

Heat and Hydration in Young Tennis Players

Most junior tennis tournaments—of the 5,000 United States Tennis Association (USTA) sanctioned junior tournaments held each year—are played outdoors in warm to hot climates. The level of play and depth of competition continue to improve, but the toughest opponent these young athletes often face (even at the National Championships level) is the heat. Heat stress can readily reduce on-court performance; it can also threaten a player's health and safety. Even players who are fit and take the necessary precautions can suffer from heat stress, making performance very difficult. One of the best ways a tennis player can better tolerate competing in the heat is to maintain adequate hydration. While most tennis players acknowledge the importance of drinking plenty of fluids and the benefits of staying well hydrated, many well-trained and “informed” players – in the juniors and up through the professional ranks – continue to have hydration-related problems. Notably, the risks associated with competition in the heat seem to be greater with young players, in part because of thermoregulatory challenges related to being a child or adolescent. Junior players also often play more than one match a day during tournaments. This presents greater recovery challenges and more readily prompts symptoms related to accumulated fluid, energy, and electrolyte deficits. Problems range from just being a little “off” to heat cramps or, more severely, heat exhaustion. Regular and copious water intake is often not enough; to play well and safely in the heat, a young tennis player must manage a number of factors related to helping the body endure the heat stress.

The overall incidence and prevalence of heat-related injuries and problems in junior tennis are difficult to portray, because accurate monitoring and record keeping are not usually maintained. Moreover, even tournaments with a large number of documented heat injuries resulting in on-site treatment or players being sent to the hospital (e.g., up to six to eight players on a single day) may have had many more unreported incidents or players who were severely affected by the heat. Often, a player loses a match, does not seek any treatment, and subsequently doesn't present symptoms until after leaving the site. Nevertheless, given the reportedly high incidence of ongoing heat-related injuries and problems at certain junior tournaments, a comprehensive effort to address this issue is a priority for organizers and players alike. It is well known that children's exercise tolerance is lower than that of young adults in hot weather. However, until recently, very little information was available that accurately described thermoregulatory balance while junior players compete or train in hot and humid conditions. In other words, the questions we need to answer include: *“How bad is it?” “What degree of heat strain are young tennis players experiencing during tournament play or training in hot environments?”*

Moreover, are high core body temperatures experienced only by those players who are not well hydrated prior to walking on the court and do not manage fluid intake appropriately during play? It may be that the combination of environmental stress, physical work, and sweat losses of fluid and electrolytes are too much for some young players to handle, even if they prepare well and attempt to replace those losses as much as possible. Alternatively, if unacceptably high core body temperatures are demonstrated only in players who begin matches dehydrated or consume too little fluid during play (i.e., develop a significant body water deficit), then a primary focus to reduce the incidence of such heat strain in these young tennis players should be education and better implementation of prevention strategies.

A recent study was funded by the USTA and conducted by Dr. Michael Bergeron at a national championship event in what is historically a very stressful environment – San Antonio, Texas in August. During this study, 13 to 14 year-old volunteer players (boys) were monitored for prematch hydration status, fluid losses, and core body temperature (using ingestible temperature sensors).



Earlier in the year, a different group of well-trained young boys and girls were similarly studied during a vigorous tennis training session in Florida under very warm and humid conditions. From these and other individual analyses of fluid and electrolyte losses in young players, a much clearer perspective has begun to emerge in understanding the thermal stress and strain encountered by junior tennis players during competition and training in the heat.

Here's what we know:

- Many tennis players *begin* play or training dehydrated. The more dehydrated a player is at the beginning of a match, the more body temperature will likely rise during play – especially if the match goes long. Interestingly, this relationship has not been shown during practice. Notably, even during less stressful “easy” early round morning matches, core temperature can readily approach (and sometimes exceed) 102°F (39°C). The same is true for afternoon doubles matches.
- On-court sweat losses can be extensive, even in the juniors. It is not uncommon for a young tennis player to lose one to two liters (35-70 ounces) of fluid through sweating every hour during singles. For some older adolescent boys, this can be as high as three liters (over 100 ounces) per hour. Importantly, sweat loss rate is very individual; not all players will sweat the same amount in the same conditions.
- Players tend to begin a second match or training session of the day significantly more dehydrated than they began their first match or practice. Accordingly, problems related to fluid-electrolyte deficits seemingly occur more often during second matches of the day, especially when there is little recovery time between matches. Moreover, the outcome of the second match seems to be, in part, dependent on the accumulated heat exposure from being on-court earlier in the day. These findings suggest that players are not adequately recovering between same-day matches and training sessions.
- Players lose far more sodium and chloride (salt) from sweating than any other electrolyte (e.g., potassium, calcium, and magnesium). Moreover, sodium and chloride losses are greater with higher sweating rates.
- If a player does not replace the salt, rehydration remains incomplete and the player appears more vulnerable to poorer performance. In addition, sodium deficits often lead to muscle cramping.
- Even more dangerously, excessive water (only) consumption, combined with an extensive sodium deficit, can lead to hyponatremia (low blood sodium) – a potentially life-threatening condition.

Here's what players can do:

- Drink plenty of fluids (e.g., water, juice, milk, sport drinks) throughout the day. Urine should be fairly light-colored or almost clear. However, players who are in the bathroom every 45 minutes (or less) may be drinking too much.
- Drink regularly during practice and pre-match warm-ups (keep warm-ups to a minimum in the heat).
- Drink at each changeover. A properly formulated sport drink offers advantages over water (e.g., energy, electrolytes, and greater appeal). For many players with high rates of fluid consumption on-court (e.g., more than a liter per hour), a combination of sport drink and water often works best.
- After play, drink about 150% of any remaining fluid deficit. For every pound lost from play, drink another 24 ounces of fluid. If the next match is on the same day, nutrient replacement (emphasizing fluids, electrolytes, and carbohydrates) should begin immediately.
- When playing in the heat, consider adding some salt to the diet.
- Eat plenty of carbohydrates; the body uses them faster in the heat and they help to store more water.

- Get plenty of sleep. Inadequate rest makes players less tolerant of the heat. This is a common challenge at junior tennis tournaments, especially when players are away from home.
- Stay out of the sun when not playing or practicing. When playing or training in the sun, use light clothing, a hat and sunscreen.

Any water deficit can have a negative effect on a young tennis player's performance and well being. As a player becomes dehydrated, the heart must work harder, body temperature increases, strength and endurance decrease, fatigue occurs faster, and even mental capacity (e.g., shot selection and concentration) is reduced. Players, coaches, and parents should also appreciate that what one can "get away with" in practice (i.e., poor hydration practices) may lead to a serious medical emergency when it's "4-all" in a 3rd set and a young player doesn't have the capacity to safely continue, but lacks the discernment to stop competing. The nature of tennis, especially with multiple long matches on the same day in the heat, increases fluid deficits and heat strain. However, many of these situations and challenges are readily preventable by taking simple measures to improve hydration and allow for sufficient recovery.

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