Basketball is a sport that requires a combination of power, speed, strength, and endurance. The season consists of multiple games per week with very few days off. With each season lasting several months, recovery nutrition can play a huge role in basketball athletes maintaining their health and fitness. Throughout the entire year, they are often very active. Whether they are participating in competitive games, extra shooting practice, agility drills, or rehabilitation, all of these activities contribute to extremely high energy needs which can be difficult to maintain without proper nutrition. The following are nutritional considerations for fueling basketball athletes properly.

**CALORIC INTAKE**

Due to the metabolic demands of basketball, many basketball players do not like feeling “heavy” on the court. Often these athletes will consume smaller portions at each meal to avoid feeling heavy. However, this may not provide enough energy intake for the athletes based on the demands of the sport. One method to avoid this and ensure that they meet the energy demands is to increase their “fuel frequency” to 5 – 8 times per day (including meals and snacks) rather than 4 – 6 times per day.

It can be a challenge for basketball players to meet the fuel recommendations for their sport, especially those trying to gain weight. Optimal fueling can be hampered by both high energy expenditures and moderate mealtime appetites. The following strategies can be used for athletes trying to meet this high energy demand:

- **Drinking calories**: This includes low-fat dairy, 100% fruit juice, and smoothies.
  > Consuming 100% fruit juice instead of milk at meals may prevent the athlete from feeling satiated from the protein in the milk and allow them to finish their entire meal. However, milk can be used to increase caloric intake if taken with snacks, for instance.

- **Eating every 2 – 3 hr**: This may allow athletes to meet their caloric needs without feeling too full at any one point.

- **Breakfast is a must**: This is a critical 500 – 1,000 calories that athletes could be missing out on if it is not made a priority.

- **Emergency snacks**: Athletes should keep snacks in their car, gym bag, etc. so they can fuel between meals, especially if it is going to be longer than 3 – 4 hr until they can eat again.

- **Nighttime snacks**: Basketball players are usually up late in the night as they are used to having a lot of night games.
  > Take advantage of this and encourage a nutrient-dense snack or “mini-meal” for those who struggle to maintain or put on weight.
  > Consume protein right before going to sleep at night because it may help with improving lean body mass.

The fuel frequency aspect of a basketball player’s diet is important as it can aid in overall body composition and physical performance. Increasing meal frequency may help prevent skeletal muscle protein catabolism (i.e., loss of muscle mass). If an
Hydration is an important component for all athletes and can have a particularly important effect on basketball performance. Dehydration is categorized as a fluid loss of more than 2% of bodyweight during activity (2,8). Fluid losses should be replaced to return to euhydration, or an adequately hydrated state (2). The following list shows the impact dehydration can have on basketball performance (3,4):

- Slower time to complete basketball-specific movement drills (e.g., defensive slides, sprints, jumps, etc.)
- Fewer shots made
- Slower reaction time
- Increased omission and commission errors

Dehydration may also increase the risk of injury, muscle fatigue, and cramping (2). The short bursts of intense movement in basketball are associated with heavy sweat losses, which make basketball athletes prone to dehydration (11). Osterberg et al. showed that sweat losses were as great as 2 L in a game (approximately 20 min of playing time) and that half of the basketball athletes (n = 29) started a game in a dehydrated state (11). The ad libitum (i.e., at one’s pleasure) fluid intake during playing time was 1 L, which did not compensate for their dehydrated state before the game (11).

During practices, consuming sports drinks is an ideal method for providing both carbohydrates and electrolytes to help sustain performance and replenish what is lost during activity. It is important for athletes to test for tolerance of sports drinks prior to games. It is recommended to establish a hydration routine during practices to ensure optimal performance during games. For those who frequently cramp or lose a lot of fluid during practices, sports drinks can be used after practice for fluid recovery. The sodium and carbohydrates they provide will help the body retain fluids that are being consumed (8,13). Sodium and carbohydrates may also be obtained through food. Athletes can also be encouraged to add salt to their meals to increase sodium intake, if needed. Salty snacks include trail mix, pretzels, peanut butter crackers, beef jerky, and popcorn. Hydration status can be assessed with a urine specific gravity (USG) test. A USG of ≥ 1.020, or fluid loss during activity of more than 2% of bodyweight, is indicative of dehydration (2).

Body Composition

Although body composition is largely individualized, some position-specific trends can be seen in basketball athletes. For instance, centers tend to have a higher body fat percentage than guards and forwards; however, they also tend to have a greater amount of fat free mass (FFM) (16). The greater amount of FFM can likely be attributed to the higher absolute weight of the centers. This trend is true of male and female basketball athletes (16). The heavier build of a center is more useful for the physicality of low-post work (16). Table 2 summarizes data from a review where most body fat percentages were measured for male and female guards, forwards, and centers using calipers (16). It should be noted that the results of one body composition measurement tool should not be compared to another, as the standard of error is different for each type of measurement tool utilized.

Recovery

A basketball athlete’s body goes through substantial wear and tear; they have a long season, play a lot of games, and their legs are heavily relied upon when it comes to jump shots, rebounding, and moving up and down the court. Therefore, recovery is very important for basketball athletes to stay fresh.

To recover from glycogen-depleting activities, a basketball athlete should have 1.0 – 1.5 g of carbohydrates/kg of bodyweight post-exercise (12). Simple carbohydrates achieve a higher amount of glycogen synthesis. Consumption of protein provides amino acids for muscle repair and encourages a more anabolic hormonal profile (i.e., muscle building) (1). Even if an activity is not enough to be “glycogen-depleting,” including recovery fuel and fluids after practices and workouts may help prevent weight loss associated with the smaller appetites and high energy expenditures common in basketball athletes. Regarding protein amounts, 20 – 25 g per serving have been shown to stimulate muscle protein synthesis (12). Larger athletes may need more, but excessive amounts are not necessary. Some food examples of post-exercise recovery snacks are low-fat Greek yogurt and granola, a peanut butter and jelly or deli meat sandwich, or a bowl of whole grain cereal with low-fat milk.

Liquid forms of protein may be optimal for some athletes due to rapid digestion rate, ensuring entry into the system during post-exercise recovery (12). Liquid forms of protein are also convenient for athletes who are tired, do not have an appetite, or are in a rush and need something quick and convenient.
SLEEP
Basketball is a sport where the majority of games are at night, which means the athletes’ wake and sleep schedules are pushed back much later than most. Sleep schedules are often inconsistent depending on what their schedule is like for the next day. Classes, tournament play, practice times, and travel all can factor into how much sleep basketball athletes get each night and when they wake the next morning. Often during breaks or off-days, they will sleep until the early afternoon, which may narrow their window to fuel their bodies enough to maintain and recover properly. They should be educated on making fueling a priority during these times to ensure they maintain muscle.

If basketball players are not able to sleep in they could be at risk for insufficient sleep. This may add just as much of a challenge to maintaining body composition and athletic performance as any other factor. Mah et al. found shooting accuracy improved with an increase in nightly sleep time (10). Both free throw percentage and three-point field goal percentage increased by 9% (10).

The restoration of muscle glycogen stores appears to be hindered by more than 30 hours of sleep deprivation (15). Sleep deprivation can be defined as prolonged periods of time without sleep. This does not seem far outside the box for basketball athletes considering their hectic schedules and travel itineraries (6). Their late wakeup times also throw off a typical day of eating. These athletes should be educated on the need to fit in enough high-quality calories to maintain muscle mass.

VITAMIN D
Basketball athletes are at risk for vitamin D deficiency, which puts them at a higher risk for stress fractures, skeletal muscle pain, and respiratory tract infections (5). Since sun exposure has the greatest impact on vitamin D levels, basketball athletes are at risk for insufficiency due to indoor participation limiting their sun exposure. Vitamin D synthesis is triggered endogenously (internally) when ultraviolet rays are exposed to the skin. Athletes with darker skin pigmentation and tones do not synthesize vitamin D as well as others, which puts them at even higher risk for insufficiency (9).

Many experts suggest the current Recommended Dietary Allowance (RDA) for vitamin D, which is 600 international units (IU), should be set higher (7,9,14). However, studies have shown that athletes’ diets in the United States often do not even meet 200 IU per day (7,14). Naturally occurring vitamin D-rich food sources include swordfish, tuna, egg yolks, salmon, mushrooms, and sardines. Foods fortified with vitamin D include milk, yogurt, margarine, cereals, and orange juice.

CONCLUSION
Rapport building and finding the goals and motivations of the basketball athletes are the best ways to gain insight into how nutrition can help them. Relating nutrition and their on-court performance can help basketball athletes see how they can benefit from making thoughtful nutritional decisions. Through a combination of education and communication with players, athletic trainers, and coaches, and having a strong nutrition presence, teams are more likely to buy in and become consistent with basketball nutrition strategies.

REFERENCES


### About the Author
Amanda Poppleton joined the North Carolina State University Athletics Department staff in July of 2014. Her current title is the Assistant Director of Sports Nutrition, where she oversees the nutritional needs of the men’s basketball, baseball, softball, men’s soccer, women’s soccer, swimming/diving, cross-country, track, volleyball, gymnastics, and rifle teams. She focuses the most on the men’s basketball team, as she manages their day-to-day nutrition, including at home and on the road. Additionally, she has also held the Sports Nutrition Assistant position at both the University of Georgia and the University of Florida. Poppleton received her Bachelor of Science degree (MFN) from the University of Tennessee in Knoxville, TN. She earned her Master’s degree in Food and Nutrition from Bowling Green State University. Poppleton was one of 12 nominated invitees to the first annual Collegiate and Professional Sports Dietitians Association (CPSDA) Advanced Practice Workshop for upcoming Sports Registered Dietitians (RD) in 2014.

| TABLE 1. SAMPLE RANGES OF DAILY CARBOHYDRATE AND PROTEIN NEED FOR BASKETBALL ATHLETES (1,16) |
|-----------------------------------------------|-----------------------------------------------|
| BODYWEIGHT (LB) | BODYWEIGHT (KG) | CARBOHYDRATE (BASED ON 7 – 9 G/KG) | PROTEIN (BASED ON 1.4 – 1.7 G/KG)|
| 180 | 81.8 | 572.6 – 736.2 | 114.5 – 139.1 |
| 210 | 95.5 | 668.5 – 859.5 | 133.7 – 162.4 |

| TABLE 2. BODY FAT PERCENTAGE FINDINGS IN BASKETBALL ATHLETES (16) |
|-----------------------------------------------|-----------------------------------------------|
| POSITION | GUARDS | FORWARDS | CENTERS |
| Male Athletes | 6 – 11% | 10 – 13% | 11 – 14% |
| Female Athletes | 14 – 17% | - | 18 – 20% |