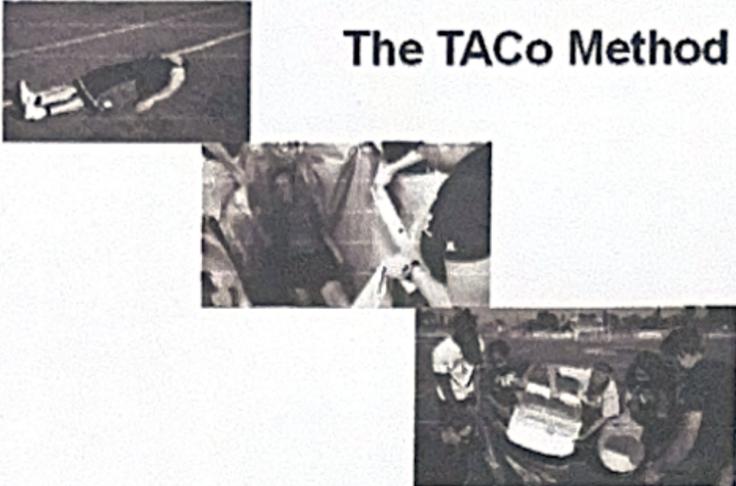


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The TACo Method



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Advanced User Guide

Exertional Heat Stroke Best Practices in U.S. Emergency Medical Services Guidelines

Faton Tishukaj et al. J Emerg Med. 2024 Oct.

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Exertional Heat Stroke and the ED



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WILEY

EARLY REPORT

A body bag can save your life: a novel method of cold water immersion for heat stroke treatment

David A. Kim MD, PhD¹ / Benjamin D. Lindquist MD² / Sam H. Shin MD, MBA¹ / Adam M. Wagner MD, MBA¹ / Grant S. Litman MD¹ //



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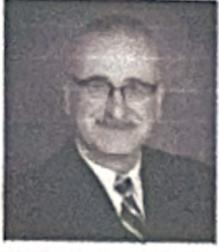
Take Home Messages

- A rectal thermometer/flexible probe and cold-water immersion **must** be utilized to confirm and care for EHS.
- EHS risk is greatest during the first 1-5 days of practice or when the WBGT was above 82° F
- **Cool first, transport second** is the gold standard when caring for EHS.

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Thank You!



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