

Basketball and Hydration - New Research Indicates Fluids are Key to Maintain Performance

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Past research focusing on the importance of hydration has targeted athletes participating in hot, humid conditions such as preseason football or all-day summer soccer tournaments. Today, the research is expanding to indoor sports, such as basketball, where hydration isn't as high on the radar screen. Every basketball fan has witnessed an NBA player dripping with sweat at the free-throw line or the event staff wiping sweat off the court following a dive for a loose ball. The intermittent, high-intensity nature of basketball often results in substantial sweat losses, which can lead to significant dehydration and decreased performance, especially in the fourth quarter.

A closer look at just how much sweat professional basketball players lose and their hydration status prior to games revealed that despite the cooler, indoor conditions, dehydration is a very real threat to physical and mental performance.

Effects of Dehydration

Dehydration negatively impacts performance. In fact, sweat losses of just 1.5% – or just 3 pounds in a 200-pound athlete – can impair performance. During exercise, blood is diverted to the working muscle – delivering oxygen and nutrients – and to the skin to cool the body. As an athlete sweats and fails to replace their fluid losses, blood volume shrinks. Consequently, the heart has to work harder to meet the demands of the working muscles. Ultimately, this reduction in blood volume compromises blood flow to the skin, causing an increase in core body temperature and decreases blood flow to the working muscles making exercise more difficult.

Data collected over the past two basketball seasons with two different NBA teams showed that players routinely arrive at practices and games inadequately hydrated. These results are consistent with other team-sport athletes, including one study that showed 70 percent of high school football players began practice hypohydrated¹. Over the past two seasons, urine-samples have been collected from various NBA players prior to practices and games. Of these samples, urine specific gravity measurements indicated that 63 percent of the NBA athletes tested were above the NATA threshold of 1.020, indicating they were not adequately hydrated. Starting the game dehydrated makes fluid replacement during the game that much more difficult and important.

Sweat Response

Sweating is the body's natural response to an increase in body temperature. As sweat evaporates from the skin, body heat is lost and core temperature is maintained at safe levels. The stop-and-go nature of basketball causes rapid increases in body temperature and, consequently, large sweat losses. During 2004 summer league play, 15 NBA players from two teams were tested to determine sweat loss and fluid intake. The players were weighed in light shorts before and after their games and ingested fluid out of specific bottles in order to account for fluid consumed during the game.

Average sweat loss for the players was 2.4 quarts, ranging from 1.1 - 4.9 quarts, with a high sweat loss of 1.2 gallons. Most players did an adequate job drinking fluids and were only slightly dehydrated, with an average dehydration of 1.4 percent of their total body weight. However, one-in-four players experienced losses above 1.5 percent of their total body weight, a level of dehydration that can negatively impact performance. In some extreme cases, players ended up losing more than 3 percent of their total body weight. This level of fluid loss coupled with inadequate hydration prior to the game may result in significant levels of dehydration.^{2,3,4}

Fluid Intake

Most athletes do not drink enough to match their sweat losses during practice and competition, even if fluid is available. This observation has been termed "voluntary dehydration" and occurs in virtually all athletes. A recent study allowed runners to drink as much as desired throughout a 10-mile simulated race. During the study, the runners only replaced a fraction of fluids lost through sweat. Furthermore, when asked how much they perceived losing through sweat, they underestimated actual losses by an average margin of 46 percent.⁵

Similarly, the NBA players competing in summer league play replaced approximately 35 percent of what they were losing. The average fluid intake was only about 27 oz., with the average sweat loss being 2.4 quarts (77 oz.). When conditions are dry, such as in a gymnasium or arena, sweat evaporates very quickly making it difficult to estimate how much is being lost. To combat this problem, keeping weight charts that track players' weight before and after practices and games is advantageous in helping to monitor sweat loss. It also serves as an effective teaching cue to demonstrate how much sweat athletes are actually losing on the court. Easy access to fluids and ample time to drink those fluids will also help keep the players in better fluid balance.

Cognitive Performance and Perceptions of Fatigue

Hydration will inevitably play a role in the latter stages of a game when errors in judgment may be especially costly. Recent studies have found that dehydration can negatively impact cognitive performance. Research has revealed that as little as 1-2 percent dehydration leads to reductions in perceived alertness and ability to concentrate – a necessity when a player is standing at the free-throw line during the final moments of a game.⁶ Perceptions of fatigue are also higher when a player is inadequately hydrated. A study completed in France found that dehydration of 2.8 percent impaired cognitive abilities of perceptual discrimination and short-term memory, as well as, subjective estimates of fatigue.⁷ In practical terms, this means that running the floor and playing defense will feel much more difficult when a player is not keeping up with his sweat losses.

Sport-specific skills may also be affected by dehydration. Scientists at Loughborough University in the United Kingdom studied highly fit soccer players who undertook an intermittent exercise protocol designed to mimic the demands of a soccer game.⁸ In one trial, athletes were allowed to drink fluid. In the other, they competed without. After each trial, they performed a soccer skill test and a mental concentration test. They found that soccer-skill

performance deteriorated 5 percent after the "no fluid" trial, while performance was maintained in the fluid trial. Research continues to support that hydration is an essential ingredient to maintaining mental and physical performance, especially at the end of a game.

Summary

Basketball is physically and mentally demanding. Dehydration is easy to prevent but, if left unmonitored, will rob players of their edge. Recognize which players are at risk and educate them to help prevent this unnecessary lapse in performance. Players that are light sweaters and adequately hydrated prior to the game will likely not experience performance-impacting levels of dehydration. For some players, however, special care must be taken to ensure that they are meeting their fluid needs.

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