



2020 NSCA COACHES CONFERENCE & LIVESTREAM



#Coaches20

CONFLICT OF INTEREST STATEMENT

I have no actual or potential conflict of interest in relation to this presentation.

HEAT ILLNESSES AND THEIR COMPLICATIONS: HOW TO IDENTIFY, TREAT, AND PREVENT COMPLICATIONS

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WHY THIS IS IMPORTANT!

D.C. Sports Bog

‘Like a rerun’: Jordan McNair isn’t the first Maryland football player to die of heatstroke

By **Jacob Bogage**

August 17, 2018 at 8:00 AM



Korey Stringer
 The Pro Bowl offensive tackle's death was the first of its kind in the NFL.

Three days after he collapsed from heatstroke at practice in 2008, 15-year-old Max Gilpin became one of at least 665 boys since 1931 to die as a result of high school football. Here's what made his case different: The Commonwealth of Kentucky tried to prove Max's coach had a hand in killing him

By **Thomas Lake**

Photograph by **JEFF JENNINGS**

The Boy Who Died of Football

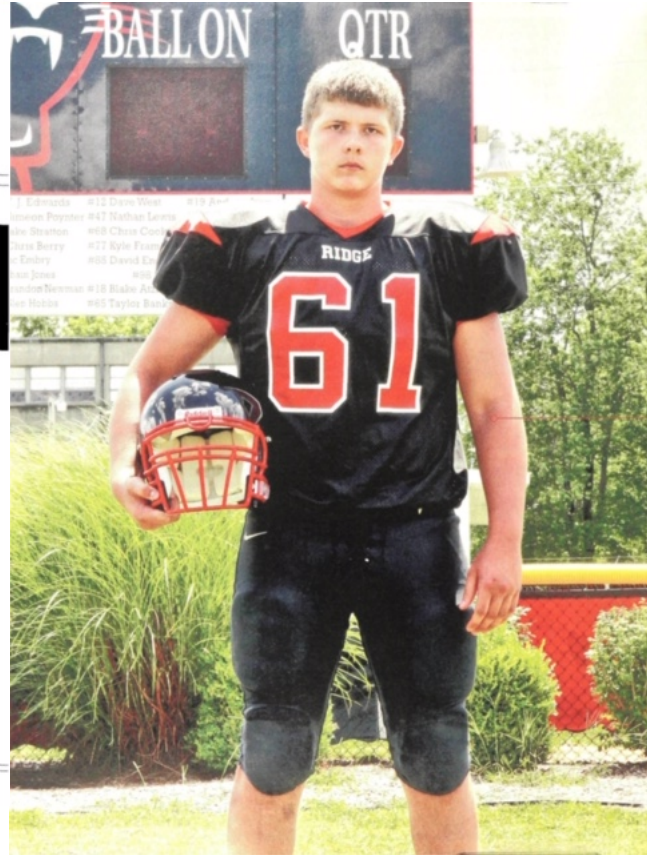
On the day Max Gilpin ran himself to death before nearly 140 witnesses, he did almost nothing but what he was told. He began complying an hour before dawn, when he stumbled out of bed at his father's command, and he continued through the morning and afternoon behind the brick walls of his school as the August sun parched the valleys of Kentuckiana. After school he surrendered to the will of his football coach, a man he loved as he loved his father, and he hoped this surrender would be enough to please them both.

This is a story about obedience, the kind that gives football and religion their magnetic power. Max Gilpin was an obedient boy. He was, to borrow a word from his adoring mother, a plover, and if he misbehaved, he had four parents to set him straight. They had family meetings, four against one, mother and stepfather and father and stepmother. Max's mother told him to obey his stepmother, and his father told him to obey his stepfather. So he did. And although he hated the Adderall pills—although they flattened his personality, made him smile less, made him want to hurl them off the deck into the backyard—he took them, usually, because they also made him stare at the teacher instead of the ceiling fan.

Max had a girlfriend named Chelsea Scott, a cheerleader with green eyes and shining auburn hair. They were sophomores at Pleasure Ridge Park High in Louisville, and they'd been a couple barely 48 hours. It should have been much longer, but Max couldn't muster the courage to ask her out. Fortunately Chelsea was a modern woman. Since the end of their freshman year she had kept a picture of Max on her phone, with the caption **MY HEART**, and over the summer, on MySpace, she had asked for and received his cell number. Still he needed encouragement. Finally Chelsea wrote Max a love note, delivered by her best friend, and he understood. That was Monday. Today was Wednesday. He had never taken Chelsea on a date. Instead they commiserated in the halls between periods, and Max complained about football.

THE PLEASER
 Max was proud of the body he built to play football, but for a long time he was in the game more for others than for himself.

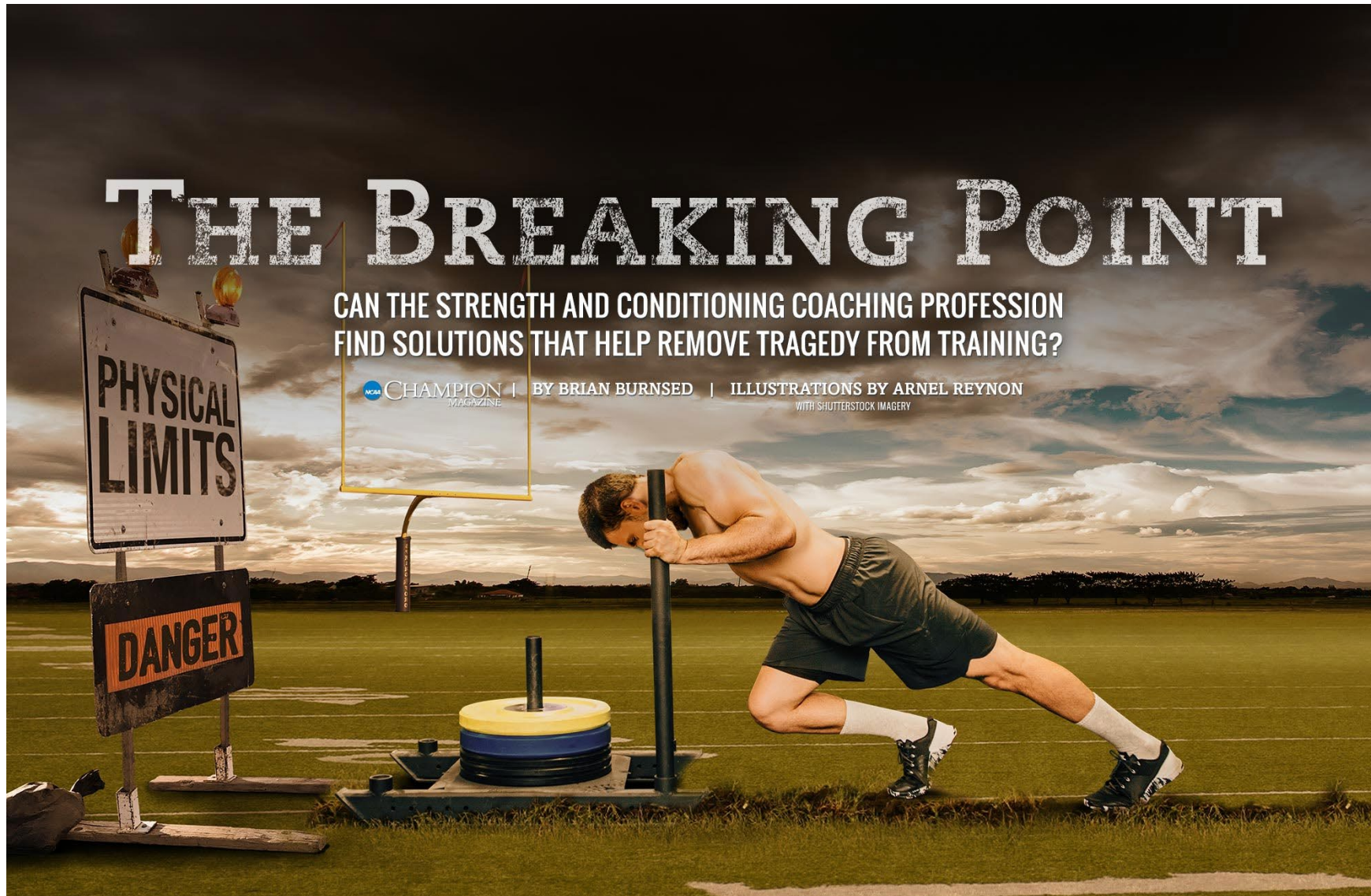
DECEMBER 6, 2010 | SPORTS ILLUSTRATED | 131



THE BREAKING POINT

CAN THE STRENGTH AND CONDITIONING COACHING PROFESSION
FIND SOLUTIONS THAT HELP REMOVE TRAGEDY FROM TRAINING?

CHAMPION | BY BRIAN BURNSED | ILLUSTRATIONS BY ARNEL REYNON
WITH SHUTTERSTOCK IMAGERY



HOW TO PREVENT HEAT STROKE?



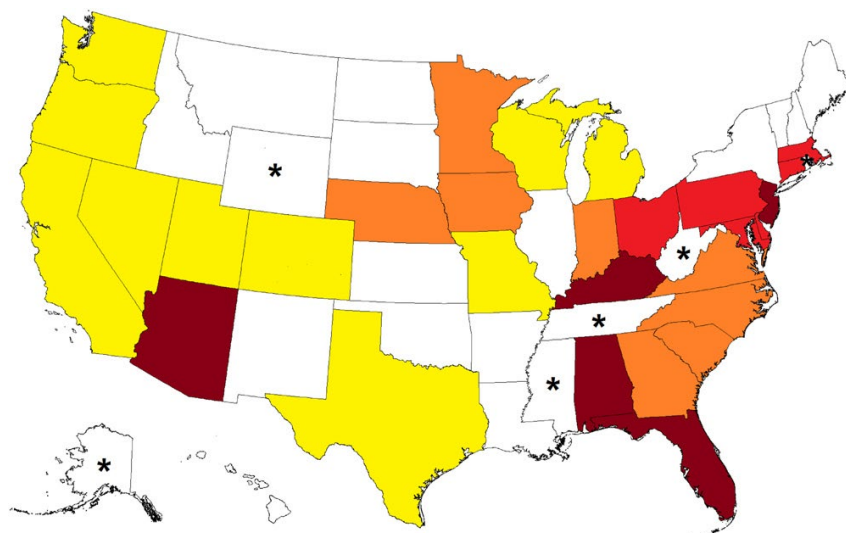
OBJECTIVES:

- *DISCUSS DIFFERENT TYPES OF HEAT ILLNESS AND IDENTIFY THEIR PRESENCE*
- *DISCUSS INDIVIDUALS THAT ARE AT RISK FOR HEAT RELATED ILLNESSES*
- *DISCUSS THE TREATMENT AND MANAGEMENT OF HEAT RELATED ILLNESSES*
- *REVIEW PREVENTATIVE STRATEGIES/POTENTIAL SCREENING QUESTIONS*

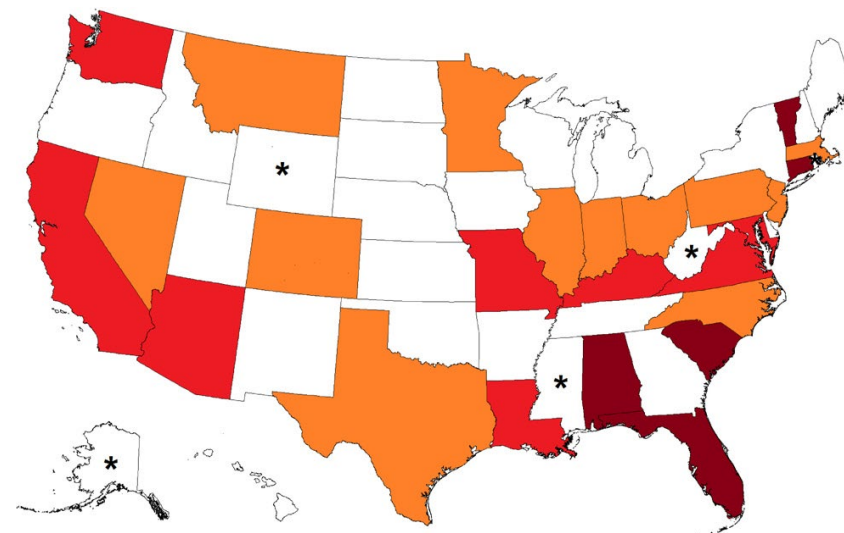
EPIDEMIOLOGY: EXERCISE RELATED HEAT ILLNESS

- *ESTIMATED 9000 HEAT RELATED ILLNESSES TREATED ANNUALLY IN HIGH SCHOOL ATHLETES*
- *MOST OFTEN OCCUR IN AUGUST OR AFTER A PROLONGED BREAK FROM ACTIVITY (SPRING FOOTBALL)*
- *ERHI RATE IS 11.4 TIMES HIGHER IN FOOTBALL THAN ANY OTHER SPORT*
- *1/3 OF HEAT ILLNESSES OCCUR WHEN A MEDICAL PROVIDER IS NOT ON THE FIELD*

RATES OF EHI BY STATE



Football related



Other Sports

EXERCISE ASSOCIATED MUSCLE CRAMPS: (EAMC)

- *SUDDEN AND SOMETIMES PROGRESSIVE, INVOLUNTARY, PAINFUL CONTRACTIONS OF SKELETAL MUSCLE DURING OR AFTER EXERCISE*
- *NOT RELATED TO ELEVATED BODY TEMPERATURE (NOT HEAT CRAMPS)*
- *MAY OCCUR IN WARM OR COOL TEMPERATURES*
- *POSSIBLE CONTRIBUTING FACTORS*
 - Salty sweaters
 - Dehydration
 - Electrolyte imbalance
 - Altered neuromuscular control
 - Fatigue
- *RECURRENT “CRAMPERS” DESERVE MEDICAL CONSULTATION TO RULE OUT MEDICAL ETIOLOGY (SICKLE CELL TRAIT)*
- *TREATMENT: STATIC STRETCHING/HYDRATION*



Warn athlete to check urine and if muddy or dark to go to the ED

EAMC: POTENTIAL PREVENTION STRATEGIES

- PICKLE JUICE
- PLYOMETRIC TRAINING
- MUSTARD
- GATORADE PLUS SALT
- SALT TABLETS
- DEIONIZED WATER
- HYPERVENTILATION
- HYDRATION (<2% BODY WEIGHT LOSS)



[Sports Health](#). 2010 Jul;2(4):279-83.
**Exercise-associated muscle cramps:
causes, treatment, and prevention**

**Hyperventilation as a Simple Cure for Severe Exercise-Associated
Muscle Cramping**

Philip M. Murphy, MD Carolyn A. Murphy, BA

Pain Medicine, Volume 12, Issue 6, 1 June 2011, Pages 987

EXERTIONAL RHABDOMYOLYSIS

- *PRESENTATION*
- *COMPLICATIONS*
- *TREATMENT*
- *RISK FACTORS*
 - Male
 - African American
 - Prior history of EHS
 - Young Age
 - Sickle cell trait
 - Training regimens



EXERTIONAL RHABDOMYOLYSIS IN THE MEDIA

Multiple Oregon Ducks football players hospitalized after grueling workouts-2017

FOOTBALL
Two Nebraska football players hospitalized, treated after offseason workout-2018

Exertional Rhabdomyolysis? Crazy Workout Sends Iowa Football Players To The Hospital-2011

Rhabdomyolysis laid low 6 athletes-2012

FORMER IOWA PLAYER FILES LAWSUIT AGAINST UNIVERSITY OVER NEGLIGENCE BY COACHES, TRAINERS



HEAT SYNCOPE/EXERCISE-ASSOCIATED COLLAPSE

- *RISK FACTORS*
 - Unacclimatized
 - Equipment
 - Dehydration
 - Diuretic use
- *RAPID CHANGE IN POSITION OR PROLONGED STANDING IN HEAT RESULTS IN A BRIEF EPISODE OF FAINTING*
- *GENERALLY OCCURS DURING FIRST 5 DAYS OF PRE-SEASON*
- *TEMPERATURE IS 39°*
- *TREATMENT:*
 - Elevate legs, rehydrate, and cool



HEAT EXHAUSTION:

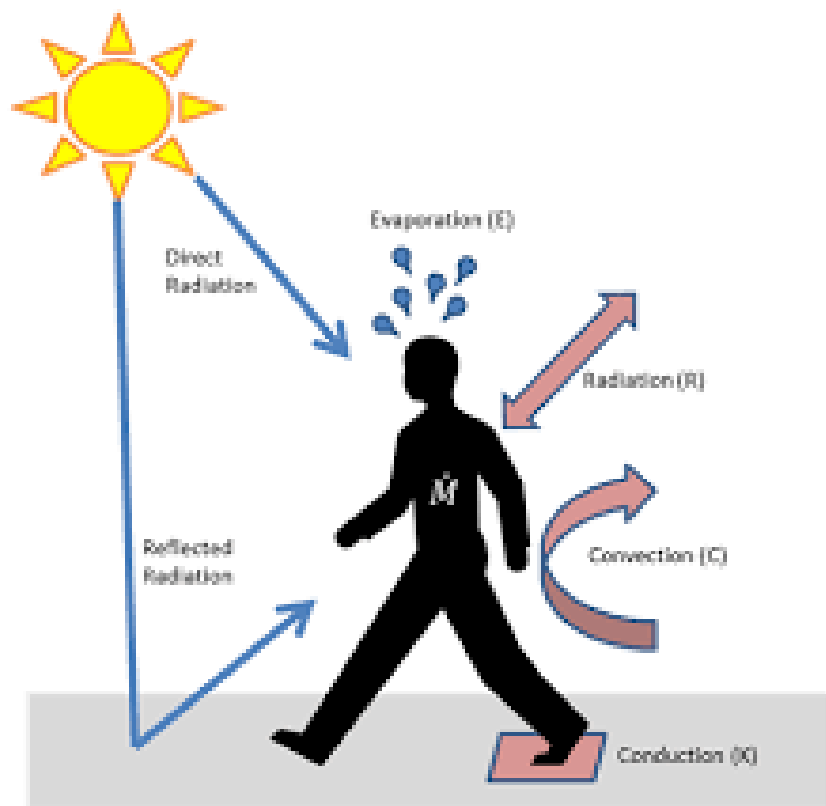
- *RISK FACTORS: BMI > 27KG/M²*
- *MANIFESTATIONS:*
 - Elevated core body temperature (< 40.5 C°)
 - Heavy sweating
 - Inability to effectively exercise/impaired coordination
 - Low blood pressure (hypotension)
 - No end organ damage
 - No mental status changes (mild headache or dizziness may be present)
- *RECTAL TEMPERATURE SHOULD BE OBTAINED TO DISTINGUISH FROM EHS!*

HEAT STROKE

- *RECTAL TEMPERATURE > 40.5° C OR 105°F**
- *MENTAL STATUS CHANGES*
 - Collapse, irritability, aggressiveness, confusion, seizures
- *RED, HOT, AND DRY SKIN (NO SWEATING)*
- *RAPID, STRONG PULSE*
- *HEADACHE*
- *DIZZINESS*
- *NAUSEA*
- *VOMITING*

Why does Thermoregulation Fail??

THEMORREGULATION



- *NO WIND—LIMITED HEAT LOSS FROM CONVECTION*
- *SUNNY DAY-INCREASED TEMPERATURE FROM RADIATION*
- *WARM DAYS LITTLE CONDUCTIVE HEAT LOSS—SMALL TEMPERATURE GRADIENT*
- *LIMITED EVAPORATIVE LOSS WITH INCREASED VAPOR PRESSURE*

AT RISK ATHLETES: MODIFIABLE

- Illness (Fever or GI)
- Obesity/BMI
- Poor conditioning
- Equipment
- Work: Rest ratio
- Intensity of workout
- Fluid/shade access
- Medications/Alcohol
- *PRACTICE DURATION (<3H)*
- *AIR CONDITIONING AT HOME*
- *SLEEP HYGIENE*
- *SUPPLEMENTS*
- *HEAT ILLNESS AWARENESS*
- *SEVERE SKIN RASH*
 - Eczema/sunburn

MEDICATIONS

- ALCOHOL
- STIMULANTS
- ANTI-CHOLINERGIC
- ANTI-HISTAMINES (ALLERGIES)
- BENZODIAZEPINES (ANXIETY)
- CARDIOVASCULAR DRUGS
- LAXATIVES
- ANTI-DEPRESSANTS
- ILLEGAL DRUGS



AT RISK ATHLETES: UNMODIFIABLE

- *SICKLE CELL TRAIT*
- *OVERZEALOUS ATHLETE/WARRIOR MENTALITY*
- *OBESITY*
- *PRIOR HISTORY OF HEAT ILLNESS*
- *SWEAT GLAND DISORDERS*
- *CYSTIC FIBROSIS*
- *CARDIOVASCULAR DISEASE*
- *HIGH SWEAT RATES (>2/H)*
- *RECENT CONCUSSION*
- *HISTORY OF MALIGNANT HYPERTHERMIA*

PREVENTION: PRE-SEASON

- *PRE-PARTICIPATION PHYSICAL EXAMINATION*
- *SCREENING*
- *10-14 DAY ACCLIMATIZATION PERIOD*
- *SPECIAL TRAINING PROTOCOLS OR MONITORING OF HIGH RISK INDIVIDUALS*



PREVENTION: SCREENING INDIVIDUALS

- *PRIOR HISTORY OF HEAT RELATED ILLNESS?*
 - What type, when, how long for return to activity, complications, have you ever had an exercise tolerance test?
- *COMPLICATIONS OF EXERCISING IN THE HEAT?*
 - Vomiting, nausea, fainting, muscle cramps
- *HOW MUCH TRAINING HAVE YOU DONE IN THE PAST TWO WEEKS?*
 - Inside or outside? Intensity?
- *WHAT ARE YOUR DRINKING HABITS (CAFFEINATED, WATER ONLY, SPORTS REPLACEMENT DRINKS)*
- *ARE YOU TAKING ANY SUPPLEMENTS?*
- *SALTY SWEATER (SALT RIM ON HATS OR SHIRTS?)*
- *LIGHT OR HEAVY SWEAT LOSS?*
- *SLEEP HABITS? AIR-CONDITIONING IN YOUR HOME?*

PREVENTION: HEAT ILLNESS SCREENING INDEX

- *FEELING TIRED*
- *CRAMPS*
- *NAUSEA*
- *DIZZINESS*
- *THIRST*
- *VOMITING*
- *CONFUSION*
- *MUSCLE WEAKNESS*
- *HEAT SENSATIONS (HEAD OR NECK)*
- *CHILLS*
- *FEELING LIGHTHEADED*

Each question 0-10 point scale. Average athlete scores 8

PREVENTION: MONITOR WET BULB GLOBE TEMPERATURE (WBGT)

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

Relative Humidity (%)	Temperature (°C)																														
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0	15	16	16	17	18	18	19	19	20	20	21	22	22	23	23	24	24	25	25	26	27	27	28	28	29	29	30	31	31	32	32
5	16	16	17	18	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28	29	29	30	31	31	32	33	33	34	35
10	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29	30	30	31	32	32	33	34	35	36	36	37
15	17	17	18	19	19	20	21	21	22	23	23	24	25	26	26	27	28	29	29	30	31	32	33	33	34	35	36	37	38	39	
20	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	31	32	32	33	34	35	36	37	38	39			
25	18	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32	33	34	35	36	37	38	39					
30	18	19	20	20	21	22	23	23	24	25	26	27	28	29	29	30	31	32	33	34	35	36	37	39							
35	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39								
40	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39									
45	19	20	21	22	23	24	25	26	27	27	28	29	30	32	33	34	35	36	37	38											
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55	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	36	37	38													
60	21	22	23	24	25	26	27	28	29	30	31	32	33	35	36	37	38														
65	21	22	23	24	25	26	27	28	29	31	32	33	34	36	37	38															
70	22	23	24	25	26	27	28	29	30	31	33	34	35	36	38	39	WBGT > 40														
75	22	23	24	25	26	27	29	30	31	32	33	35	36	37	39																
80	23	24	25	26	27	28	29	30	32	33	34	36	37	38																	
85	23	24	25	26	28	29	30	31	32	34	35	37	38	39																	
90	24	25	26	27	28	29	31	32	33	35	36	37	39																		
95	24	25	26	27	29	30	31	33	34	35	37	38																			
100	24	26	27	28	29	31	32	33	35	36	38	39																			

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

MODIFICATIONS: KOREY STRINGER INST.

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.

HEAT SAFETY REGIONS

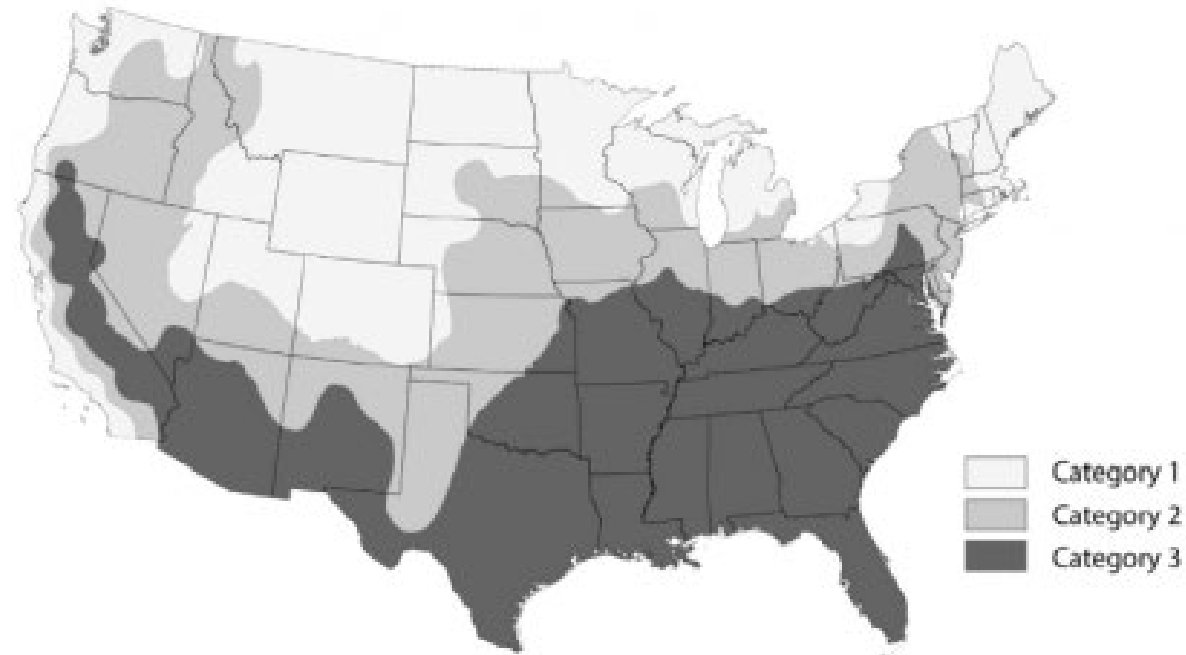


Fig. 2. Heat safety regions.



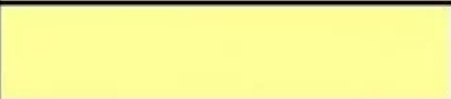





NATA PREVENTION: MODIFICATION BASED ON WBGT

WBGT Reading	Activity Guidelines	Rest-Break guidelines
Under 82.0 F	Normal activities	>3 of at least 3 minutes
82.0-86.9 F	Use discretion for intense or Prolonged exercise. Watch at Risk	> 3 Separate rest breaks of at least 4 minute duration
87.0-89.9 F	Maximum practice 2 hours. Players restricted to helmet, shoulder pads, and shorts. No equipment for conditioning	> 4 Separate rest breaks of at least 4 minute duration
90.0-92.0 F	Maximum length of practice 1 hour. No protective equipment. No conditioning.	20 minute break during 1 hour practice
Over 92.1 F	No outdoor workouts, cancel exercise, delay practice better WBGT.	

PREVENTION • MONITOR HYDRATION

AM I HYDRATED?

Urine Color Chart

1		If your urine matches these colors, you are drinking enough fluids
2		Drink more water to get the ideal color in Shade 1 and 2.
3		Dehydrated
<hr/>		
4		You may suffer from cramps and heat-related problems
5		Health risk! Drink more water.
6		Health risk! Drink more water.
7		Health risk! Drink more water.
8		Health risk! Drink more water.

- *MONITOR URINE COLOR*
- *FREE UNRESTRICTED ACCESS TO FLUID DURING PRACTICE AND GAMES*
- *MONITOR WEIGHT-*
 - Pre and post workout
- *HYDRATION GUIDELINES*

<https://ksi.uconn.edu/wp-content/uploads/sites/1222/2015/03/Heat-and-Hydration-HUF.pdf>

PREVENTION: HEAT ACCLIMATIZATION (NCAA)

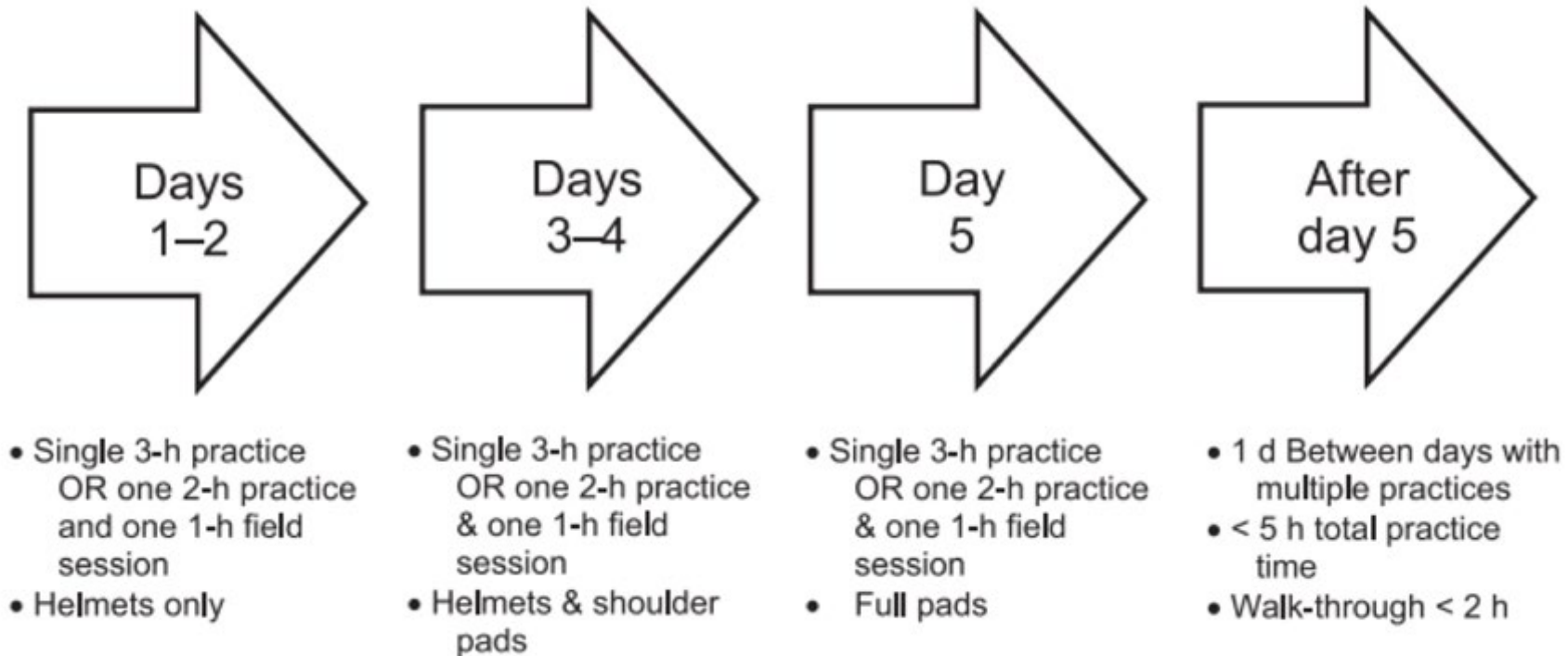


Figure 1. National Collegiate Athletic Association heat-acclimatization guidelines.

PREVENTION: CLOTHING AND EQUIPMENT

- *MOISTURE WICKING CLOTHING*
- *GRADUALLY ADD EQUIPMENT*
- *LIGHT COLORED CLOTHING*
- *FULL EQUIPMENT DAY 6*



PREVENTION: PRACTICE MODIFICATIONS:

- *CHANGE THE TIMING OF PRACTICE (EARLY OR LATE)*
- *CHANGE THE EQUIPMENT AND CLOTHING WORN*
- *INCREASE WATER BREAKS*
- *DECREASE DURATION AND INTENSITY OF PRACTICE*
- *FIELD CHANGE—GRASS VS TURF OR INDOOR VS OUTDOOR*

PREVENTION: EMERGENCY PREPAREDNESS

STRENGTH COACHES

- *BATH TOWELS*
- *TUB FOR IMMERSION*
- *FANS*
- *CRUSHED OR CUBED ICE*
- *PLASTIC BAGS*
- *ORAL REHYDRATION FLUIDS*
- *CUPS FOR FLUIDS*
- *HIGH TEMPERATURE THERMOMETER*

MEDICAL STAFF

- *WHEELCHAIR OR STRETCHER*
- *STETHOSCOPE*
- *BP CUFF*
- *ALCOHOL WIPES*
- *OXYGEN TANK*
- *GLUCOMETER/CHEMISTRY CHIPS*
- *DIAZEPAM*
- *DEFIBRILLATOR*

TREATMENT: EMERGENCY ACTION PLAN

- *ACCESS TO APPROPRIATE COOLING EQUIPMENT—ICE TOWELS, ICE BATH, TACO METHOD, FANS*
- *ACCESS TO RECTAL THERMOMETER FOR APPROPRIATE MANAGEMENT IN SUSPECTED EHS/EHI*
- *EAP THAT IS WRITTEN AND PRACTICED BEFORE EACH SEASON*
- *ACTIVATE EMS IF:*
 - Altered Mental Status
 - Temperature >104
 - Persistent vomiting and unable to maintain oral hydration

[HTTP://WWW.CDC.GOV/NIOSH/DOCS/2004-101/EMRGACT/EMRGACT1.HTML](http://www.cdc.gov/niosh/docs/2004-101/emrgact/emrgact1.html)

TREATMENT: EXERCISE EXHAUSTION

- *REMOVE EXCESS CLOTHING AND EQUIPMENT*
- *PLACE IN SHADED AREA WITH FANS AND ICE*
- *ENCOURAGE FLUID INTAKE*
- *MONITOR VITAL SIGNS*
- *ELEVATE LEGS*
- *RECTAL TEMPERATURE OBTAINED TO CONFIRM TEMPERATURE BELOW 40°C*
- *IF CONDITION HASN'T IMPROVED IN 30 MINUTES OR TEMPERATURE IS ELEVATED ACTIVATE EMS.*

TREATMENT: EHS

- *REMOVE EXCESS CLOTHING/SUBMERGE IN ICE*
- *PLACE IN SHADED AREA*
- *OBTAIN RECTAL TEMPERATURE. MONITOR TEMPERATURE AND VITALS EVERY 5-10 MINUTES IF CONTINUOUS MONITOR UNAVAILABLE*
- *ACTIVATE EMS*
- *REMOVE ATHLETE FROM CWI WHEN TEMPERATURE RETURNS TO 38.9°C OR 102°F*
- *IF NO RECTAL TEMPERATURE IS AVAILABLE, COOL PATIENT 10-15 MINUTES AND THEN TRANSPORT*
- *MEDICAL PERSONNEL ARE AVAILABLE IV FLUIDS AND ELECTROLYTES CAN BE MONITORED (SODIUM AND GLUCOSE)*

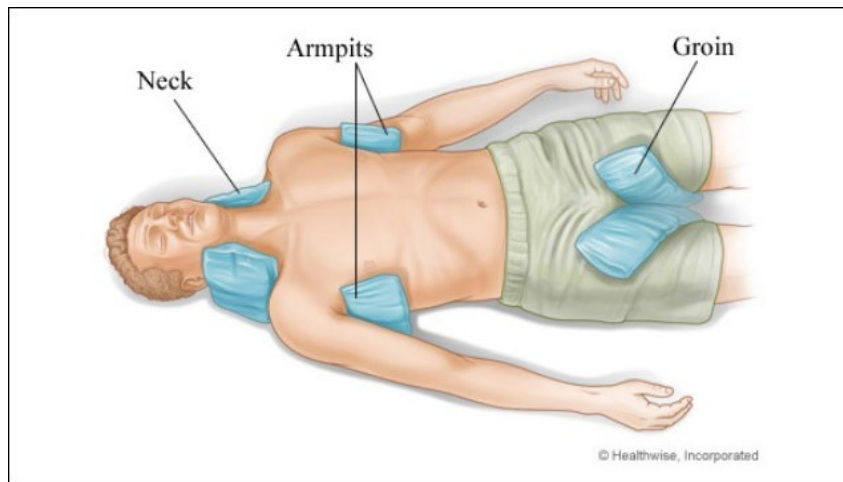
*TREATMENT: COOLING METHODS
GOLD STANDARD COLD WHIRLPOOL
IMMERSION*



TREATMENT: OTHER COOLING METHODS



TREATMENT: COOLING OPTIONS



- REMOVE AS MUCH CLOTHING AS POSSIBLE
- APPLY ICE TO DEMONSTRATED AREAS
- APPLY COOL FANS IF AVAILABLE
- PLACE IN THE SHADE OR TENT

RETURN TO PLAY:

- *NO EXERCISE FOR 7 DAYS AFTER RELEASED FROM MEDICAL CARE*
- *FOLLOW UP WITH MEDICAL TEAM AFTER ONE WEEK FOR REPEAT LABORATORY TESTING*
- *RETURN SLOWLY*
- *IF ATHLETE IS UNABLE TO PROGRESS BACK TO FULL ATHLETIC ACTIVITY WITHIN 4 WEEKS FOLLOW UP WITH A MEDICAL PROVIDER IS RECOMMENDED.*
- *THE ATHLETE MAY RESUME COMPETITION WHEN ABLE TO PARTICIPATE IN FULL TRAINING IN HEAT FOR 2-4 WEEKS WITHOUT ADVERSE SEQUELAE.*
- *HEAT TOLERANCE TESTING IS RECOMMENDED IF ATHLETE IS UNABLE TO RETURN TO ACTIVITY WITHIN 4 WEEKS.*

RECOMMENDED HEAT ILLNESS GUIDELINES

High School Level

Ensure proper durations of practices in the preseason (i.e., no double practice days in first 5 d of formal football practice, practice sessions on single practice days are no more than 3 h in length, and two practice sessions are separated by a break of at least three continuous hours that is in a cool environment)

Do not allow all protective equipment to be worn until day 6 of practice

Implement appropriate timeline regarding contact drills (i.e., contact with blocking sleds and tackling dummies not initiated until day 3 and 100% full contact drills not initiated until day 6)

Require athletes to wear lightweight and light-colored clothing during all practices

Have an immersion tub filled with ice water available during practice

Local-, State-, and National-Level High School Athletics Association Level

Mandate implementation of NATA preseason heat acclimatization recommendations in high school football

Mandate implementation of EHI prevention strategies (e.g., usage of wet bulb globe thermometer and immersion tubs, coaching education, and cardiopulmonary resuscitation/first aid training)

Better monitor compliance with implementation of preseason heat acclimatization recommendations

Assist smaller high schools in drafting and implementing emergency response plans

Academia/Research Level

Monitor EHI events in schools lacking AT coverage

Qualitative data regarding facilitators and barriers of compliance with preseason heat acclimatization recommendations and use of EHI prevention strategies

Longitudinal surveillance of compliance with preseason heat acclimatization recommendations and use of EHI prevention strategies

APPLIED SPORTS SCIENCE IN SPORTS & EXERCISE

NATA-IATF RECOMMENDED EHI PREVENTION STRATEGIES

Prevention Strategy ^a	Pct.	States with Recommendations Mandated (%)	States without Recommendations Mandated (%)	P value ^b	<1000 Students (%)	≥1000 Students (%)	P value ^b
Primary prevention strategy							
Monitored environmental temperature	72.8	76.3	71.0	0.06	70.8	74.1	0.23
Monitored humidity	71.6	73.8	70.4	0.23	70.6	72.5	0.48
Athletes required to wear lightweight clothing during all practices	59.3	64.9	56.6	0.008*	63.2	57.2	0.05
Athletes required to wear light-colored clothing during all practices	33.5	42.2	29.3	<0.001*	35.2	32.9	0.44
Monitored wet bulb globe thermometer	31.7	33.8	30.5	0.26	28.2	33.8	0.05
Secondary prevention strategy							
Ice bags/cooler available	98.5	98.9	98.3	0.44	98.6	98.6	0.99
Policy with instructions for initiating EMS response	87.8	91.0	86.3	0.02*	81.8	91.1	<0.001*
Emergency response plan enacted in school	84.0	88.6	81.8	0.004*	79.4	86.8	0.001*
Trained staff for recognition and treatment of heatstroke	79.7	84.7	77.3	0.004*	78.2	80.8	0.29
Immersion tub filled with ice water before the start of practice	44.8	55.3	39.4	<0.001*	40.7	47.6	0.02*
Fans available	34.1	36.0	33.2	0.36	37.8	32.3	0.06
Mist machine/water-spray available	26.2	33.0	23.0	<0.001*	24.4	27.6	0.24
IV fluids available	2.2	2.7	2.0	0.4	1.9	2.4	0.57

^aPrimary prevention aims to protect athletes from developing EHI. Secondary prevention aims to halt or slow the detrimental effects of EHI at its onset.

^bP values are from chi-square tests comparing distributions of prevalence of EHI prevention strategies between, first, AT working in states with and without mandated recommendations and, second, AT working in high schools with <1000 students and ≥1000 students.

*P < 0.05.

MEDICINE & SCIENCE IN SPORTS & EXERCISE

NATA-IATF RECOMMENDED EHI PREVENTION STRATEGIES

NATA Recommendations	Pct.	States with Recommendations Mandated (%)	States without Recommendations Mandated (%)	P value ^a	<1000 Students (%)	≥1000 Students (%)	P value ^a
1. First 5 d							
1.1. During the first 5 d of formal football practice, walk-throughs were no more than 1 h in length	77.4	78.9	76.9	0.46	78.8	76.5	0.39
1.2. Double practice days did not occur during the first 5 d of formal football practice	41.2	57.1	34.8	<0.001*	42.0	42.1	0.96
2. Length of practice							
2.1. Single-practice days consisted of practice no more than 3 h in length	39.7	50.0	34.6	<0.001*	41.1	38.7	0.42
2.2. Double-practice days consisted of practices no more than 5 h in length in total	76.9	84.5	73.4	<0.001*	80.1	75.4	0.07
2.3. No more than two practices/day	91.5	94.8	90.0	0.006*	91.4	91.5	0.93
3. Length of rest breaks							
3.1. A 3-h recovery period occurred between the practice and walk-through (or vice versa)	58.3	65.8	55.6	0.01*	55.6	59.6	0.22
3.2. Two practices were separated by a break of at least three continuous hours that was in a cool environment	48.9	60.6	43.3	<0.001*	49.2	48.8	0.90
3.3. Double practice days were not followed by another double-practice day	87.0	94.6	87.6	<0.001*	90.0	90.5	0.78
3.4. One day of complete rest after six consecutive days of practice	96.8	95.5	97.3	0.11	97.0	96.5	0.64
4. AT presence							
4.1. AT must be on-site before, during, and after all practices	95.0	97.5	93.8	0.007*	94.9	95.1	0.89
4.2. AT had ability to cancel/delay practice because of inclement weather/heat restrictions	80.9	78.2	82.1	0.14	81.0	81.0	0.99
5. Equipment alterations							
5.1. Helmet was the only equipment worn on first 2 d of practice	77.0	87.5	71.8	<0.001*	77.0	77.4	0.88
5.2. During days 3–5, only helmets and shoulder pads were worn	39.0	45.7	35.7	<0.001*	39.3	38.6	0.81
5.3. All protective equipment was not worn until day 6	40.3	46.7	37.2	<0.001*	40.3	40.1	0.95
6. Contact drills							
6.1. Contact with blocking sleds was not initiated until day 3	50.5	56.8	47.3	0.005*	55.0	48.0	0.03*
6.2. Contact with tackling dummies was not initiated until day 3	56.8	58.8	55.8	0.36	62.7	53.3	0.004*
6.3. One hundred percent full-contact drills were not initiated until day 6	43.0	45.2	41.9	0.31	46.5	40.8	0.07
Total complying with all NATA recommendations	2.5	4.1	1.7	0.01*	2.9	2.4	0.66

^aP values are from chi-square tests comparing distributions of compliance with NATA-IATF recommendations between, first, AT working in states with and without mandated recommendations and, second, AT working in high schools with <1000 students and ≥1000 students.

*P < 0.05.

MEDICINE & SCIENCE IN SPORTS & EXERCISE

INTER ASSOCIATION TASK FORCE RECOMMENDATIONS FOR REDUCING SUDDEN DEATH IN ATHLETES

- *GRADUAL ACCLIMATIZATION*
- *SLOW INTRODUCTION OF NEW CONDITIONING ACTIVITIES*
- *AVOID USING EXERCISE AS PUNISHMENT*
- *PROPER EDUCATION AND CREDENTIALING OF STRENGTH AND CONDITIONING STAFF*
- *PROVISION OF APPROPRIATE MEDICAL STAFF*
- *DEVELOPMENT OF EMERGENCY ACTION PLANS*
- *RAISE AWARENESS OF CONDITIONS THAT MAY LEAD TO HEAT ILLNESS.*

Nichols, A. Heat-related Illness in Sport and Exercise. *Curr Rev Musculoskelet Med* (2014)7:355-365.

RECOMMENDATIONS:

- *ALWAYS PROPERLY ACCLIMATIZE YOUR ATHLETES*
- *SCREEN YOUR ATHLETES WITH QUESTIONNAIRES AND POTENTIALLY SCREEN FITNESS WITH 1.5 MILE RUN TIME.*
- *SEPARATE ATHLETES INTO HIGH RISK AND LOW RISK GROUPS AND MODIFY WORKOUTS ACCORDINGLY IN ADVERSE WEATHER CONDITIONS*
- *HAVE A HIGH INDEX OF SUSPICION FOR HEAT ILLNESS AND ACTIVATE EMERGENCY ACTION PLAN IF SUSPECTED*
- *HAVE SUPPLIES PREPARED TO BEGIN IMMEDIATE COOLING OF ATHLETE UNTIL MEDICAL TEAM IS AVAILABLE*

THANK YOU



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