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HEAT & HYDRATION



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Evaporation of sweat is the most important mechanism for losing heat

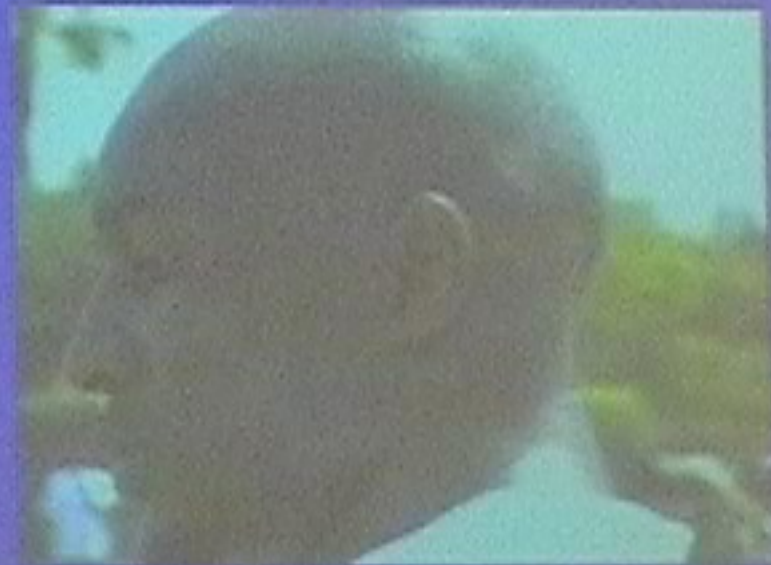
- ✓ Sweating can provide more than 80 percent of heat loss
- ✓ The warmer the environment, the greater dependence on evaporative heat loss and sweating



Sweating has its place

✓ Sweating is beneficial and aids evaporative cooling the most under these conditions:

- Low humidity
- High wind
- Little clothing



Calculating Sweat Rate

Sweat rate =

Pre-Exercise Body Weight

– Post-Exercise Body Weight

+ Fluid Intake

– Urine Volume

– Exercise Time in Hours

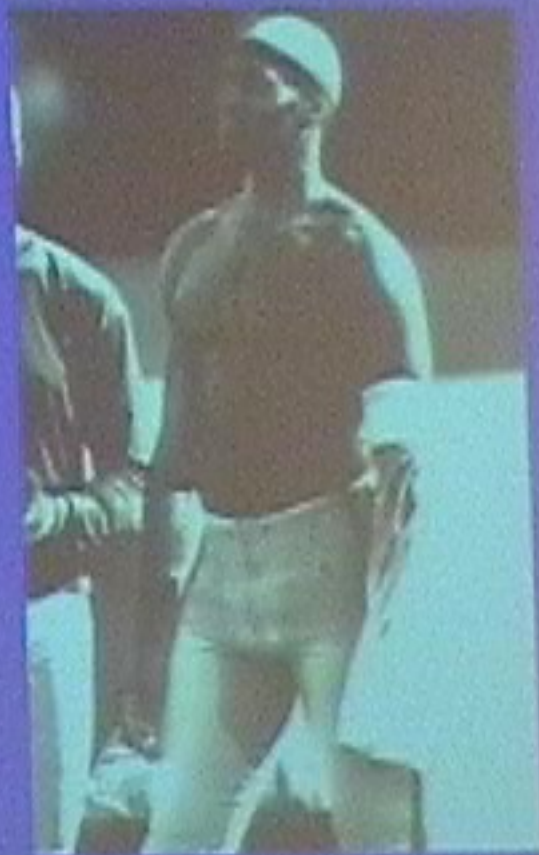


Sweat Rates

- ✓ Some athletes have been shown to lose 2 qt. (2 L) sweat/hour = 4 lb. (2 kg) body weight lost
- ✓ Sweating can easily exceed 1 oz. (30 mL) /minute or 3.75 pounds (1.8 kg)/hour

Sweating Leads to Dehydration

- ✓ If fluids are not replaced, the body will become dehydrated and performance will decrease.
- ✓ We could live weeks without food, but only a few days without fluid.



Effects of Dehydration on the Body

- ✓ **Increased core body temperature**
 - ✓ Core temperature can rise an additional 0.27 to 0.36 °F (0.15 to 0.20 °C) for every percent of body weight lost through sweat.
- ✓ **Impaired skin blood flow**
- ✓ **Delayed sweat response**

Effects of Dehydration: Physiology

- ✓ Prolonged performance affected by dehydration due to thermoregulatory and cardiovascular impairment.
- ✓ Sweating rate lower for a given core temperature (also, the threshold for sweating increases), and the potential for heat dissipation through sweat evaporation is reduced

Effects of Dehydration: Physiology

- ✓ **Core temperature can become dangerously high during intense exercise in a hot environment.**
- ✓ **Cardiovascular system is put under considerable stress and cardiac output can be reduced.**
- ✓ **This puts the athlete at risk for heat illness, particularly heat stroke.**

Effects of Dehydration on Performance

- ✓ No one adapts to dehydration
- ✓ Dehydration impairs performance by decreasing:
 - Muscle strength (if dehydrated at 5% or more of body weight)
 - Aerobic power
 - Muscle endurance

Early Warning Signs of Dehydration:

- ✓ Thirst
- ✓ Irritability
- ✓ Fatigue
- ✓ General discomfort
- ✓ Headache
- ✓ Weakness
- ✓ Dizziness
- ✓ Muscle cramps
- ✓ Chills
- ✓ Vomiting/nausea
- ✓ Head or neck heat sensations
- ✓ Decreased performance

Effects of Dehydration on Performance

- ✓ Prolonged training and competition most affected
 - ✓ Dehydration and heat illness can occur in as little as 20 to 30 minutes
- ✓ Dehydration + heat intensifies adverse effects

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Fluid Replacement Guidelines Before Exercise

- ✓ **Begin all exercise sessions well hydrated**
- ✓ **2 to 3 hours before exercise drink 500-600 mL (17-20 fl oz) of water or a sports drink**
- ✓ **10 to 20 minutes before exercise drink 200-300 mL (7-10 fl oz) of water or a sports drink**

Fluid Replacement Guidelines During Exercise

- ✓ Drink 200 to 300 mL (7 to 10 fl oz) every 10 to 20 minutes
- ✓ Goal is to drink amount equal to sweat and urine losses



Fluid Replacement Guidelines During Exercise

- ✓ Specific individual recommendations may vary based on:
 - sweat rates
 - body size
 - availability of fluid
 - individual tolerance

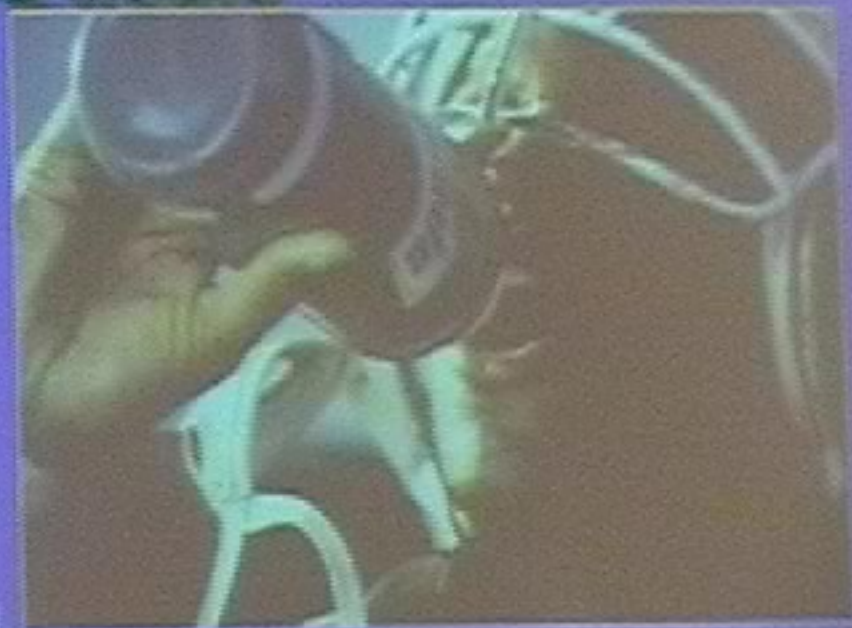


Fluid Replacement Guidelines During Exercise

- ✓ **Drink early and at regular intervals**
 - **Use an alarm wristwatch as a reminder**
- ✓ **Offer cool, flavored and/or lightly sweetened fluids**
- ✓ **Make fluid containers readily accessible**
- ✓ **Experiment with different beverage containers**

Fluid Replacement Guidelines After Exercise

- ✓ Drink 25%-50% more than fluid losses (20-24 fl oz per lb or over 1 L per kg lost) within 2 hours
 - Research supports using 150 percent of the fluid loss

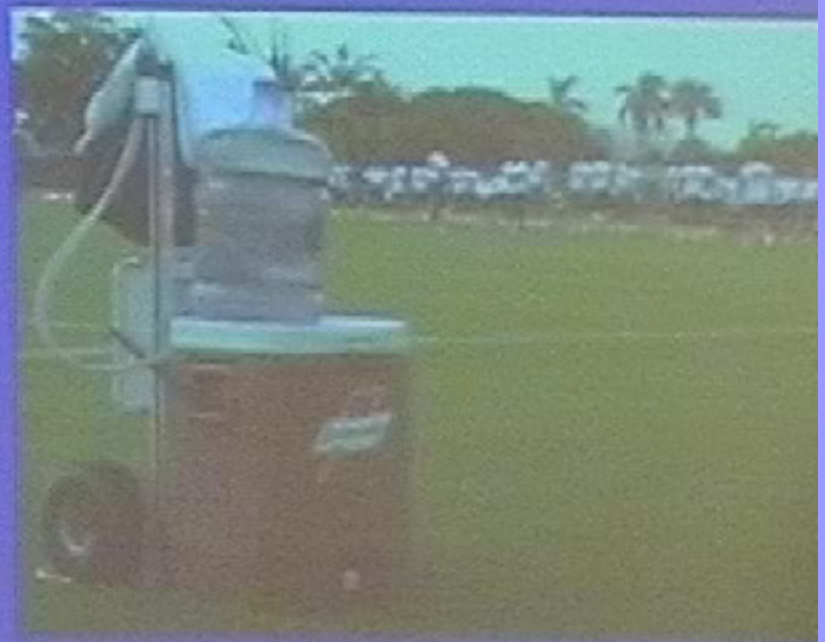


Fluid Replacement Guidelines After Exercise

The ideal beverage may not be plain water

✓ Beverage should contain:

- Water for hydration
- Carbohydrate to speed absorption of fluid and begin refueling muscles
- Electrolytes to speed rehydration



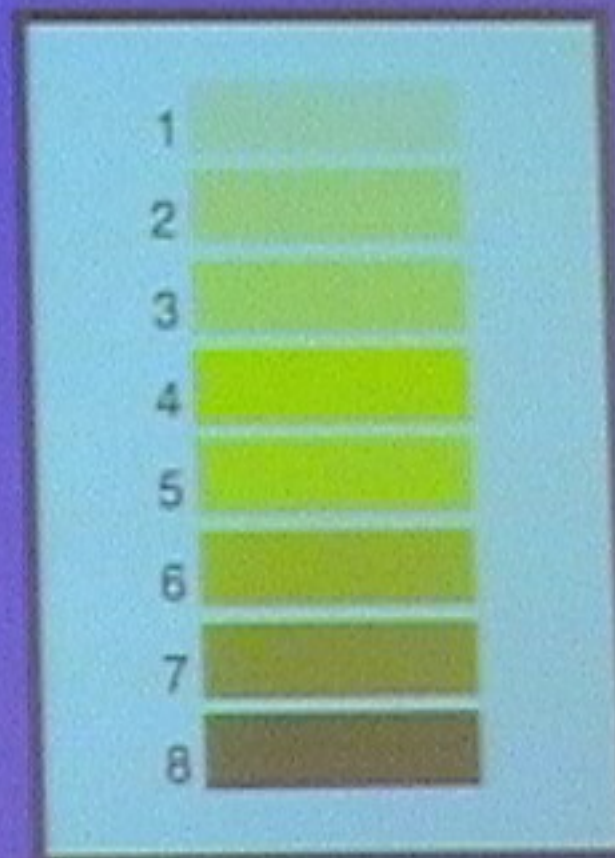
Casa et al. *J Athletic Training*, 35(2):212-224, 2000
Gonzalez-Alonso et al. *Int J Sports Med*, 13:399-406, 1992

Factors Affecting Fluid and Fuel Replacement

- ✓ **Opportunities to consume fluid** (breaks in play, placement of aid stations, etc.)
- ✓ **Sporting dynamics and rules** (in soccer, fluids cannot be brought onto the field)
- ✓ **Equipment and methods to assist fluid replacement** (paper cups, portable drink bottles, special carriers, etc.)

Monitoring Fluid Balance: Clinical Measures

✓ Urine Color Chart



Reprinted, by permission, from L. E. Armstrong, 1980, *Performing in extreme environments*.
(Champaign, IL: Human Kinetics)

Characteristics of the Ideal Fluid Replacement Beverage

- ✓ **Palatability - "tastes good"**
 - Encourages drinking
- ✓ **Composition that promotes absorption**
 - Contains proper amount of carbohydrate and sodium
- ✓ **Energy content**
 - Provides adequate carbohydrate to provide energy and delay fatigue, but also promote rapid fluid replacement

Heat-Related Muscle Cramps

✓ Symptoms

- Muscle spasms (Calf, Hamstrings, Abdomen)
- Occasionally Whole Body Cramps
- Muscle pain



Athletes Prone To Getting Heat Cramps



- ✓ History of heat cramps
- ✓ Eats a low-salt diet
- ✓ Sweats early and heavy
- ✓ Poor hydration habits
- ✓ Excessive sodium losses through sweat
- ✓ Not acclimated to heat/humidity

Treating Muscle Cramps

- ✓ **Mild Stretching**
- ✓ **Ice Massage**
- ✓ **Rest**
- ✓ **Fluid replacement**
- ✓ **Additional sodium**

Hyponatremia

- ✓ Drinking Too Much Water Results In Low blood sodium (<135 mEq/L)
- ✓ Can Be Just As Dangerous as Becoming Dehydrated
- ✓ Symptoms
 - Early: Headache, apathy, fatigue, nausea and possibly cramping
 - Advanced: Confusion, lack of coordination, seizure, coma, collapse and death

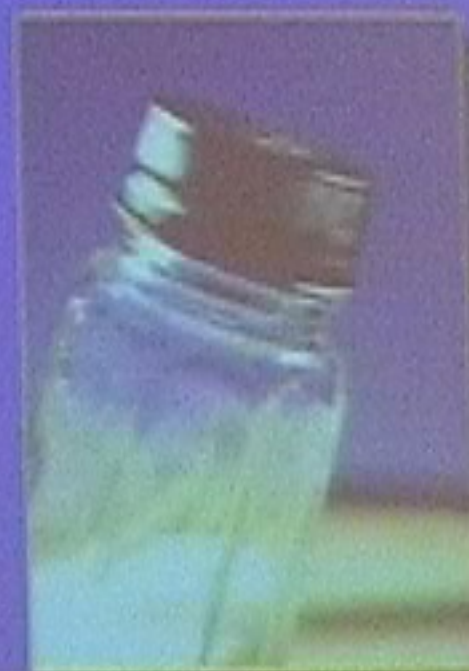
Hyponatremia

✓ Prevention

- Add salty foods and snacks
- Follow NATA guidelines for amounts and types of fluid
- Drink fluids containing electrolytes
- Avoid drinking only water

✓ Treatment

- Seek medical attention immediately



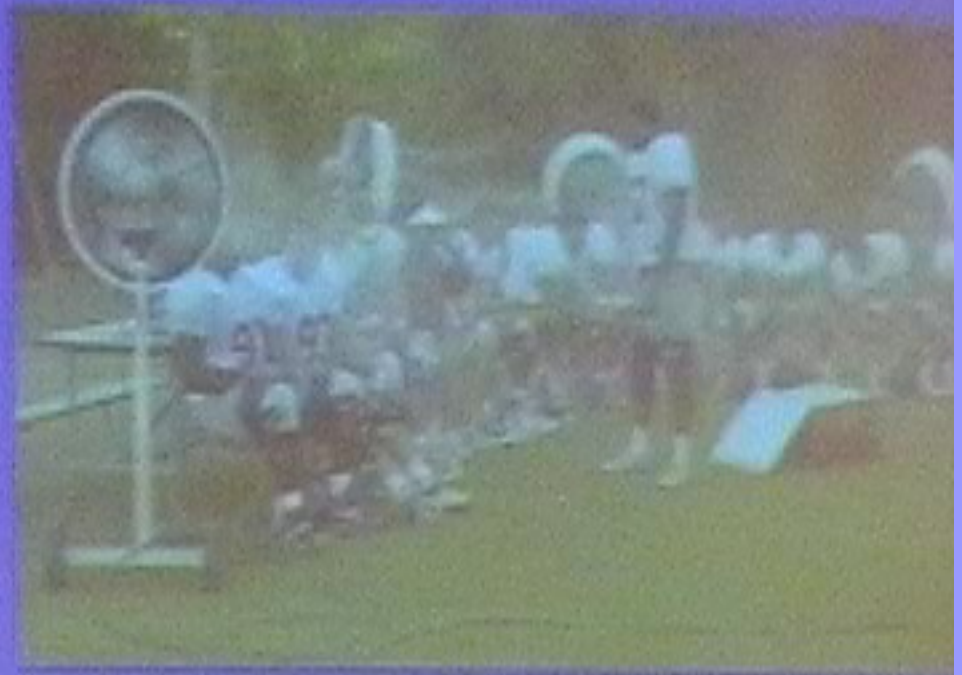
Heat Exhaustion

✓ Symptoms

- Headache, nausea
- Weakness, faintness
- Dizziness
- Cramps and chills
- Profuse sweating
- Pale, clammy skin
- Core Temp < 103 °F

✓ Treatment

- Rest in cool, shaded area
- Drink fluid
- Loosen or remove clothing and equipment



Rehydration: Oral Vs. I.V.

✓ Drinking oral fluids is superior to I.V.

- Oral drinking triggers the body to recognize fluids and cool itself down
- Faster, convenient
- Just as good at cooling the body
- No difference in performance



Warning Signs of Heat Stroke

✓ Symptoms

- Weakness
- Irrational behavior
- Drowsiness
- Confusion
- Disorientation
- Dizziness
- Nausea
- Rectal temperature $>104^{\circ}\text{F}$

Emergency Management of Heat Stroke

- ✓ Seek medical attention immediately
- ✓ Cool the body down before moving an athlete using:
 - An ice bath (preferred)
 - Ice packs placed at the groin, neck and armpits
 - A cool shower
 - Wet towels
 - Water spray



Examples of Products Containing Ephedra

- ✓ Ripped Fuel
- ✓ Xenadrine RFA-1
- ✓ Hydroxycut
- ✓ Thermo Speed
- ✓ Ma Huang
- ✓ GH Fuel
- ✓ Herba Fuel
- ✓ Metabolift
- ✓ ThermiCore CRT
- ✓ ETA Stack
- ✓ Metabolife 365
- ✓ Ultimate Orange
- ✓ Extreme Ripped Force
- ✓ Ecstasy
- ✓ UltraCuts
- ✓ Mega Pro Vasopro
- ✓ Adipokinetic
- ✓ ThermoPlex
- ✓ Thermogenic Power
- ✓ MetaCuts
- ✓ LipoKinetix
- ✓ Clenbutryx
- ✓ BetaLean
- ✓ Diet Pep
- ✓ Diurlean
- ✓ Dyna-Burn Xtreme