

HEATSTROKE IN SPORTS: RISK FACTORS AND FIRST AID

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Introduction

Heatstroke is one of the most life-threatening emergencies in sports medicine and remains a leading cause of preventable death among athletes. It is defined as a core body temperature exceeding 40 °C (104 °F) accompanied by central nervous system dysfunction, including confusion, loss of coordination, or unconsciousness. Unlike heat exhaustion, heatstroke represents a failure of thermoregulatory homeostasis and demands immediate intervention. With increasing global temperatures and rising participation in endurance and team sports, the incidence of exertional heatstroke (EHS) continues to grow, making its prevention and management a priority for sports medicine professionals, coaches, and athletes alike.

Objective

The purpose of this thesis is to systematically examine the risk factors predisposing athletes to heatstroke and to outline evidence-based protocols for emergency first aid, with the aim of reducing morbidity and mortality in competitive and recreational sports settings.

Risk Factors

Risk factors for exertional heatstroke are broadly categorized into environmental, physiological, and organizational domains:

1. Environmental Factors

- High ambient temperature (>32 °C) and relative humidity (>60%) significantly impair sweat evaporation.
- Solar radiation and wind absence further elevate the wet-bulb globe temperature (WBGT), a key metric for heat stress assessment.
- Artificial turf and asphalt surfaces retain substantially more heat than natural grass, increasing radiant heat load.

2. Individual / Physiological Factors

- Inadequate acclimatization: athletes require 10–14 days of gradual heat exposure to achieve thermoregulatory adaptation.
- Pre-existing dehydration reduces plasma volume and cardiac output, limiting heat dissipation.

- Obesity, low cardiovascular fitness, and prior episodes of heatstroke confer heightened susceptibility.
- Use of certain medications (diuretics, anticholinergics, stimulants) and sleep deprivation impair thermoregulation.
- Age extremes (adolescents and masters athletes) demonstrate reduced heat tolerance.

3. Organizational / Behavioral Factors

- Scheduling events during peak heat hours (10:00–16:00), excessive training intensity, and inadequate rest intervals.
- Wearing impermeable or heavy protective equipment restricts sweat evaporation.
- Absence of medical supervision and cold-water immersion (CWI) facilities at the venue.

Emergency First Aid Protocol

Prompt recognition and cooling are the cornerstones of EHS management. The guiding principle is "Cool first, transport second." The following stepwise protocol is recommended:

- Recognition: suspect EHS in any athlete who collapses or exhibits altered mental status (combativeness, confusion, seizure) during or after exertion in the heat. Rectal thermometry is the gold standard for core temperature measurement.
- Activate emergency medical services (EMS) immediately.
- Rapid whole-body cooling: Cold-water immersion (CWI) at 1–15 °C is the most effective cooling method, achieving a cooling rate of ~0.2 °C/min; target core temperature ≤ 38.9 °C before evacuation.
- If CWI is unavailable, apply rotating ice packs to the neck, axillae, and groin; use wet towels with aggressive fanning.
- Airway management: place unconscious athlete in the recovery position; supplemental oxygen if available.
- IV fluid resuscitation (isotonic saline) for hemodynamic compromise, guided by clinical assessment.
- Antipyretics (paracetamol, NSAIDs) are contraindicated — they do not lower thermogenic core temperature in EHS and may worsen hepatic injury.

Prevention Strategies

Prevention relies on a multi-layered approach: implementing WBGT-based activity modification guidelines, enforcing structured acclimatization programs, ensuring adequate pre-exercise hydration (urine color monitoring), providing shaded

rest areas with cooling stations, educating coaches and athletes on early warning signs, and mandating the availability of CWI tubs at all high-risk events.

Conclusion

Exertional heatstroke is a medical emergency in which the margin between survival and death is measured in minutes. Survival and neurological outcome are directly correlated with the speed and efficacy of cooling initiated on-site. A thorough understanding of modifiable risk factors — environmental, physiological, and organizational — combined with universal training in emergency cooling protocols, is essential for all stakeholders in sport. Institutional policies mandating CWI equipment and qualified medical personnel at events represent the most impactful systemic intervention. With appropriate preparation, the vast majority of EHS fatalities are preventable.

Keywords: *exertional heatstroke, thermoregulation, cold-water immersion, sports medicine, WBGT, heat illness, emergency cooling*

Key References

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