HEAT ILLNESS

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What is Heat-illness?

Heat illness, or otherwise known as hyperthermia related illnesses, is when the body is unable to correctly regulate itself when heat is involved. There are various types of heat-related illnesses. Non-life threatening heat-illness disorders can include muscular cramps and can range to life threatening, an example being hyperthermia, or otherwise known as heatstroke (Leiva et al., 2023). It is important for coaching staff, parents, and athletes to understand these heat-illnesses, and what to do when they can occur, and how to prevent them. Athletes that are involved in sports during the hot summer and fall seasons are exceptionally more prone to these heat-related illnesses. It is crucial to recognize signs and symptoms, risk factors, and treatment, especially in the case that athletic trainers or medical staff are not immediately present.

Recognize Types of Heat related illness

Cramps are one of the most common heat-related injuries that athletes can suffer from. Heat-related cramps from exercises have symptoms that can come as involuntary spasms of large muscle groups that occur during or after exertion. This can be caused by lack of hydration, inappropriate nutrition or sleep, in combination with high temperature, humidity, and high amounts of exercise. Other symptoms may include nausea, vomiting, fatigue, weakness, sweating, and tachycardia (Leiva et al., 2023). If cramps are not treated or taken seriously, this can lead to a more worse condition of rhabdomyolysis.

Rhabdomyolysis is when muscles start to break down and leak into the bloodstream, which can be life threatening. This is caused by putting the body through an intense amount of exercise accompanied by electrolyte or metabolic disturbances, lack of oxygen to the body, genetics, and rise in body temperature. Symptoms to look for are severe muscle pain, swelling of the muscles, muscle weakness, limited active and passive range of motion (Nicholas., 2014). Those at higher risk of rhabdomyolysis are those with sickle cell trait, especially if they have a history of exertional heat exhaustion or heat stroke. If rhabdomyolysis is not treated efficiently, serious muscular injury or death can occur.

Heat exhaustion is characterized by the inability to exercise in heat due to a combination of factors, including cardiovascular insufficiency, hypotension, and central fatigue. This condition leads to an elevated core body temperature of 40.5°C or 105°F. Individuals experiencing heat exhaustion may also exhibit excessive sweating, dizziness, cool and clammy skin, dehydration, and a rapid, weak pulse. It is typically observed in individuals who are dehydrated and not acclimatized to environmental conditions. If heat exhaustion is not treated properly, it can progress to organ and central nervous system dysfunction, increasing the risk of exertional heat stroke.

Exertional heat stroke is the most severe heat-related illness. It is characterized by a high core body temperature (>105°F) and impairment to the neuropsychiatric system. When the body's thermoregulatory system becomes

overwhelmed with excessive heat production, the ability to sweat decreases, and moisture evaporation becomes difficult. This can occur in hot and humid environments and can worsen with intense physical activity. Signs of exertional heat stroke include vomiting, red and hot dry skin, altered consciousness, and a rapid, strong pulse. Exertional heat stroke is a medical emergency, and the risk of mortality significantly decreases if the core body temperature is properly lowered.

Treatment of Heat-Related Illnesses

The "cool first, transport second" method is a reliable and crucial approach for effectively treating heat illness. There are specific methods tailored to address heat exhaustion, exertional heat stroke, rhabdomyolysis, all of which require immediate action to ensure the best possible outcome. Treatment for heat-related muscle cramps on site can include high salt or electrolytes such as pickle juice, trigger point release, and passive stretching. After the event an athlete should replenish fluids and nutrients, continue to stretch, rest, message, and monitor symptoms.

Treatment of heat exhaustion requires stopping exercise and removing the affected individual from the hot environment. Relocating them to a cooler area while assisting in the removal of excess clothing and equipment will aid in the cooling process. Additional measures such as using cold towels or fans can help control their body temperature. Placing the person in a supine position with their legs elevated above the heart can improve blood circulation and facilitate recovery. Monitoring vital signs and encouraging fluid intake are also essential steps to reduce the risk of further complications. If there is no improvement or the condition worsens despite these interventions, it is crucial to activate EMS to ensure assistance is provided promptly.

Exertional heat stroke is a medical emergency demanding immediate action; cooling takes precedence over anything else. If exertional heat stroke is suspected, the most effective method for reducing core body temperature is to promptly immerse the affected individual in cold water up to the neck. It is also essential to remove any excess clothing and equipment to maximize the cooling effect. If immediate cold-water immersion is not feasible, partial-body immersion, focusing on the torso and extremities, is a recommended alternative. As soon as the cooling process begins, activating EMS becomes the next critical step to ensure the individual receives proper medical care and is safely transported to a healthcare facility.

In the event someone is experiencing symptoms of rhabdomyolysis, they need immediate medical attention. Another crucial element is to gather the athlete's medical history, and if they have a past of heat related cramps, heat exhaustion, heat stroke, past rhabdomyolysis, and sickle cell. EMS needs to be immediately contacted in order to transport the patient to get the necessary treatment. While waiting for EMS, the athletes should be taken to a shaded area and placed in a cold tub, pushing fluids such as water and electrolytes, while monitoring core body temperature if needed. Depending on the setting and who is trained, aggressive replenishment of IV fluids can be pushed. The athlete's symptoms need to be monitored to make sure other heat illnesses do not set in.

Prevention

To ensure the best outcomes in preventing heat-related illnesses, acclimatization must be carefully addressed. Gradual acclimation of individuals to the environment over a 7-14 day period is crucial. This process should encompass phases for equipment wearing, as well as the intensity and duration of activities. The first 2-3 weeks of the pre-season are when individuals are most susceptible to exertional heat illnesses. By implementing a well-structured approach, gradually introducing protective equipment and acclimatization standards, the best results can be achieved.

Moreover, it is essential to consider the medical conditions of the individuals (i.e. sickle cell), which may increase their susceptibility to heat-related issues. Monitoring and encouraging proper fluid intake is vital in preventing dehydration. Having cooling stations and cold-water immersion tubs readily available can provide immediate relief in case of heat-related emergencies. Effective communication among all parties involved, including athletes, coaches, and medical staff, is crucial in ensuring a comprehensive approach to heat illness prevention.

References

Leiva, Daniel, and Ben Church. "Heat Illness - Statpearls - NCBI Bookshelf." National Center for Bioethanol Information, Jan. 2023, www.ncbi.nlm.nih.gov/books/NBK553117/.

Nichols, Andrew W. "Heat-related illness in sports and exercise." *Current reviews in musculoskeletal medicine* vol. 7,4 (2014): 355-65. doi:10.1007/s12178-014-9240-0

Casa DJ, DeMartini JK, Bergeron MF, et al. National Athletic Trainers' Association Position Statement: Exertional Heat Illnesses. *Journal of Athletic Training*. 2015;50(9). doi: https://doi.org/10.4085/1062-6050-50-9-07

Scarneo-Miller SE, Lopez RM, Miller KC, Adams WM, Kerr ZY, Casa DJ. High Schools' Adoption of Evidence-Based Practices for the Management of Exertional Heat Stroke. *Journal of Athletic Training*. 2021;56(10):1142-1153. doi: https://doi.org/10.4085/1062-6050-361-20