CHAPTER 6

HYDRATION SCIENCE AND STRATEGIES FOR BASKETBALL

Lindsay B. Baker, PhD, FACSM
Gatorade Sports Science Institute

KEY POINTS

- Research indicates that ≥ 2% dehydration may impair performance of basketball-specific skills (field-goal shooting) and basketball-specific movements (on-court sprinting and agility).
- Multiple indices should be used and interpreted collectively to obtain an estimate of hydration status. Practical assessment techniques, such as monitoring urine (color, concentration, and frequency), changes in body weight, and thirst sensation can be useful in guiding fluid intake needs before, during, and after training or competition.
- The descriptive literature indicates that relatively low levels of dehydration accrue in most players during basketball practice/games if drink breaks are provided. However, it seems that off-court hydration may be inadequate in some players. Rehydration strategies should be individualized and consider the volume, rate, and composition of fluid intake, especially in situations involving congested schedules and travel between practices/games.

INTRODUCTION

Body water loss through sweating occurs during exercise to dissipate body heat and, therefore, prevent sharp rises in body core temperature. Thermoregulatory sweat losses can be large, particularly during high-intensity and/or prolonged activity such as a ~1.5-2 h basketball practice or game. When fluid intake is less than sweat loss, a body water deficit, or dehydration, occurs. The purpose of this chapter is to: 1) provide an overview of the effect of dehydration on basketball performance, 2) discuss what is currently known about off-court and on-court hydration practices of basketball players to determine the most common hydration issues that need to be addressed, and 3) recommend hydration strategies that can be implemented by coaches and practitioners to ensure players are well-hydrated before, during, and after practice/competition. Throughout this chapter, dehydration will be expressed as a percentage of body weight deficit (e.g., 2% dehydration is equivalent to 2% loss of body weight, which is 3 lb. in a 150 lb. player). The term euhydration will be used to denote "normal" body water content or maintenance of baseline body weight by ingesting fluid to completely replace sweat losses incurred during a workout.

EFFECT OF DEHYDRATION ON PERFORMANCE

Success in the game of basketball is dependent upon both aerobic and anaerobic performance as well as sprinting, strength, and jumping ability. Research suggests that some, but not all, of these components of the game may be impacted by hydration status. Dehydration (> 2% body weight deficit) has been found to consistently impair aerobic performance (Cheuvront & Kenefick, 2014; Sawka et al., 2007). In addition, hypohydration may be associated with decrements in muscle endurance, muscle strength, and anaerobic power, but has no effect on anaerobic capacity and vertical jumping ability (Savoie et al., 2015). The game of basketball also involves the execution of complex sport- specific skills, which are dependent upon motor skill and cognitive function. There is evidence from studies in the general population and with athletes that dehydration (>2%) impairs mood and cognitive performance, especially for tasks involving attention, executive function, and motor coordination (Sawka et al., 2007; Wittbrodt & Millard-Stafford, 2018). Cognitive performance research specific to basketball is limited; however, one study has found that dehydration (1-4%) impairs attention (resulting in more errors made during a test) in male high school and college basketball players (Baker, Conroy, et al., 2007).

A few studies have also tested the impact of dehydration on basketball-specific skills during a simulated game. Dougherty et al. (2006) compared the effect of 2% dehydration vs. fluid replacement to maintain euhydration on skill performance of 12 to 15-year-old competitive male basketball players. Performance was assessed during four quarters of basketball drills designed to incorporate various aspects of the game, including field-goal and free-throw shooting, repeated sprints, vertical jumps, and defensive slides. Compared with the players' performance during the euhydration trials, 2% dehydration resulted in significantly slower total sprinting and lateral movement times as well as a lower shooting percentage over the course of the entire simulated game (Dougherty et al., 2006). In a follow up study, Baker et al. (2007) employed a similar basketball protocol to investigate the effect of progressive (1% to 4%) dehydration vs. euhydration on performance in 17 to 28-year-old male basketball players. In this study, the players experienced a progressive deterioration in sprint times and the number of shots made as dehydration progressed from 1 to 4%. The level of dehydration at which overall performance was significantly impaired compared with euhydration was 2% body weight deficit (Baker, Dougherty, et al., 2007).

In another basketball performance study, ten male players completed a 40-min simulated "2 on 2 full court" game with or without drinking (Hoffman et al., 1995). During the fluid-restricted trial, players accrued 1.9% dehydration throughout the simulated game, whereas euhydration was maintained with water during the fluid-ingestion trial. No statistically significant differences in field-goal or free-throw shooting performance were observed between trials. However, during the fluid-restricted trial, players experienced an 8.1% decrease in field-goal percentage between the first and second half of the simulated game. By contrast, field-goal percentage increased by 1.6% in the fluid-ingestion trial (Hoffman et al., 1995). Although this difference did not reach statistical significance, a net 9.7% difference in shooting performance could be of practical significance in a game. In another study, Carvalho et al. (2011) found no effects of 2.5% dehydration on performance of basketball drills in 14 to 15-year-old male players after a 90-min training session. It is important to note, however, that players accrued 1.0% body weight deficit in the control trial, thus there was a smaller difference in body weight loss between dehydration and control trials in this study (Carvalho et al., 2011) compared with the literature finding detrimental effects on skill performance. Studies with female basketball players have found that 2.1% and 2.3% dehydration were associated with lower field goal percentage (Brandenburg & Gaetz, 2012) and impaired lower body reactive agility (Hoffman et al., 2012), respectively, compared with euhydration.

The aspects of basketball performance that are negatively impacted by dehydration are illustrated in Figure 1. Although more basketball-specific research is needed, the balance of evidence to date suggests that ≥2% dehydration may impair sprinting, agility, field goal shooting, and certain aspects of cognition (attention) in basketball players. In addition, ≥2% dehydration is associated with increased ratings of fatigue (Baker, Conroy, et al., 2007; Dougherty

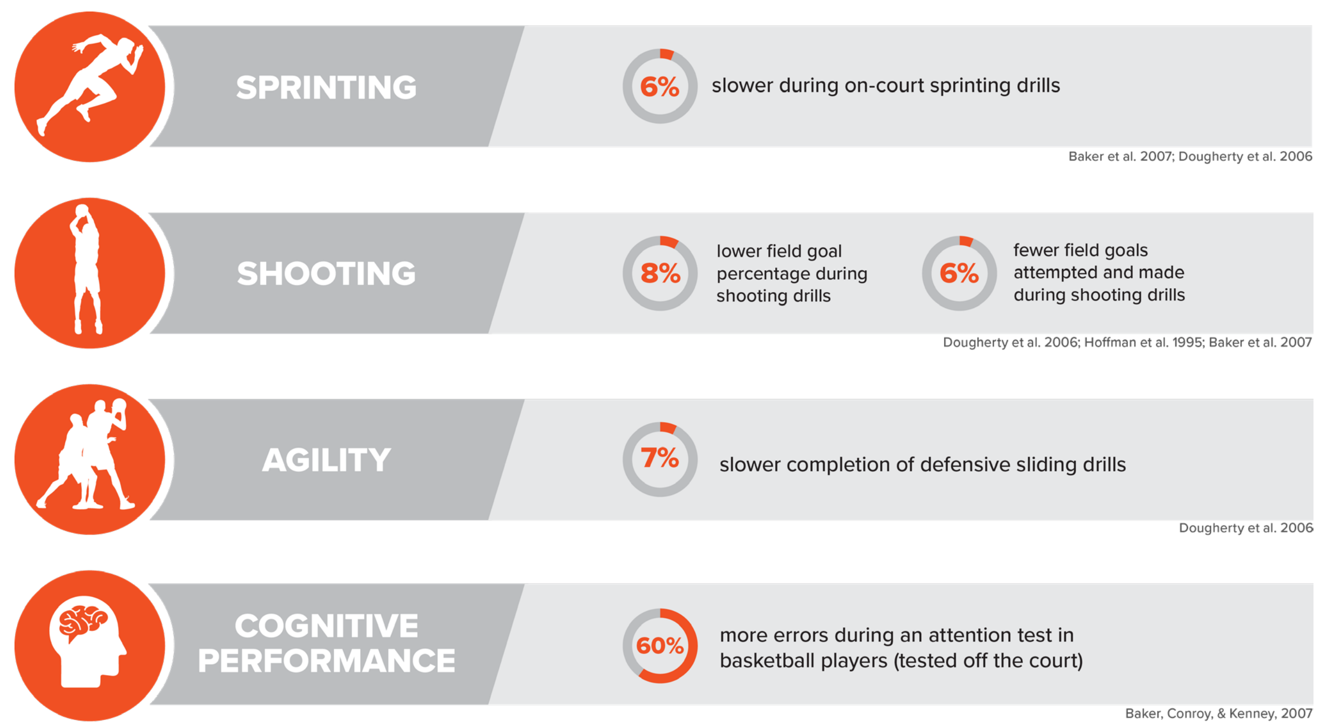

Figure 1: Aspects of basketball performance impaired by ≥ 2% dehydration.

ORIGINAL BODY WEIGHT (LBS)	NET FLUID LOSS IF 2% HYPOHYDRATED (LBS)	BODY WEIGHT WHEN 2% HYPOHYDRATED (LBS)
150	3.0	147.0
160	3.2	156.8
170	3.4	166.6
180	3.6	176.4
190	3.8	186.2
200	4.0	196.0
210	4.2	205.8
220	4.4	215.6
230	4.6	225.4
240	4.8	235.2
250	5.0	245.0

Table 1: Body weight loss equivalent to 2% dehydration.

et al., 2006). Table 1 shows the body weight loss equivalent to 2% dehydration for basketball players of various body weights (in 10-lb increments).

FLUID BALANCE IN BASKETBALL PLAYERS

Off-Court Hydration

Fluid intake habits off the court are important in determining how well-hydrated an athlete is at the start of a training session or game. Observational studies (Table 2) suggest that it is common for basketball athletes to begin practice or competition with urine concentrations that may be indicative of dehydration (urine specific gravity, USG ≥ 1.020) (Brandenburg & Gaetz, 2012; Hamouti, Del Coso, Estevez, et al., 2010; Heishman et al., 2021; Osterberg et al., 2009; Sawka et al., 2007; Thigpen et al., 2014). For example, Heishman et al. (2021) found that 55–66% of pre-exercise urine samples had USG > 1.020 across multiple years of NCAA men's preseason and competitive basketball seasons. In this study USG was significantly higher during the competitive season versus preseason (Heishman et al., 2021). In another study, 79% of NCAA basketball players' samples had USG > 1.020 before offseason conditioning and preseason practices, with no significant differences between men and women (Thigpen et al., 2014). However, Brandenburg & Gaetz (2012) found that female Canadian national-level players were well-hydrated prior to games. Given the inconsistent results between studies more research may be needed to understand off-court hydration habits of female players.

Although USG is a practical measure, interpretation of spot measurements (pre-exercise) can be difficult because of confounding factors. Experts suggest that USG is most useful and accurate as a hydration assessment technique when collected upon waking in the morning (Cheuvront et al., 2015; McDermott et al., 2017; Thomas et al., 2016). Interestingly one study in Table 2 collected first morning voids and all 11 European professional basketball players had a USG > 1.020, thus providing support to the notion that most athletes begin exercise in a hypohydrated state (Hamouti, Del Coso, Estevez, et al., 2010). However, future studies should report the percentage of athletes with USG >1.025 (as well as >1.020) since false positives may occur with values between 1.021-1.025, especially in larger athletes (Hamouti, Del Coso, Avila, et al., 2010).

On-Court Hydration

Shortly after beginning physical activity fluid losses start to occur from thermoregulatory sweating. Therefore, fluid intake is needed to prevent dehydration during training or competition. Sweating rates can vary considerably among players (and even from day-to- day within players) because of differences in body size, exercise-intensity, and environmental conditions, among other factors. Based on normative data developed by the Gatorade Sports Science Institute (GSSI) (Figure 2) the mean sweating rate across 196 basketball players (92 ± 18 kg) was 950 ml/h, but ranged from ~0.2 L/h up to 2.5 L/h (Barnes et al., 2019). Sweat sodium losses were ~10 mmol/h to 150 mmol/h (or 230 mg/h to 3,450 mg/h). Similar results have been reported for sweating rate (see Nuccio et al., 2017 for review) and sodium losses (Hamouti, Del Coso, Estevez, et al., 2010) in other observational studies with basketball athletes. For example, one study observed 16 to 18-year-old basketball players training at the Australian Institute of Sport (Broad et al., 1996) and found that sweating rates were higher during games (male: 1587±362 ml; female: 976±254 ml) than practices (male: 1039±169 ml; female: 687±114 ml) and higher in practices than the weightlifting sessions (male: 377±120 ml; female: 246±133 ml) during the winter season. This finding may be explained by differences in absolute exercise intensity among session types, but this is speculative since energy expenditure data were not collected in this study (Broad et al., 1996).

Despite the large sweat losses incurred during training and competition, the descriptive literature suggests that most basketball players drink enough fluid to prevent significant fluid deficits

REFERENCE	PARTICIPANTS	SEASON	TIMING OF URINE COLLECTION	USG RESULTS
Heishman et al., 2021	15 male NCAA Division I players	Preseason and competitive seasons across two years	Pre-practice	55–66% >1.020
Thigpen et al., 2014	11 male and 11 female NCAA Division II players	Offseason conditioning and preseason practice	Pre-practice	68% 1.020-1.030 and 14% >1.030 (men) 55% 1.020-1.030 and 20% >1.030 (women)
Hamouti et al., 2010	11 male European professional players	Competitive season	First morning void (3 h before practice)	100% 1.021-1.030
Osterberg et al., 2009	29 players from 5 NBA teams	Summer league competition	Pre-game	52% > 1.020
Brandenburg & Gaetz, 2012	17 female Canadian national-level players	Exhibition game during training camp	Pre-game	6% > 1.020

Table 2: Summary of studies assessing urine specific gravity before basketball practices and games.

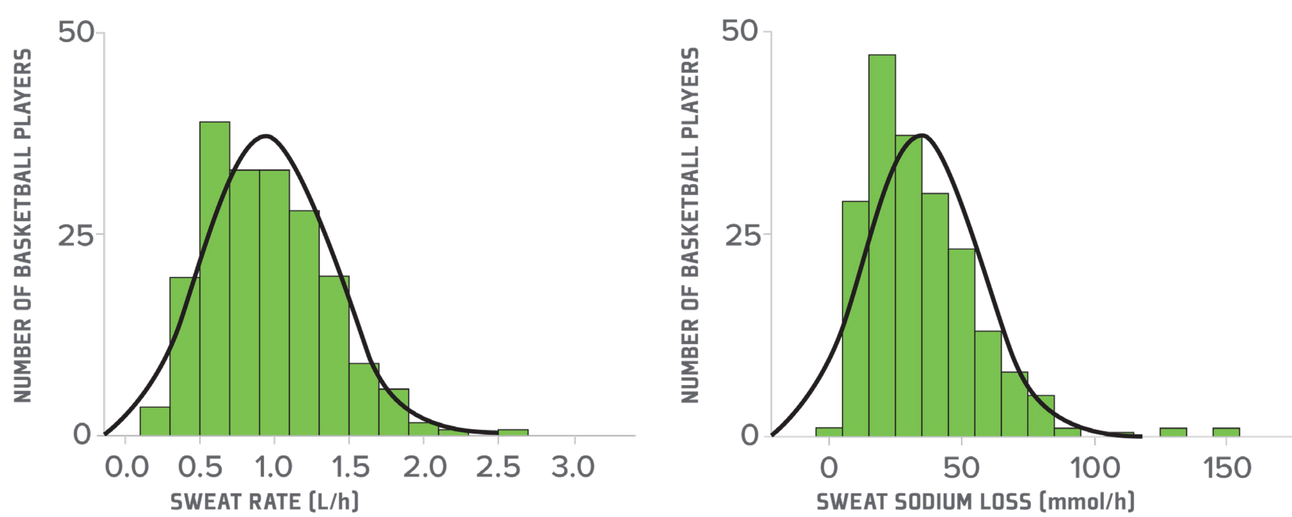

Figure 2: Frequency histograms showing whole body sweating rate and sweat sodium loss of 196 basketball players tested by the Gatorade Sports Science Institute. Reproduced from Barnes et al. 2019, with permission.

(≥2% body weight deficit). For example, Broad et al. (1996) found that less than 10% of the 16 to 18-year-old basketball players accrued ≥ 2% dehydration throughout a training session or game and most players (~50-70%) accrued < 1% dehydration. Similarly, GSSI has found that only 12% of professional basketball players developed >2% hypohydrated during pre-season practices (Figure 3) (Baker et al., 2022). Similar findings have been reported in other observational studies with male and female adolescent (Carvalho et al., 2011; Minehan et al., 2002), male and female collegiate (Thigpen et al., 2014), and male professional basketball players (Hamouti, Del Coso, Estevez, et al., 2010; Osterberg et al., 2009). These results may be somewhat surprising given that most basketball players underestimate their sweat losses during training (Thigpen et al., 2014). However, the volume of *ad libitum* fluid consumed by an athlete during exercise is largely dependent upon fluid availability (Passe, 2001). Thus, the lack of significant in-game dehydration found in basketball is likely related to the structure of the game, which is conducive to frequent stoppage of play, allowing opportunity for fluid intake during time-outs, player substitutions, and halftime (Belval et al., 2019). It is important to note, however, that the possibility of the Hawthorne effect (alteration of behavior – i.e., consuming more fluids than usual - due to their awareness of being observed) cannot be ruled out either.

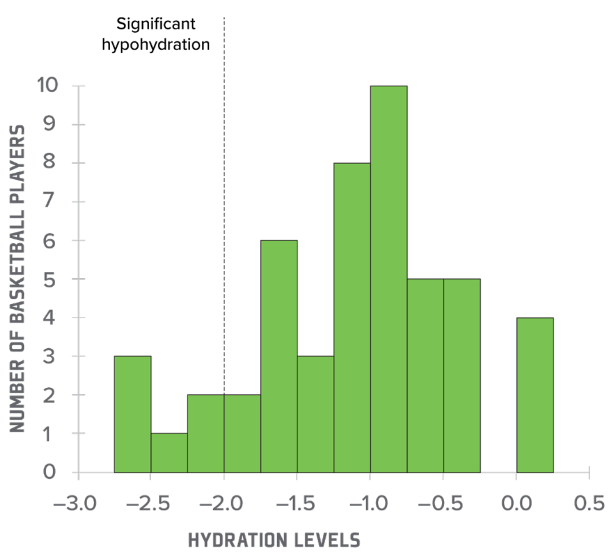

Figure 3: Frequency histograms showing fluid balance of 49 professional basketball players after 98 ± 30 min of a coach-led pre-season practice. Reproduced from Baker et al. 2022, with permission.

HYDRATION STRATEGIES

Hydration Assessment Techniques

Practical indices of hydration status include body weight (e.g., fluctuation in morning body weight or change from before to after exercise), urine (e.g., color, USG, and frequency), and thirst. Although each of these indices is somewhat limited in their precision and accuracy (compared to more- expensive or controlled laboratory-based techniques), they can still be effective in estimating fluid intake needs, especially when used collectively and interpreted in the proper context (Sawka et al., 2007). For example, first morning nude body weight can be a useful indicator of hydration status. For a euhydrated individual who is in "energy balance," morning body weight (after voiding) is stable and not expected to deviate by > 1% (Armstrong, 2007). Thus, when a first morning nude body weight deviates from "normal" morning body weight (established by regular measurements over a period of several days) by > 1%, the individual may be dehydrated, especially if accompanied by dark/concentrated urine and thirst.

This concept is illustrated in the Venn diagram in Figure 4 (Cheuvront & Sawka, 2005). "WUT" is a simple memory tool to help determine if a player is dehydrated based on their body weight, urine color,

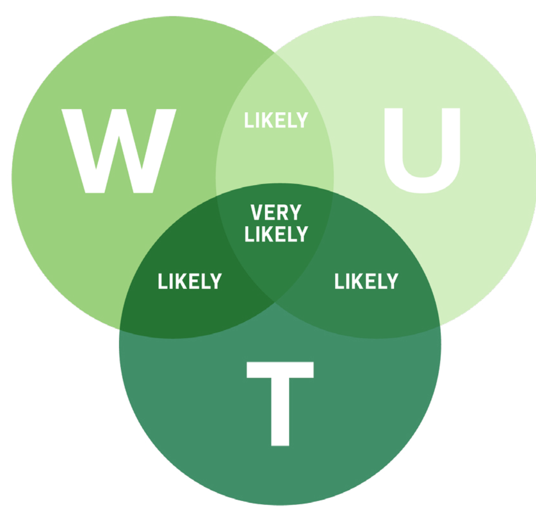

Figure 4: WUT Venn diagram to monitor day-to-day hydration status. There are three questions that can be assessed based on simple markers to determine if an athlete is dehydrated: 1) Is the player thirsty? 2) Is their morning urine dark yellow? 3) Is their morning body weight noticeably lower when compared to yesterday morning? If the answer to any one of these questions is "Yes," the athlete may be dehydrated. If the answer to any two of these questions is "Yes," it is likely that the athlete is dehydrated. If the answer to all three of these questions is "Yes," it is very likely that the athlete is dehydrated. Reproduced from Cheuvront and Sawka 2005, with permission.

and thirst. When two or more markers are present, dehydration is likely. If all three markers are present, dehydration is very likely. The "WUT" technique is most appropriate for day-to-day hydration assessment, whereas acute changes in body weight are best for monitoring fluid losses and hydration needs during/after exercise. Another simple assessment is urine frequency, with ≥ 5-7 voids per day considered "optimally" hydrated (Perrier et al., 2021).

Sweat Testing

As discussed above, it is well known that sweat profiles (i.e., sweating rate and sweat sodium concentration) vary considerably among athletes. Thus, sweat testing is recommended to determine sweat profiles of each individual player. This information can be helpful in developing personalized hydration strategies – i.e., how much water and sodium are needed to replace sweat losses and restore euhydration.

The simplest and most accurate way to assess sweat loss is by measuring the athlete's body weight over time. Acute body weight change (e.g., from pre- to post-exercise of a < 3 h workout) (Sawka et al., 2007) represents ~16 oz. of sweat loss per 1 lb. of body weight loss (Armstrong, 2007). However, non-sweat sources of body mass change (especially fluid/food intake and urine/stool output) should also be measured and accounted for, when applicable.

Objective assessments are important because athletes tend to poorly conceptualize their sweat losses during exercise (O'Neal et al., 2020). For example, Thigpen et al. (2014) found that the error in self-estimating sweat losses was high (~71%) among male and female NCAA Division II basketball players.

Sweat is comprised mostly of water and salt (sodium chloride). While sweat contains a variety of other electrolytes, minerals, and metabolites, sodium and chloride are by far the most abundant constituents. In particular, sodium plays an important role in fluid balance in the body. Sodium (and chloride) concentrations in sweat range from 10-90 mmol/L (230-2070 mg/L sodium and 355-3191 mg/L chloride), whereas potassium is ~2-8 mmol/L (78-312 mg/L), while calcium (0.2- 2 mmol/L or 8-80 mg/L) and magnesium (<0.5 mmol/L or < 12 mg/L) are even lower. Sweat composition is typically determined from the standard absorbent patch technique. With this method patches are placed on the skin (typically the forearm) to collect sweat during exercise. The sweat samples are subsequently analyzed using ion chromatography in a biochemistry laboratory to determine the athlete's sweat electrolyte concentrations (Baker, 2017).

Recently, a microfluidic wearable device (Gx Sweat Patch) has been developed by GSSI to provide a more practical alternative to determine sweating rate and sweat sodium/chloride losses. In a validation

PRE GAME
4 h before game: Drink 14-19 oz of fluid
2 h before game: Player has dark urine and USG=1.021. Therefore, drink 8-14 oz of fluid.

DURING GAME
Drink at least 24 oz but no more than 80 oz.
e.g., depending on tolerance, could aim for 30 oz (or 1 full Gatorade squeeze bottle) per half

POST GAME
Body weight deficit of 1.25 lbs after the game
Drink 30 oz of fluid with post game salty snack or a meal

Additional Considerations:

Sweat Profile – based on previous sweat tests this player typically loses about ~5 lb during a game.

Schedule – the player has another game tomorrow.

Figure 5: Example game-day fluid intake volumes required for a 180-lb player based on pre, during, and post-exercise recommendations.

study with G-League basketball players, the Gx Sweat Patch provided similar sweat sodium/chloride concentrations and whole body sweating rate results during moderate-intensity practices compared with standard methods (Baker et al., 2022).

Recommendations

Table 3 contains detailed hydration strategies to aid proper hydration before, during, and after training/competition. Example game-day fluid volumes required for a 180-lb player based on these recommendations can be found in Figure 5. Because of the deleterious effects of dehydration on basketball performance, it is recommended that athletes start practice well-hydrated, drink enough fluid to prevent ≥ 2% body weight deficit during a practice session or game, and rehydrate to replace any remaining body fluid deficit after a workout. Beginning practice or competition in a well-hydrated state is important because fluid intake during exercise may not be sufficient to compensate for poor pre-exercise hydration status; as studies with professional basketball players have shown that there is no relation between pregame USG and the volume of fluid consumed during competition (Hamouti, Del Coso, Estevez, et al., 2010; Osterberg et al., 2009).

To ensure players begin training/competition well-hydrated, fluids should be readily available throughout the day. For example, athletes could be encouraged to carry a water bottle if possible or drink during passing periods in school. The use of a fluid tracking smart bottle/application may also help remind athletes to sip fluid throughout the day. For basketball teams that may travel via air before/after games, players should be encouraged to drink fluids while in flight since the dry air in the cabin results in greater insensible (respiratory and transcutaneous) fluid loss (Zubac et al., 2020). Consuming beverages that promote fluid retention (e.g., electrolytes) can reduce the need to urinate (topic discussed in more detail below).

Rapid and complete rehydration after exercise is important if the athlete is participating in a practice session or game within the same day or in <24 h (Sawka et al., 2007; Shirreffs & Sawka, 2011). In this case, it is recommended that athletes drink 24 oz for each 1 lb (i.e., 150%) of body weight deficit. The additional volume compensates for the urine loss stimulated by rapid consumption of large volumes of fluid. Consuming fluid with sodium and/or at a more gradual rate over time also helps maximize fluid retention. When there is ≥ 24 h between sessions, adequate fluid can usually be consumed with normal eating and drinking practices (i.e., ad libitum). However, congested schedules and travel, particularly to warmer areas, may make it difficult to drink appropriately throughout the day. With these considerations in mind, fluid intake strategies after exercise should be based on individual needs (as determined by assessments described above and in Table 3). In addition, adequate all-around fluid intake before and during practices/games lessens the need for aggressive post-exercise rehydration,

OCCASION AROUND TRAINING/ COMPETITION	HYDRATION ASSESSMENT TECHNIQUE	DEFINITION	RECOMMENDATIONS
Before	Morning body weight Urine specific gravity Urine color Urine frequency Thirst	• In a euhydrated individual who is in "energy balance," morning body weight (after voiding) is stable and not expected to deviate by >1%. • Determine "normal" (euhydrated) baseline body weight by taking daily measurements (over a period of ≥3 days). • Specific gravity is a measure of urine concentration. A urine sample < 1.020 is indicative of euhydration. This technique requires an instrument called a refractometer. • Light yellow (like lemonade) is indicative of euhydration. • Dark yellow or brown (like apple juice) is indicative of dehydration. • Clear urine is indicative of overhydration. • As a general assessment, urine frequency ≥ 5-7 x per day may be considered well hydrated. • Thirst can be determined with a simple yes/no question.	• Use the "WUT" diagram (Figure 5) to determine if a player is dehydrated based on body **w**eight, **u**rine color, and **t**hirst. When two or more markers are present, dehydration is likely. If all three markers are present, dehydration is very likely. • If morning body weight has dropped by >1% from "normal," then drink fluid to reestablish baseline body weight. • Slowly drink fluids (e.g., ~5–7 mL/kg or 0.077-0.108 oz/lb) at least 4 h before the practice or game. If no urine is produced, or urine is dark or highly concentrated, slowly drink more fluid (e.g., another ~3–5 mL/kg or 0.046-0.077oz/lb) about 2 h before the event. • Consuming beverages with sodium (110-270 mg/8 oz) and/or small amounts of salted snacks or sodium-containing foods will help retain the consumed fluids.
During	Change in body weight	• Measure pre- and post-workout body weight to determine expected sweat loss during training and games of various intensities, durations, and environmental conditions. • Body weight should be taken with minimal dry clothing or nude, if possible.	• Avoid significant body weight deficit (i.e., ≥2%). Also, avoid any body weight gain. • Drink up to 16 oz of fluid for each 1 lb of sweat lost during the course of a workout. • Consuming a beverage with sodium (110-160 mg/8oz) helps replace sweat sodium losses and stimulate thirst.
After	Change in body weight	• Compare post-workout body weight to pre-workout body weight. Body weight should be taken with minimal dry clothing or nude, if possible.	• Drink ~24 oz of fluid for each 1 lb of body weight deficit. This is especially important if the next practice or game is in <24 h. In most other situations, fluid can be consumed with normal eating and drinking practices. • Consuming a beverage with sodium (110-270 mg/8oz) and/or small amounts of salted snacks or sodium-containing foods helps replace sweat sodium losses, stimulate thirst, and retain the ingested fluids.

Table 3: Hydration strategies before, during and after training/competition.

which allows athletes to focus their attention on other nutrition needs or recovery modalities between training sessions/games (Davis et al., 2022).

Strategies for adequate hydration after exercise should consider the composition as well as the volume of fluid ingested between games/training (Evans et al., 2017). Some of these considerations are described in Table 3. For example, the inclusion of sodium in a drink stimulates renal water reabsorption, which helps to restore plasma volume and promotes better fluid retention after exercise-induced dehydration than electrolyte-free fluids (Shirreffs et al., 1996). Fluid retention can also be enhanced by increasing energy density (e.g., inclusion of protein and/or ≥ 10–12% carbohydrate), which slows fluid delivery to the circulation, thereby delaying urine losses after fluid ingestion. For example, the increased energy density as well as the clotting of casein in milk-based products delays gastric emptying (James et al., 2011).

Practitioners should consider the duration between training bouts when deciding the most appropriate composition of a fluid replacement beverage. Milk or other energy-dense carbohydrate/protein-based drinks are effective for rehydration when there are several hours between exercise bouts. However, when more rapid fluid replacement is needed, energy dense fluids such as milk may not be suitable since the delay in gastric emptying could cause gastrointestinal distress. In these situations, athletes should drink up to ~1.5 L (51 oz) of a sodium-containing fluid (with relatively low energy density, i.e., 2-6% carbohydrate) for each kilogram (2.2 lbs) of body fluid deficit to promote fluid retention without delaying fluid delivery to the circulation. Providing a chilled beverage with the addition of flavor and sweetness can also improve beverage palatability and voluntary fluid intake (Sawka et al., 2007). Further, regarding the rehydration efficacy of other common beverage components consumed throughout the day, moderate caffeine (up to 400 mg) does not impact fluid balance (Maughan et al., 2019), but drinks with > 2% alcohol can impair rehydration by stimulating urine loss (Evans et al., 2017).

On a final note, although female sex hormones alter certain aspects of body fluid regulation, there are minimal effects of sex or menstrual cycle phase on hydration outcomes. Direct comparisons have not been made in basketball athletes, but in general sweat loss, fluid balance, and post-exercise rehydration are not significantly influenced by sex per se and do not differ significantly within women across the menstrual cycle. Instead, factors such as body size, absolute workload, aerobic fitness, heat-acclimatization status, and behavioral differences generally play a larger role in determining sweat loss and fluid balance. The reader is referred to review papers for more information on this topic (Baker, 2023; Rodriguez-Giustiniani et al., 2022).

SUMMARY

Dehydration by ≥ 2% of body weight has been found to impair basketball skill performance, and greater levels of dehydration can further degrade performance. Observational studies suggest that a relatively small percentage of athletes (~10-15%) experience significant body weight loss from pre- to post-training/competition, likely because of easy access to fluids and frequent opportunities to rehydrate. However, players with heavy sweating rates and who receive minimal substitution breaks can accrue ≥ 2% body weight loss during practice and competitions. Thus, sweat testing is recommended to identify the 10-15% of players with significant risk for dehydration and inform hydration strategies on and off the court. Moreover, most (≥ 50%) basketball players begin practice or competition with urine concentrations that may be indicative of dehydration, suggesting that off- court (i.e., pre-training or pre-game) hydration habits may be inadequate. Furthermore, fluid intake during a game may not compensate for poor pre-game hydration status. Therefore, strategies to ensure that a player begins training or competition in a well-hydrated state should be considered just as important as in-game hydration strategies.

Lindsay Baker is employed by the Gatorade Sports Science Institute, a division of PepsiCo R&D. The views expressed are those of the author and do not necessarily reflect the position or policy of PepsiCo, Inc.

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