

Children, Heat, and Fluid Replacement Considerations For Coaches

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With the summer months just ahead and the mercury steadily rising, issues regarding heat and dehydration in gymnasts deserve to be reviewed. These issues have implications not only for our athletes' overall health, but also for their performance in the gym on a daily basis. For example, even at sub-clinical levels, dehydration has been shown to lead to measurable decreases in performance.

Heat Tolerance in Children

Humans must maintain their internal temperature within a very narrow range. When exercising in warm environments, the primary method we use to release heat is through evaporative cooling. Water from our expired respiratory air extracts heat from the body, as does the water we lose in sweat. When the skin surface is cooled, the blood flowing immediately below the surface is also cooled.

Unfortunately, children are at a distinct disadvantage compared to adults with regard to their ability to use evaporative methods of heat loss. First, children produce less sweat than adults during exercise, and the exercise intensity required to initiate sweating in children is higher than adults. Research comparing sweating rates of boys and men for example, showed that men have almost double the sweating rate as pre-puberty boys (Falk, Bar-Or, Calvert, & McDougall, 1992). It has also been shown that children require almost double the increase in body core temperature for sweating to begin than is seen in mature, adult subjects (Davies, 1979). It appears that children have a greater ability to shunt (direct) blood flow to their extremities and near the skin than adults, which can aid greatly in heat loss. Unfortunately, this shunting of blood from the vital internal organs causes physiological distress such that dizziness and fainting may occur in children during exercise in the heat, even with minimal increases in core temperature that should indicate heat intolerance (Drinkwater, Kupprat, Denton, Crist, Horvath, 1977). Adding to the relative inadequacy of children in expelling heat during exercise, at similar levels

of work, children produce more metabolic heat than adults (Rowland, 1996).

Dehydration and Thirst

Thirst results from a complex interaction of physiological mechanisms and social/behavioral influences. Under dehydrated conditions, thirst is brought about by increases in 1) cellular tonicity – the loss of water within cells, and 2) decreases in fluid outside of the cells. Other factors can more indirectly influence the sensation of "thirst" such as including the timing and content of meals, temperature and flavor of beverage, and social influences ("everyone is drinking").

Research has shown that both children and adults become dehydrated during exercise in the heat, even when fluids are freely available (Bar-Or, 1980). Even children who are acclimatized to a tropical environment have been shown to suffer from chronic mild dehydration (Rodriguez-Santana, Rivera-Brown, Frontera, Rivera, Myol, Bar-Or, 1995).

Dehydration reduces strength, anaerobic capacity, and aerobic power, each of which may reduce the gymnast's ability to perform difficult and repeated gymnastics elements. Therefore, prevention of dehydration should be of critical importance for coaches. Because coaches do not have a ready method for assessing either dehydration or heat stress in their athletes, prevention of these problems is the prudent choice for reducing their influence on daily training.

Here are some guidelines to follow to prevent dehydration and heat illness in your athletes:

1. Conduct workouts during the early morning hours, before the gym has had a chance to "heat up," if there is no AC.
2. Encourage your athletes to bring beverage containers with them to practice, and even allow them to be located within the event area. This encourages

consumption both on the social level as well as the physiological level.

3. If beverages are provided by the facility or staff, grape-flavored drinks have been shown to be consumed in greater quantities than orange or apple-flavored beverages, and water.
4. Watch closely for signs of reduced performance combined with flushed, red, and mottled (blotchy) skin, especially on the face. These are signs that heat-related illness has already begun. Remove the child from workout immediately, encourage fluid intake, and reduce body temperature through the use of cold towels and fans. If symptoms are not resolved or are worsened within 15 minutes of treatment, seek medical attention.
5. Encourage frequent (every 15 minutes) drink breaks.
6. Beverages containing carbohydrates and especially sodium (such as "sports" drinks) should be considered for workouts lasting more than 2 hours.
7. Lotions applied to the skin may impair evaporation. Educate your athletes to not apply lotions prior to workout in the heat.

References

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