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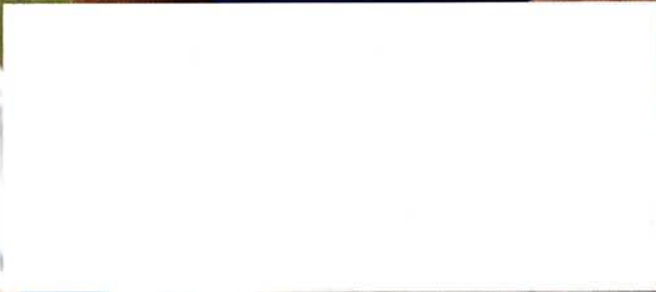
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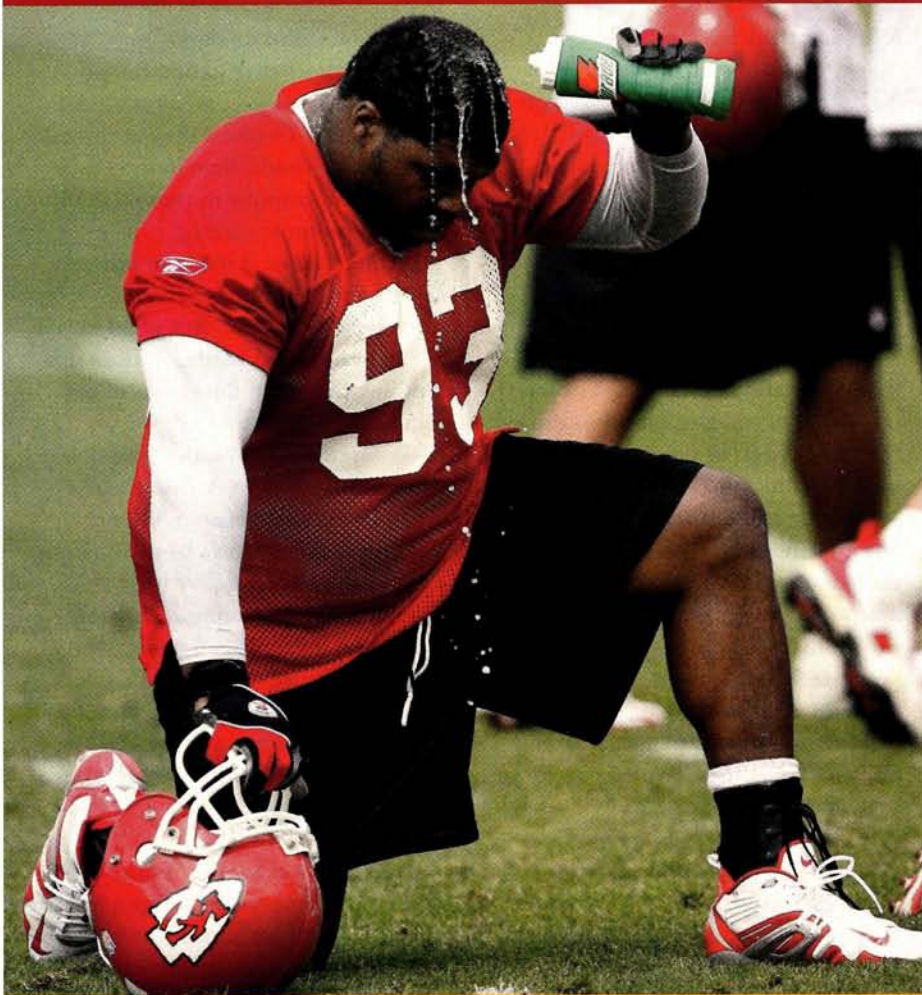
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Beat The Heat!

By Matt Brzycki, Assistant Director of Campus Recreation,
Fitness, Princeton (NJ) University

The summer is an excellent opportunity for your athletes to improve their strength, conditioning and sport skills. It also presents special challenges. As the calendar moves into and through the summer, the temperature and humidity increase. And as the temperature and humidity increase, so does the risk of heat disorders (or heat-related injuries).

The importance of safeguarding your athletes against heat disorders cannot be overemphasized. Each year, roughly 400 Americans die from heat

disorders. The risk, of course, is greater during physical exertion. Athletes who are overweight, out of shape and/or unaccustomed to laboring in the heat are most susceptible.

HEAT DISORDERS

There are three types of heat disorders: heat cramps, heat exhaustion and heat stroke. Let's take a closer look at each of these conditions.

Heat Cramps: This heat disorder is characterized by painful, involuntary muscle spasms that usually affect the legs (quadriceps, hamstrings, and

calves) and abdomen. Heat cramps are the least dangerous of the three types of heat disorders.

Heat Exhaustion: The characteristics of heat exhaustion include skin that's cool, moist and pale; a weak pulse; chills; profuse sweating; headache; nausea; vomiting; dizziness; disorientation; exhaustion; and weakness. Heat exhaustion is considered to be a medical emergency.

Heat Stroke: This heat disorder is characterized by high body temperature; skin that's red and hot; a rapid or weak pulse; rapid or shallow breathing; confusion; irritability; profuse or absent sweating; and loss of consciousness. Heat stroke is the most severe type of heat disorder; it can be life threatening.

It's extremely critical for coaches to recognize the symptoms of heat disorders and be prepared to alert medical personnel if any signs appear. This is especially applicable to heat exhaustion and heat stroke.

Exertional heat stroke is one of the leading causes of death among athletes. As the name suggests, exertional heat stroke is a heat disorder that occurs during physical activity. Coaches take note: A fact that's often overlooked is that exertional heat stroke can happen in cool and moderate environments.

THE MECHANICS OF SWEATING

Given the potential dangers, how can coaches reduce the likelihood that their athletes will sustain a heat disorder? In answering this question, it's important to first learn how heat disorders occur.

Under resting conditions, core temperature is about 98.6 degrees Fahrenheit and there's a balance between heat production and heat loss. When exercising, core temperature increases and triggers several heat-loss mechanisms. In the case of

exercise, the primary mechanism for heat loss is the evaporation of sweat.

Blood carries internal body heat to the surface of the skin where sweat is secreted from millions of sweat glands and evaporation occurs. As the sweat evaporates, it cools the skin; this, in turn, cools the blood. The cooled blood then returns to the warmer core and the cycle is repeated.

This physiological process cools the internal body. (To illustrate the effects of evaporation, wet your finger and blow on it. You'll quickly notice a cooling sensation as the evaporative process withdraws heat from your skin.)

Here's a point to ponder: Sweating, in itself, doesn't cool the body; evaporation does.

It's hard to believe but people are constantly sweating. When the weather is cool and dry, a relatively small amount of sweat is produced and the rate of evaporation can keep pace with the rate of perspiration. Here, the skin is dry to the touch and people aren't aware that they're sweating – even though this alone may involve about a quart of water per day.

Unfortunately, this cooling mechanism doesn't work well when the weather is hot and/or humid. When the humidity is high, there's a large amount of moisture already in the air.

At higher levels of humidity, the evaporation of sweat is impaired because the air is highly saturated with water vapor and, as a result, there's little or no place for any extra moisture to go. This situation causes the body to overheat and may result in a heat disorder. In fact, a temperature of only 80 degrees Fahrenheit approaches a dangerous level if the humidity reaches 90%.

EXERCISING IN HEAT AND HUMIDITY

Exercising in the heat and humidity places tremendous physiological demands on the body. When training or practicing in these conditions, you and your athletes should employ the

following guidelines:

1. Acclimatize to the environment.

Perhaps the best way to protect your athletes against heat disorders is to allow them time to gradually acclimatize to high heat and humidity. Most adverse reactions to heat and humidity occur during the first few days of training outdoors. Initially, then, your athletes may need to do train and/or practice outdoors during the cooler parts of the day such as the early morning and late evening.

As your athletes adapt to hot, humid conditions – which usually takes about 10 to 14 days – they'll be able to employ greater levels of intensity while maintaining a safe body temperature. Another option is to have them do their training indoors in air-conditioned surroundings (assuming, of course, that they have access to such an environment).

2. Wear appropriate clothing/equipment.

To promote heat loss, tell your athletes to wear clothing that's loose fitting, lightweight, and light colored. (Lighter colors reflect the sun's rays; darker colors absorb them.) Under no circumstances should you permit them to train in rubberized clothing or a "sauna suit."

Training in this manner can be lethal since these garments act as a barrier, trapping perspiration and hindering evaporation which causes the body to overheat rapidly. Remember, the evaporation of sweat is necessary to cool the body.

The sport with the highest number of reported deaths from heat disorders is football with 26 fatalities from 1995 to 2005. The American College of Sports Medicine recommends a six-day acclimatization period during pre-season practices in which equipment is gradually added: helmet only on the first two days, helmet and shoulder pads on the next three days and full gear on the sixth day (without any

contact on those six days).

When practicing in hot, humid conditions, give your athletes longer and/or more frequent breaks, unlimited access to fluids, time in the shade and the opportunity to remove equipment to promote cooling.

Athletic apparel made of unique fabrics and blends has become exceedingly popular. But when exercising in heat and humidity, does this clothing live up to the claims of the manufacturers?

In one study, eight men exercised on a treadmill in an environmental chamber under three conditions: wearing clothing made from an evaporative polyester fabric, wearing clothing made from a traditional cotton fabric and dressed semi-nude. The semi-nude attire consisted of a Lycra racing swimsuit and polyester anklet socks; the other two attires consisted of a short-sleeved T-shirt, form-fitting cycling shorts that extended to mid-thigh and anklet socks.

The men ran for 30 minutes at 70% of their maximum oxygen intake and walked for 15 minutes at 40% of their maximum oxygen intake. The chamber was set at 86 degrees Fahrenheit and 35% humidity (which equates to a heat index of 84.5 degrees). The cotton attire retained significantly more sweat than the other two attires.

However, the synthetic attire wasn't better than the cotton or semi-nude attire with respect to thermoregulation and oxygen intake. In addition, there were no perceived differences between the three types of attire in "heat comfort" or "sweating sensations."

It's unclear as to whether or not synthetic fabric is more effective at evaporating sweat in environmental conditions that are more severe.

3. Consume sufficient fluids.

It's crucial for your athletes to drink adequate amounts of fluid. This is true before, during and after exercising in hot, humid environments. Warning to coaches: If you deny your

athletes fluids under adverse conditions, you're putting them at risk for a heat disorder.

Tell your athletes to drink fluids *before* they're thirsty, not after. The reason for this is because thirst isn't a good indicator of fluid needs.

After training and practicing, your athletes must rehydrate with cold fluids as needed. They should measure their bodyweight each day before and after an activity. In this way, they can monitor their water loss to determine if adequate rehydration is taking place. Your athletes should consume about 16 ounces of water for every pound of bodyweight that they lose while training and practicing.

Two telltale signs that indicate whether your athletes are consuming enough fluids are the volume and color of their urine. Specifically, the urinary volume should be high and its color should be clear to light yellow.

Can your athletes over-hydrate? Not too long ago, a front-page article in *The New York Times* quickly sparked nationwide concern about the intake of water when exercising. Much of the article was based on a study that appeared in *The New England Journal of Medicine*.

The study examined 488 runners who provided blood samples and completed a questionnaire at the finish line of the Boston Marathon. The researchers found that 13% of the runners had hyponatremia or over-hydration (which is also referred to as "water intoxication"). Three of the runners had "critical hyponatremia."

The primary risk factor for this condition is thought to be an excessive intake of fluids. In the study, 35% of the runners drank so much fluid that they actually gained weight *during* the marathon. One individual was *nine pounds heavier* at the end of the race!

Think about that for a minute: After running for several hours – which normally would have produced a considerable loss of weight – the individual still managed to gain nine pounds. (The study had several short-

comings that weren't mentioned in the article, including a small sample size and reliance on self-reported data. Plus, imagine being asked to complete a questionnaire about your fluid intake and urine output immediately after running 26.2 miles!)

While over-hydration is certainly a concern, the unfortunate interpretation of the newspaper article was that exercising athletes should restrict their intake of fluids. As a result, countless athletes were no doubt frightened into thinking that they should avoid drinking fluids.

Certainly, endurance athletes should be aware of the potential for over-hydration. But for other athletes, over-hydration is extremely rare. When hot, humid weather picks up steam throughout the United States, proper hydration is absolutely critical.

4. Maintain an adequate electrolyte balance.

During intense efforts, electrolytes are lost through sweat. Replacing these electrolytes – most notably sodium and potassium – is especially important when exercising in hot, humid conditions.

Under most circumstances, lost sodium can be replaced with a normal intake of foods. If necessary, your athletes can increase their intake of sodium by simply using table salt on their foods and eating salty snacks; they can increase their intake of potassium by eating more fruits and vegetables.

Most sports drinks contain high amounts of electrolytes which is an advantage over water. In addition, sports drinks contain carbohydrates which provide your athletes with a source of energy during intense activity and expedite the recovery process. (Water has no calories and, therefore, isn't a source of energy.) Finally, sports drinks have flavoring which makes them more palatable and encourages their consumption.

Over the years, other fluids have been used to replace sodium. One example is pickle juice which gar-

nered national attention in September of 2000. During a televised broadcast of a professional football game in Texas between the Philadelphia Eagles and Dallas Cowboys, the announcers noted that some of the visiting players drank pickle juice to combat muscle cramps from the heat and humidity.

Adding to the mystique was Duce Staley who rushed for 201 yards on 26 carries – the most by an Eagles player since 1949 – and picked up another 61 yards on four receptions. (The Eagles won the game 41-14.) Today, the belief that pickle juice can prevent muscle cramps is still in vogue.

Unfortunately, there's no scientific evidence to support this practice. Yes, pickle juice is high in sodium. But the sodium content of pickle juice is extremely high. It's so high, in fact, that according to the Professional Football Athletic Trainers Society, sipping pickle juice is like sipping seawater.

THE LAST REP

With increased temperature and humidity comes an increased risk of heat disorders. However, this risk can be reduced a great deal through adequate precaution and preparation.

Your athletes can be prepared for the heat and humidity by being in good condition. A study involved male Marine recruits who went through basic training from 1988-1992 at the Marine Corps Recruit Depot in Parris Island, South Carolina. The researchers found that recruits who were overweight and had slower times in a 1.5-mile run had a higher risk of heat disorders.

The bottom line: Don't let your athletes become heat casualties! ■

Matt Brzycki is the Assistant Director of Campus Recreation, Fitness, at Princeton University in Princeton, New Jersey. He has authored, co-authored, or edited 16 books including the best seller, *Dumbbell Training for Strength and Fitness*.