

Heat Illnesses & Injuries

Adapted from Arnheim's
Principles of Athletic Training
12th Edition by Prentice
Ancillaries

- Environmental stress can adversely impact an athlete's performance and pose serious health threats
- Areas of concern
 - Hyperthermia
 - Exposure to the sun

Heat Stress

- Extreme caution should be used when training in the heat (overexposure could result in heat illness)
- It is preventable
- Athletes that train under these extreme conditions are at risk
- Physiologically the body will continue to function if body temperature is maintained
- Body must be dissipate heat to maintain homeostasis

- Metabolic Heat Production
 - Normal metabolic function results in production of heat (will increase with intensity of exercise)
- Conductive Heat Exchange
 - Physical contact with objects resulting in heat loss or gain
- Convective Heat Exchange
 - Body heat can be lost or gained depending on circulation of medium
- Radiant Heat Exchange
 - Comes from sunshine and will cause increase in temperature

- Evaporative Heat Loss
 - Sweat glands allow water transport to surface
 - Evaporation of water takes heat with it
 - When radiant heat and environment temperature are higher than body temperature, loss of heat through evaporation is key
 - Lose 1 quart of water per hour for up to 2 hours
 - Air must be relative water free for evaporation to occur
 - relative humidity of 65% impairs evaporation
 - relative humidity of 75% stops evaporation

Heat Illnesses

- Heat rash (prickly heat)
 - Benign condition associated with red, raised rash, combined with prickling with sweat
 - Result of continuously wet un-evaporated sweat
 - Continually toweling the body will prevent
 - Generally localized to areas covered with clothing

- Heat Syncope (heat collapse)
 - Associated with rapid fatigue and overexposure, standing in heat for long periods of time
 - Caused by peripheral vasodilation, or pooling of blood in extremities resulting in dizziness and fainting
 - Treat by placing athlete in cool environment, consuming fluids and laying down
- Heat Cramps
 - Painful muscle spasms (calf, abdominal) due to excessive water loss and electrolyte imbalance
 - Occurs in individual in good shape that overexert themselves

- Prevent by consuming extra fluids and maintaining electrolyte balance
- Treat with fluid ingestion, light stretching with ice massage
- Return to play unlikely due to continued cramping

- Exertional Heat Exhaustion
 - Result of inadequate fluid replacement
 - Unable to sustain adequate cardiac output
 - Will exhibit signs of profuse sweating, pale skin, mildly elevated temperature, dizziness, nausea, vomiting or diarrhea, hyperventilation, persistent muscle cramps, and loss of coordination
 - May develop heat cramps or become faint/dizzy
 - Core temperature will be $<104^{\circ}$
 - Performance may decrease

- Immediate treatment includes fluid ingestion (intravenous replacement, ultimately), place in cool environment, remove excess clothing
- Must continue to monitor vital signs
- Return to play – must be fully hydrated and be cleared by a physician

- Exertional Heatstroke
 - Serious life-threatening condition, with unknown specific cause
 - Characterized by sudden onset - sudden collapse, LOC, CNS dysfunction, flushed hot skin, minimal sweating, shallow breathing, strong rapid pulse, and core temperature of $\geq 104^{\circ}\text{F}$
 - Breakdown of thermoregulatory mechanism

- Drastic measures must be taken to cool athlete
 - Strip clothing
 - Sponge with cool water
 - Do not immerse in water
 - Transport to hospital immediately
 - Cool first, transport second
- Athlete should avoid exercise for a minimum of one week and gradually return to full practice
 - Must be asymptomatic and cleared by physician

- Exertional Hyponatremia
 - Fluid/electrolyte disorder resulting in abnormally low concentration of sodium in blood
 - Caused by ingesting too much fluid before, during and after exercise
 - May be result of too little sodium in diet or in ingested fluids over a period of prolonged exercise
 - Athletes that ingest large quantities of water and sweat over several hours are at risk (marathon, triathlon)
 - Preventable – must maintain balance

– Signs and Symptoms

- Progressively worsening headache, nausea, vomiting
- Swelling of hands and feet, lethargy, apathy or agitation
- Low blood sodium
- Could compromise CNS and create a life-threatening situation

– If levels can not be determined on-site, measures to rehydrate should be delayed and the athlete should be transported to a medical facility

- Delivery of sodium, diuretics, or intravenous solutions may be necessary

Preventing Heat Illness

- Common sense and precaution
 - Consume fluids and stay cool
- Fluid and Electrolyte Replacement
 - Body requires 2.5L of water daily when engaged in minimal activity
 - 1-2% drop in body weight (due to dehydration) results in thirst
 - If thirst is ignored, dehydration results in:
 - nausea, vomiting, fainting and increased risk for heat illness

- More likely to occur when exercising outdoors sweating heavily and engaging in strenuous exercise
- Prevent through hydration, don't ignore thirst, and don't rely on it being your indicator
- Generally only 50% of fluid is ever replaced and should therefore be replaced before, during and after exercise
- Athletes should have unlimited access to water to prevent decrements in performance and hypohydration

- Using Sports Drinks

- More effective than just replacing fluids with water
- Flavoring results in increased desire to consume
- Replaces fluids and electrolytes
- Water alone can prematurely stop thirst response and initiate fluid removal by kidneys
- Small amounts of sodium help in retention of water
- Different drinks have different nutrient levels
- Optimal CHO level is 14g per 8 ounces of water
- More CHO results in slower absorption
- Effective for both short term and endurance activities



- Identifying Susceptible Individuals
 - Athletes with large muscle mass
 - Overweight athletes (due to increased metabolic rate)
 - Death from heat stroke increase 4:1 as body weight increases
 - Women are physiologically more efficient with regard body temp. regulation
 - Others that are susceptible include, those with poor fitness, history of heat illness, or previous or concurrent illness with fever

Guidelines for Athletes Who Intentionally Lose Weight

- Predispose themselves to heat related injuries and could create life-threatening situations
- Weight loss should not be accomplished through dehydration
- Gradual process over weeks and months and should be a result of body fat lost
- NCAA and high school federations have established guidelines for weight loss in wrestling

Overexposure to Sun

- Precautions must be taken to protect athletes, coaches, athletic trainers and support staff
- Long Term Effects on Skin
 - Premature aging and skin cancer due to ultraviolet exposure
 - Premature aging is characterized by dryness, cracking and inelasticity of the skin
 - Skin cancer is the most common malignant tumor found in humans

- Using Sunscreen
 - Can help prevent damaging effects of UV radiation
 - Sunscreen effectiveness is expressed as SPF (sun protection factor)
 - Indicates how many times longer an individual can be exposed to the sun with vs. without sunscreen before skin turns red.
 - Greater the susceptibility the higher the SPF should be used
 - Should be worn by athletes, coaches and athletic trainers who are outside a considerable amount, and/or have fair complexion, light hair, blue eyes or skin that burns easily

- Individuals with dark complexion should also apply
- 60-80% of sun exposure occurs before the age of 20
- Sunscreen use is at its highest March - November but should be used year round (particularly between the hours of 10am-4pm)
- It should be applied 15-30 minutes before exposure and re-applied after exposure to water, excess sweating, rubbing skin with clothing or a towel