SPORTS NUTRITION FOR HIGH-INTENSITY, INTERMITTENT ACTIVITY: FUELING THE TEAM SPORT ATHLETE

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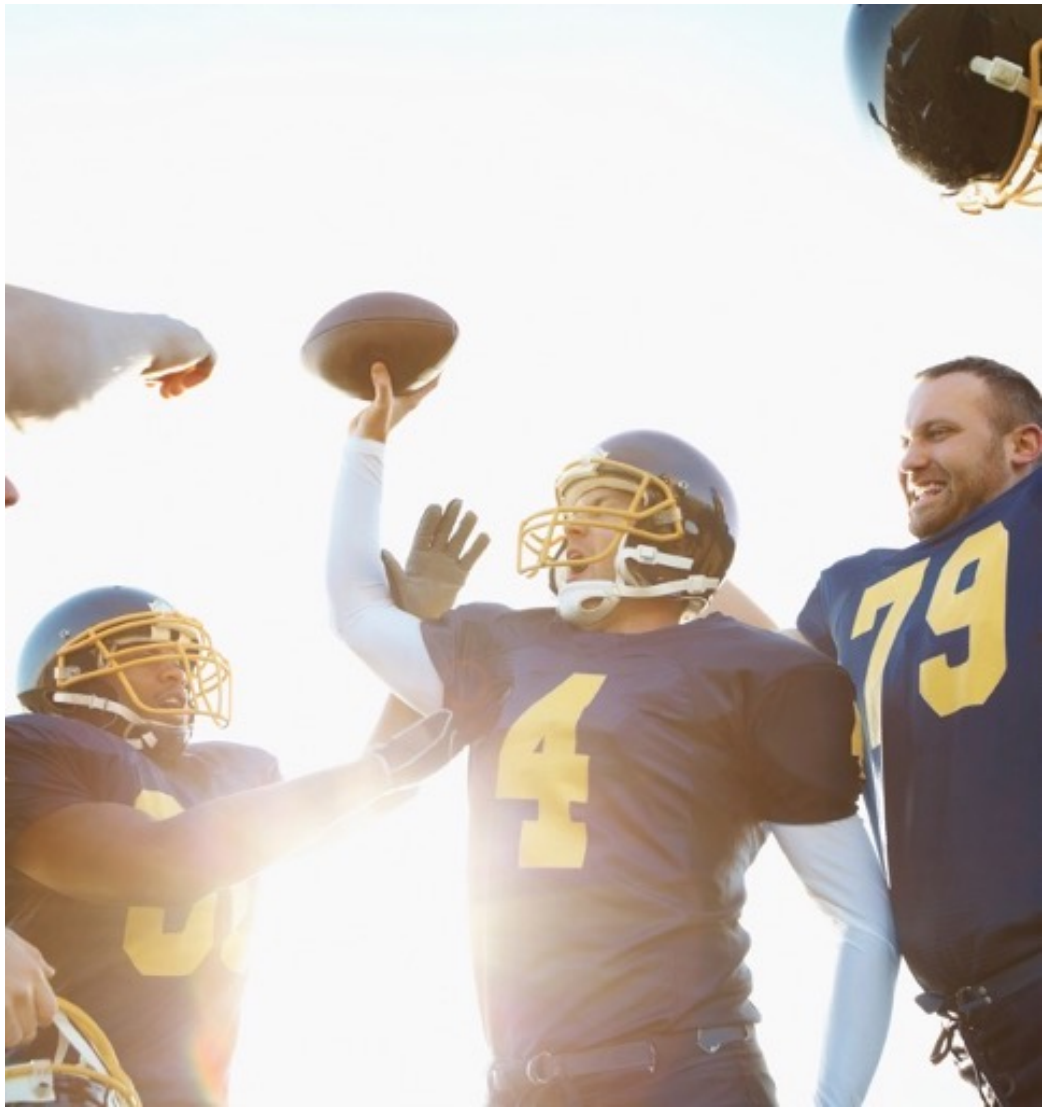
LECTURE OUTLINE

- The Team Sport Athlete
- Energy
- Hydration
- Structure
- Key takeaways



TEAM SPORT ATHLETES







All Athletes:

- Use and need fuel for energy to train/compete
- Sweat and need hydration
- Use muscles, need to be strong and recover

Team Sport Athlete Specifics:

- Mixture of high and low intense activity over specific duration
- Changes in pace/direction (“stop & go”, fast, slow, jumping, forward, backward, lateral)
- May have certain skill involvement (throwing, swinging, kicking, dribbling, catching)
- Can involve physical contests (guarding, pushing, pulling, tackling)
- May involve a ball/puck or other pieces of equipment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ENERGY

CARBOHYDRATES AND PERFORMANCE

Carbohydrates= Muscle Fuel

During Endurance Exercise

- Maintain high rates of carbohydrate oxidation
- Reduce ratings of perceived exertion
- Increase endurance capacity
- Delay the onset of fatigue
- Prevent hypoglycemia

What about for Team Sports?

Cermak & van Loon. *Sports Med*. 2018;43:1139-1155
Jeukendrup A. *Nutrition*. 2004;20:669-677

ENERGY METABOLISM

The duration of a sprint can last several seconds with recovery lasting a few seconds to several minutes during lower intensity periods or breaks.

Since sprinting is primarily reliant on the anaerobic system of ATP generation, phosphocreatine (PCr) and glycogen contribute in almost equal amounts to ATP turnover.

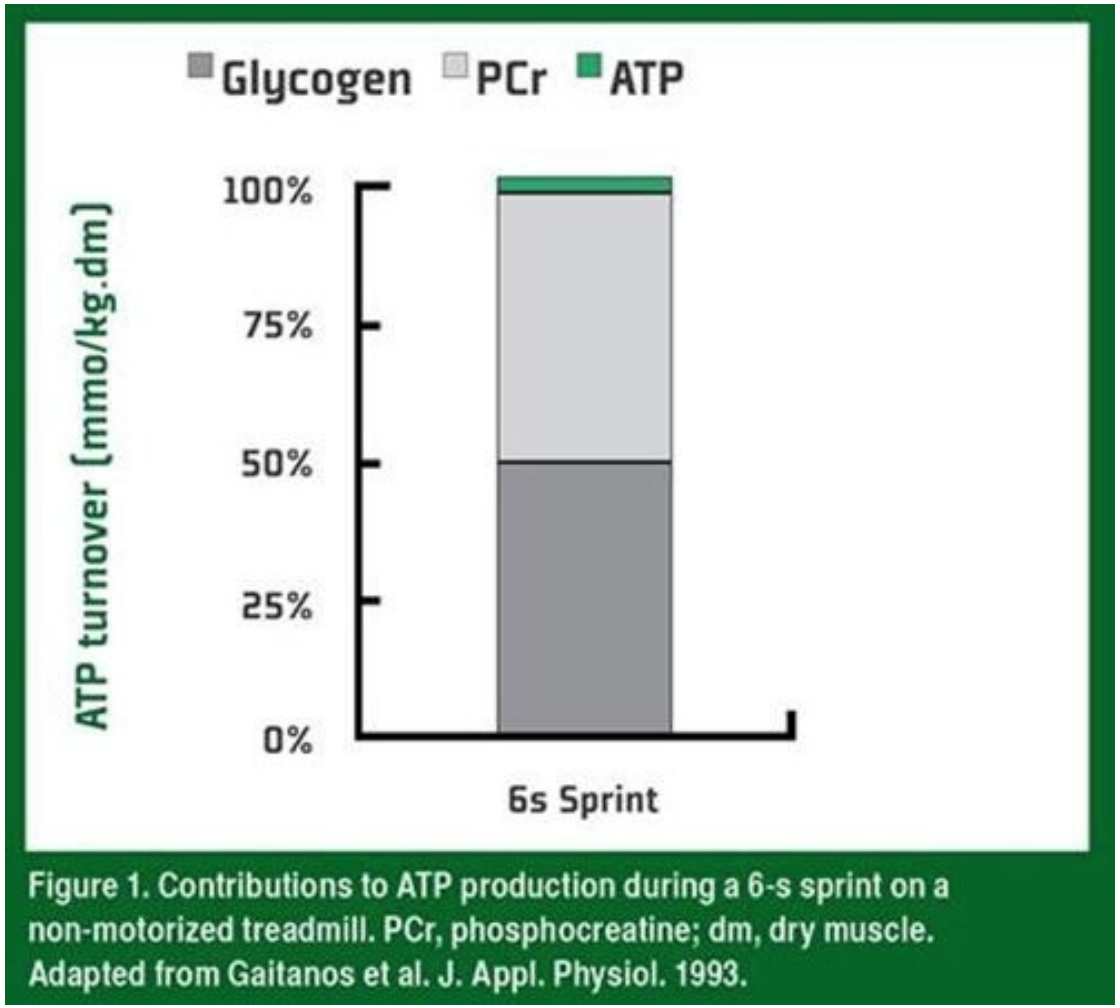

Figure 1. Contributions to ATP production during a 6-s sprint on a non-motorized treadmill. PCr, phosphocreatine; dm, dry muscle. Adapted from Gaitanos et al. J. Appl. Physiol. 1993.

SSE#140

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Spencer M, Bishop D, Dawson B, et. al. *Sports Med*. 2005;35:1025-1044
Gaitanos GC, Williams C, Boobis LH, et. al. *J Appl Physiol*. 1993;75(2):712-719
Williams C and Rollo I. *Sports Science Exchange*. 2015;28(140)1-7

GLYCOGEN DEPLETION

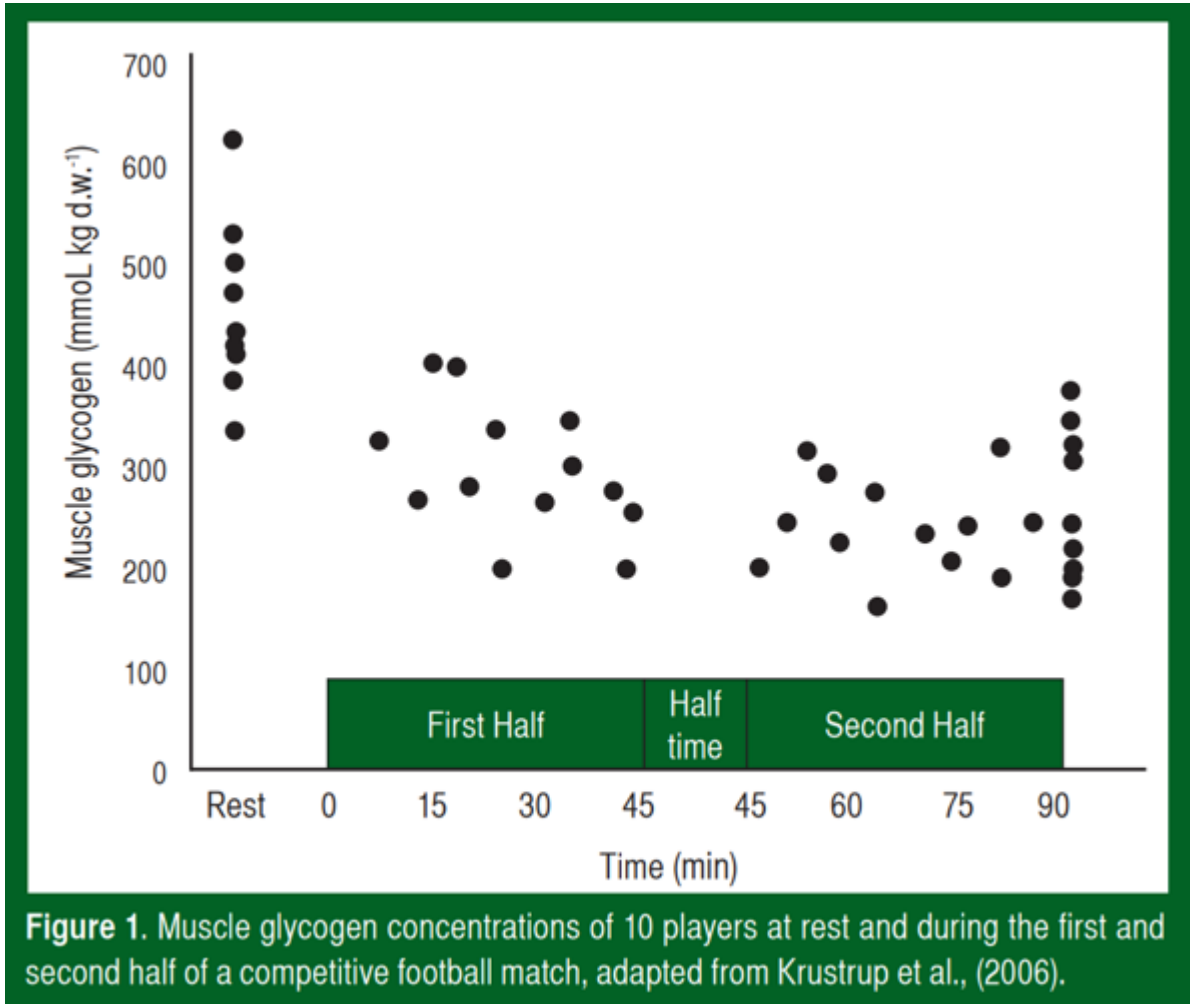

Figure 1. Muscle glycogen concentrations of 10 players at rest and during the first and second half of a competitive football match, adapted from Krustrup et al., (2006).

Muscle glycogen is used during team sport activities! (eg. soccer)

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Rollo I. *Sports Science Exchange*. 2014;27(127)1-8
Krustrup P, Mohr M, Steensberg A, et. al. *Med Sci Sports Exerc.* 2006;38(6):1165-1174
Saltin B. *Med Sci Sports and Exercise.* 1973;5(3):137-146

CARBOHYDRATE RESAERCH & TEAM SPORTS

Studies showing benefits of carbohydrate in team sports:

Intermittent high-intensity exercise: 10 of 12

Sprinting: 5 of 17

Jumping: 1 of 5

Change of Direction/Agility: 4 of 9

Skill: 10 of 17

Baker LB, Rollo I, Stein KW, et. al. *Nutrients*. 2015;7(7):5733-5763

BASKETBALL EXAMPLE

Compared to water, carb intake during a basketball protocol resulted in…

14%

Faster

20 m sprint (4th Q)

37%

Longer

Run time to fatigue

↑

Improved second-half motor skills

↓

Decreased second-half fatigue (POMS)

Welsh RS, Davis JM, Burke JR, et. al. *MSSE*. 2002;34(4):723-731

CARBOHYDRATE RESEARCH & TEAM SPORTS

Field Sports
STRENGTH + POWER

Short distances covered, many short bursts

Field Sports
ENDURANCE

Large distances covered, high speeds

Batting Sports

Lower overall energy demands, long duration

Court Sports

Smaller area, shorter duration, tournaments, substitutions

CARBOHYDRATES ARE ESSENTIAL

- Maintain short energy bursts
- To maintain glycogen stores
- To maintain blood glucose for attention & decision making
- To maintain glycogen over time

Holway & Spriet. *J Sport Sci*. 2011;29(1):S115-125

DAILY RECOMMENDATIONS

Recommendations based on body weight

Team Sport Athletes (3-5 or 5-7g/kg)

A wide range of carbohydrate is recommended since each sport is different. Within the sport, needs also vary by position and intensity.

Choose a starting point and then alter within the range based on tolerability and energy level

Type of Activity	Daily Carbohydrate Targets
Low intensity or skill-based activities	3-5 g/kg
Moderate exercise (~1h per day)	5-7 g/kg
Endurance program (~1-3 h/d mod-high intensity exercise)	6-10 g/kg
Extreme commitment (>4-5 h/d mod-high intensity exercise)	8-12 g/kg

Burke LM, Hawley JA, Wong SHS, et. al. *Journal of Sports Science*. 2011;29(1):S17-S27

B/D/A RECOMMENDATIONS

For a performance benefit

1-4 Hours Before

1-4 g/kg

1 Hour Before

~25-30g

During

30-60 g/h

≥ 60 min duration

Performance goal

After

1.0-1.2 g/kg

< ~8 h until next training or competition

Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc.* 2016;48(3):543-68
Burke LM, Hawley JA, Wong SHS, et. al. *Journal of Sports Science.* 2011;29(1):S17-S27
Howlett K, Angus D, Proietto J, et. al. *J Appl Physiol*. 1998;84(4):1413-1417

CARBOHYDRATE TYPES: BEFORE

1-4 Hour Prior to Exercise ("Pre-game Meal")

- Higher glycemic carbohydrate-rich food foods
  - Cereals, breads, potatoes, rice, pasta, etc
- Minimal fiber, fat, and protein
- What works for the athlete! (Trial and error best while training vs games)

<1 Hour Prior to Exercise

- Same rules as above but may come in form of gels, gummies, and/or sports drinks (falls in line with "During" types)

Burke LM, Hawley JA, Wong SHS, et. al. *Journal of Sports Science*. 2011;29(1):S17-S27
Jeukendrup & Killer. *Ann Nutr Metab*. 2010;57(2):18-25
Wee SL, Williams C, Tsintzas K, et. al. *J Appl Physiol*. 2005;99(2):707-714

CARBOHYDRATE TYPES: DURING

- Choose mostly Fast vs Slow Carbs

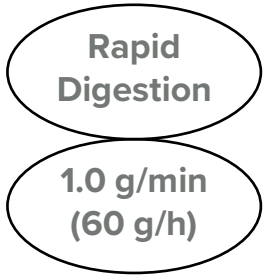
  Fast = easily digested, rapidly absorbed and oxidized

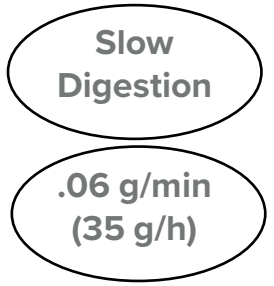
  Slow= slowly digested, not as rapidly absorbed and oxidized

- A high rate of carbon oxidation = better performance
- Fructose is appropriate in small amounts when combined with Fast Carbs
- The form in which CHO is consumed (gel, drink, gummy) does not influence oxidation rates and athletes should choose the form that works best for them

Fast

Glucose (dextrose)
Maltose
Sucrose
Maltodextrins
Amylopectin





Slow

Fructose
Galactose
Trehalose
Isomalatulose
Amylose

Baker LB, Rollo I, Stein KW, et al. *Nutrients*. 2015;7:5733-5763
Pfieffer B, Stellingwerff T, Zaltas, E et al. *Medicine & Science in Sports & Exercise*. 2010;42:2030-2037
Thomas DT, Erdman KA, Burke LM. *Medicine & Science in Sports & Exercise*. 2016;48:543-568

AVOIDING GI ISSUES

- The stomach is an organ that can be trained
- Gradually increase the amount of fuel intake during exercise to meet the recommendations
- Consuming more carbohydrates than an athlete is used to can result in a “sloshy” stomach and other more intense gastrointestinal (GI) discomfort

Stellingwerff & Jeukendrup. *JAP*. 2011
Murray R. *Curr Sports Med Rep*. 2006;5(3):161-164

CARBOHYDRATE TYPES: AFTER

Types may vary, depending on next exercise bout

Higher glycemic vs lower glycemic carb foods (within 24 hours/same day)

Adding protein while equating calories result in a similar rate of glycogen resynthesis

Gunnarsson T, Bendiksen M, Bischoff R, et. al. *Scand. J. Med. Sci. Sports*. 2013;23(4):508-515
Burke LM, Collier GR, Hargreaves M. *J Appl Physiol*. 1993;75(2):1019-1023

SUMMARY: CARBOHYDRATE ENERGY

- Team sports, although very diverse, contain commonalities including:
  - a mixture of high and low intense activity over specific duration
  - changes in pace/direction
  - rely on skill
  - can involve physical contests
  - may involve a ball/puck or other pieces of equipment
- Glycogen is a major energy source during sprinting as well as overall team sport activity
- Carbohydrate is well known to improve aspects of team sports performance
- Daily feeding of carbohydrates depending on the activity and body size are crucial
- Acutely, feeding carbohydrate before and during can top off fuel supply and improve performance
- Types of carbs in addition to amount and timing are also important (fast and slow)
- It is imperative that the athlete personalize their carb intake based on recommendations and tolerance with trial and error in a practice/training setting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HYDRATION

HYDRATION

- Water ~ 60% of body weight
- Roles in numerous physiological processes
- Evaporation of sweat cools the body
- Performance suffers with fluid/sweat losses >2% body weight

Sawka MN, Burke LM, Eichner ER, et. al. *Med Sci Sports Exerc*. 2007;39(2):377-390

CONSEQUENCES OF DEHYDRATION

- Dehydration impairs the ability to remove heat
- Increased cardiovascular strain
- Altered metabolic & CNS function
- Increased glycogen use
- Decreased fluid absorption
- Risk of heat illness

Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48(3):543-568

DEHYDRATION AND PERFORMANCE

- 2% dehydration = decreases in endurance performance
- Performance decrements also seen in:
  - Anaerobic/high intensity performance
  - Muscle strength
  - Muscle power
  - Cognition

Does this mean dehydration impacts team sport performance?

Judelson DA, Maresh CM, Farrell MJ, et. al. *Med. Sci. Sports Exerc.* 2007;39(10):1817–1824
Grandjean AC & Grandjean NR. *J Am Coll Nutr.* 2007;26(5):549S–554S
Casa DJ, Stearns RL, Lopez RM, et. al. *J Athl Train.* 2010;45(2):147–156
Judelson DA, Maresh CM, Anderson JM, et. al. *Sports Med.* 2007;37(10):907–921

SOCCER EXAMPLE

- Fluid either was or was not provided during a 90-min LIST test
- Resulted in dehydration of 1.4% and 2.5%, respectively
- For 2.5% dehydration:
  - RPE was higher (panel A)
  - Sprint time was slower at the end of LIST (panel B)
  - Also, football-specific skill performance (i.e., dribbling skill) decreased by 5% (was maintained with 1.4% dehydration)

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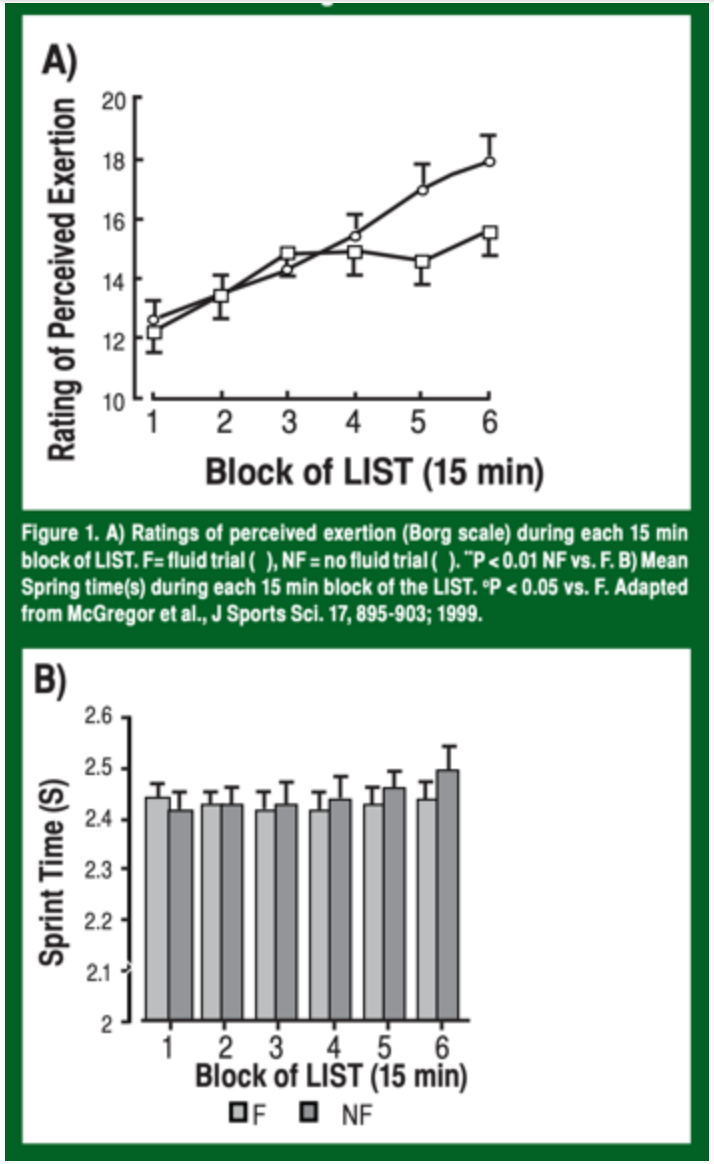


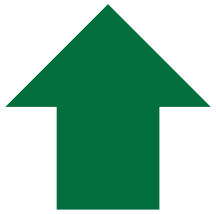
Figure 1. A) Ratings of perceived exertion (Borg scale) during each 15 min block of LIST. F= fluid trial ( ), NF = no fluid trial ( ). ¨P < 0.01 NF vs. F. B) Mean Spring time(s) during each 15 min block of the LIST. °P < 0.05 vs. F. Adapted from McGregor et al., J Sports Sci. 17, 895-903; 1999.

Laitano O, Runco JL, Baker L. *Sports Science Exchange*. 2014;27(128)1-7
McGregor SJ, Nicholas CW, Lakomy, HK, et. al. *J Sports Sci*. 1999;17(11):895-903

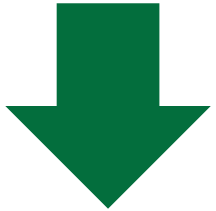
BASKETBALL EXAMPLE

2% Dehydration vs. Euhydration

Repeated sprint times



Defensive slide times



Shooting %

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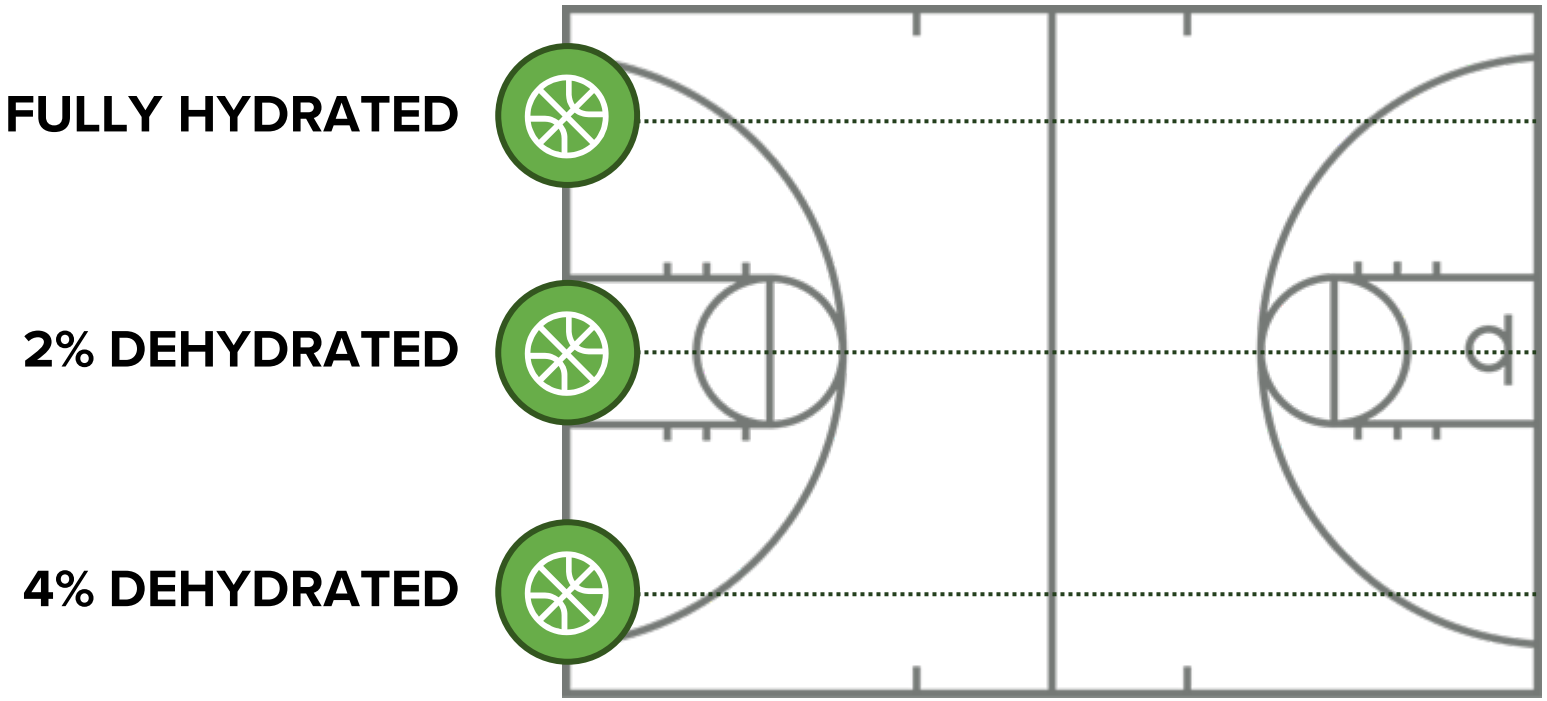
Baker L. *Sports Science Exchange*. 2016;28(165)1-4
Dougherty KA, Baker LB, Chow M, et. al. *Med Sci Sports Exerc*. 2006;38(9):1650-1658

PROGRESSIVE DEHYDRATION



FEWER SHOTS MADE and SLOWER SPRINT SPEED as level of dehydration increases

Baker LB, Dougherty KA, Chow M, et. al. *Med Sci Sports Exerc*. 2007;39(7):1114-1123

CURRENT BEHAVIORS

It is not uncommon for team sport athletes to show up to practices or games already dehydrated (USG > 1.020). For example, in specific studies it was found:

- 89% youth soccer players showed up to a morning training camp dehydrated
- 15 out of 29 professional male basketball players started games dehydrated

- Prevalent in football players due to large daily sweat losses with inadequate replenishment

Arnaoutis G, Kavouras SA, Kotsis YP, et. al. *Int J Sport Nutr Exerc Metab*. 2013;23(3):245-51
Aragón-Vargas LF, Moncada-Jimenez J, Hernandez-Elizondo J, et. al. *Eur J Sport Sci*. 2009;9(5):269–276
Duffield R, McCall A, Coutts AJ, et. al. *J Sports Sci*. 2012;30(10):957-965
Osterberg KL, Horswill CA, Baker LB. *J Athl Train*. 2009;44(1):53-57
Brandenburg JP & Gaetz M. *Int J Sport Nutr Exerc Metab*. 2012;22:347-352
Godek SF, Bartolozzi AR, Burkholder R, et. al. *J Ath Train*. 2008;43(2):184–189

CURRENT BEHAVIORS

Athletes do not always replenish the fluids needed during exercise:

- Soccer- only 50% replenishment
- Thirst is not a reliable indicator
- Limited availability?
- Soccer - gastric emptying to replenish unable to keep up with sweat losses

Figure 2

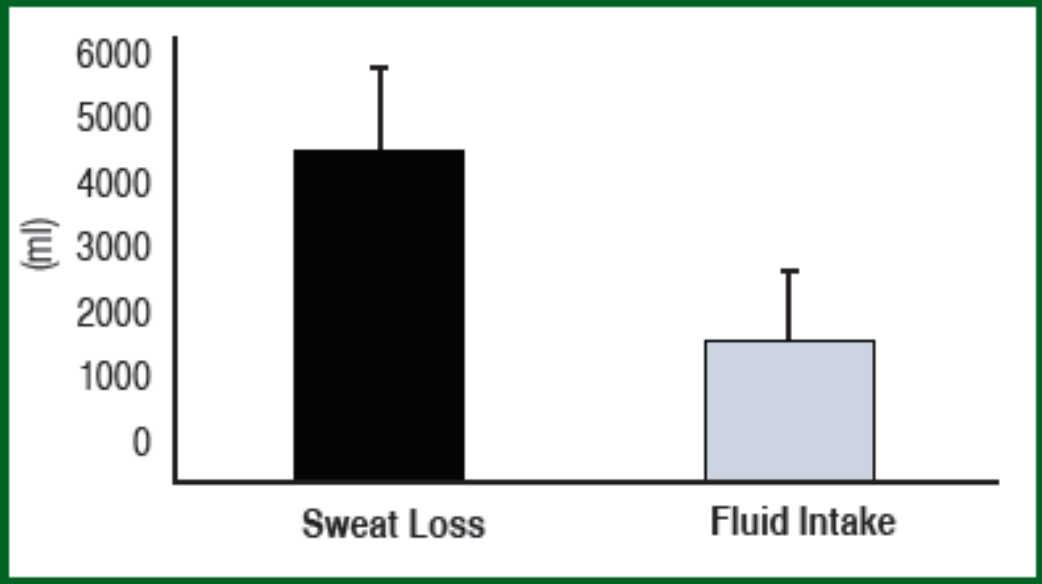


Figure 2. Fluid balance in professional soccer players (mean ± SD; n = 17) resulting in 3.4% dehydration. Adapted from Aragón-Vargas et al., *Eur. J. Sports. Sci. 9(5):269-276; 2009.*

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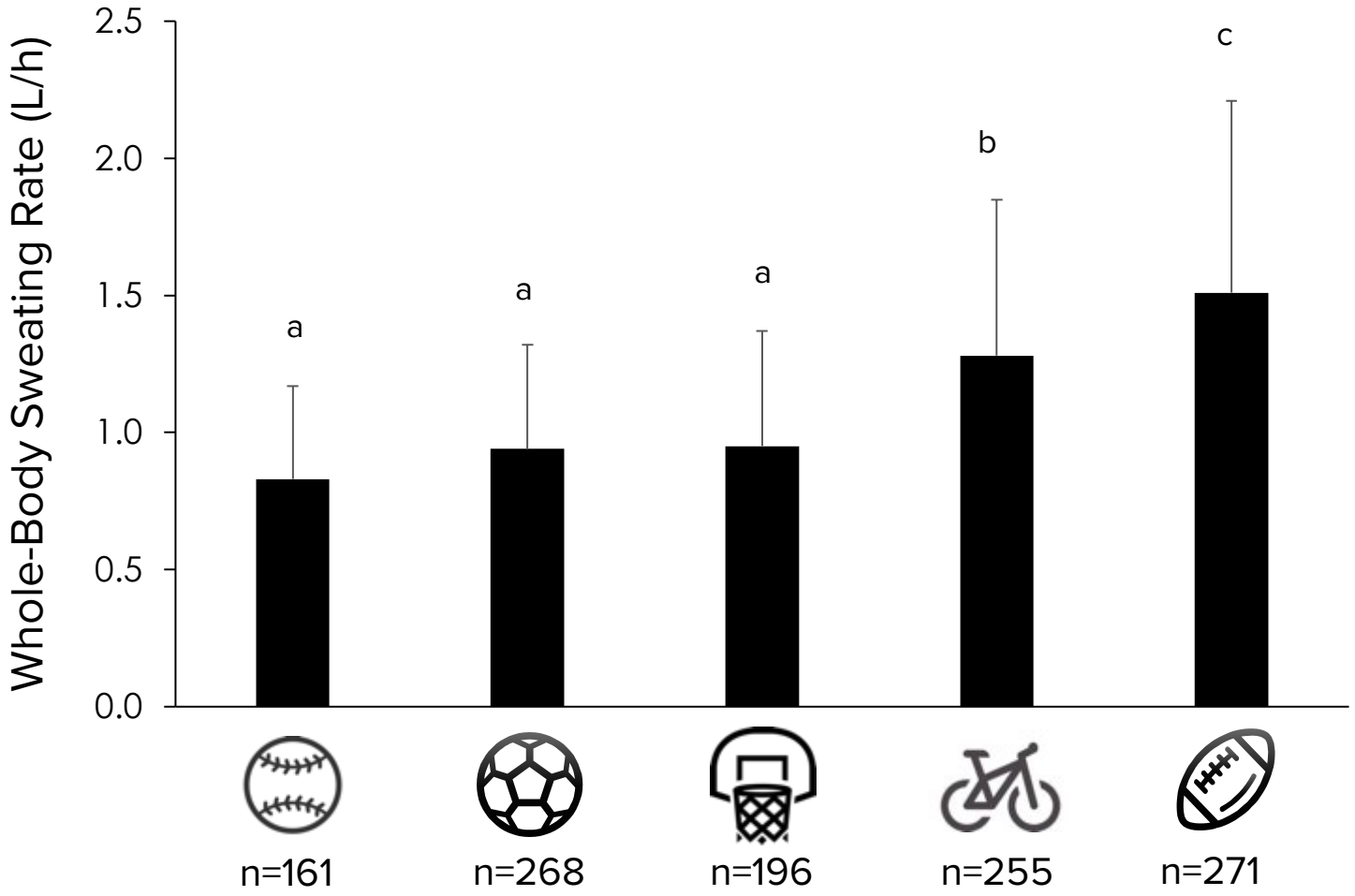
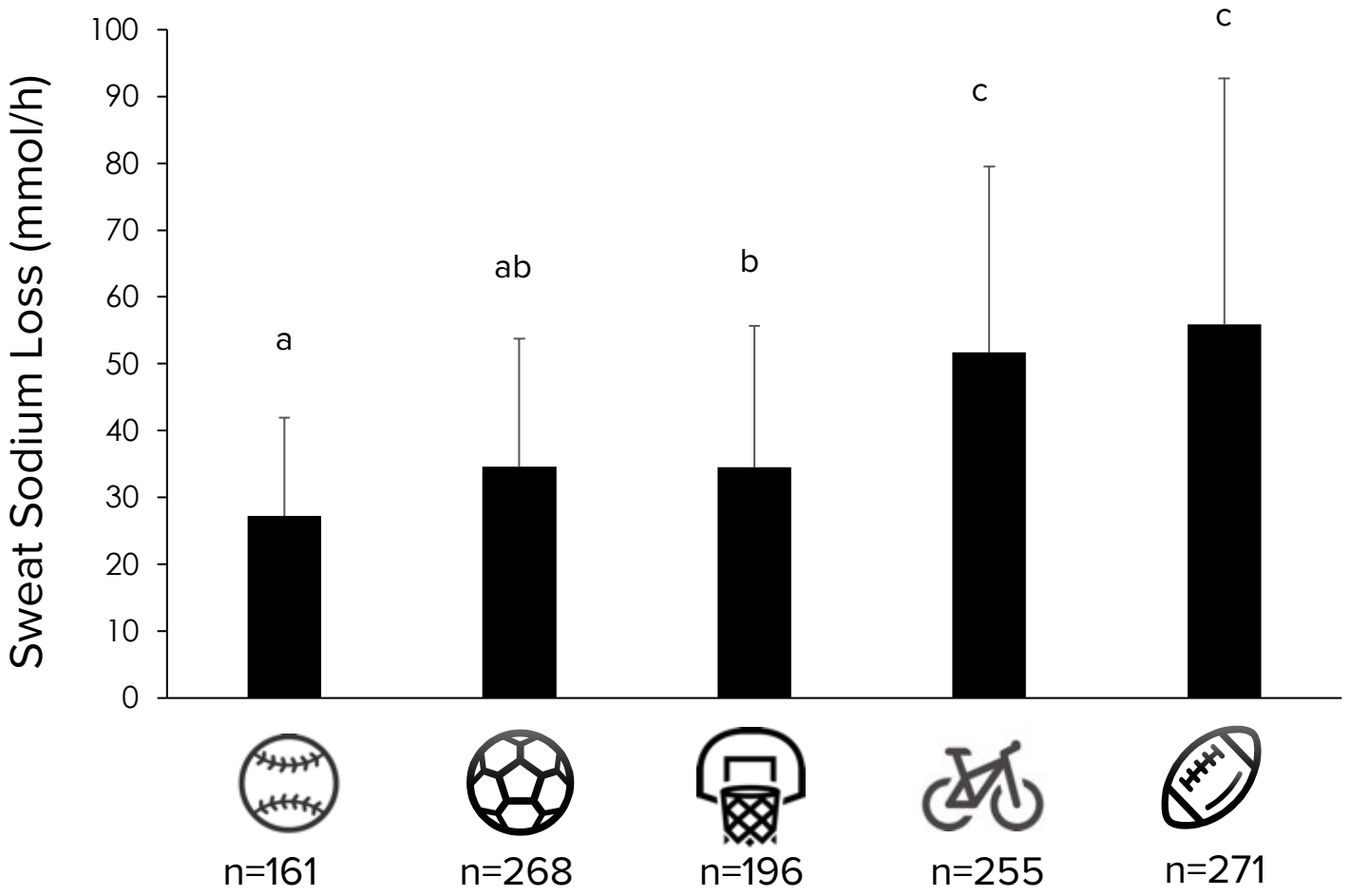
Da Silva RP, Mundel T, Natali AJ, et. al, *J Sports Sci*. 2012;30(1):37-42
Shirreffs SM, Sawka MN, Stone M. *J Sports Sci*. 2006;24(7):699-707
Broad EM, Bure LM, Cox GR, et. al. *Int J Sport Nutr*. 1996;6:307-320
Laitono O, Runco JL, Baker L. *Sports Science Exchange*. 2014;27(128):1-7

SWEATING RATE: NORMATIVE DATA BY SPORT



Sports sharing same letter are not different ($p>0.05$)

SODIUM LOSS: NORMATIVE DATA BY SPORT



Sports sharing same letter are not different ($p>0.05$)

EXAMPLE HYDRATION STRATEGY

Example of a football player that underwent a fluid balance assessment during training:

- Pre weight- 100kg Post weight- 97kg

  1L fluid consumption (96kg corrected)
- Sweat test exercise duration: 120 minutes
- Sweating rate: 100-96=4 L / 2 hours = 2 L / hour
- 3-hour game = 6 L or 6 kg body mass loss
  (in similar conditions at similar intensity as sweat test)
- Drinking volume (sweat loss – 2% window):
  6L-2L = 4 L
- **Hydration strategy: 4 L/3 h = 1333 ml/h OR 445 ml/20 min; 1 L per quarter**

SUMMARY: HYDRATION

- Dehydration can decrease performance within the team sport setting
- Efforts to hydrate should be made to avoid fluid losses of ≥ 2% of body mass
- Risk for fluid imbalances vary among sports because of differences in fluid availability or opportunity for hydration breaks
- Sweat rates and sodium losses vary between and within sports, so you need to know your losses whenever possible throughout a season
- Take advantage of assessment techniques and use collectively (thirst, urine color, body weight changes, USG)
- Drink 16-20 fl oz for every pound lost after activity
- Include sodium with fluids to improve palatability, stimulate drinking, and retain fluid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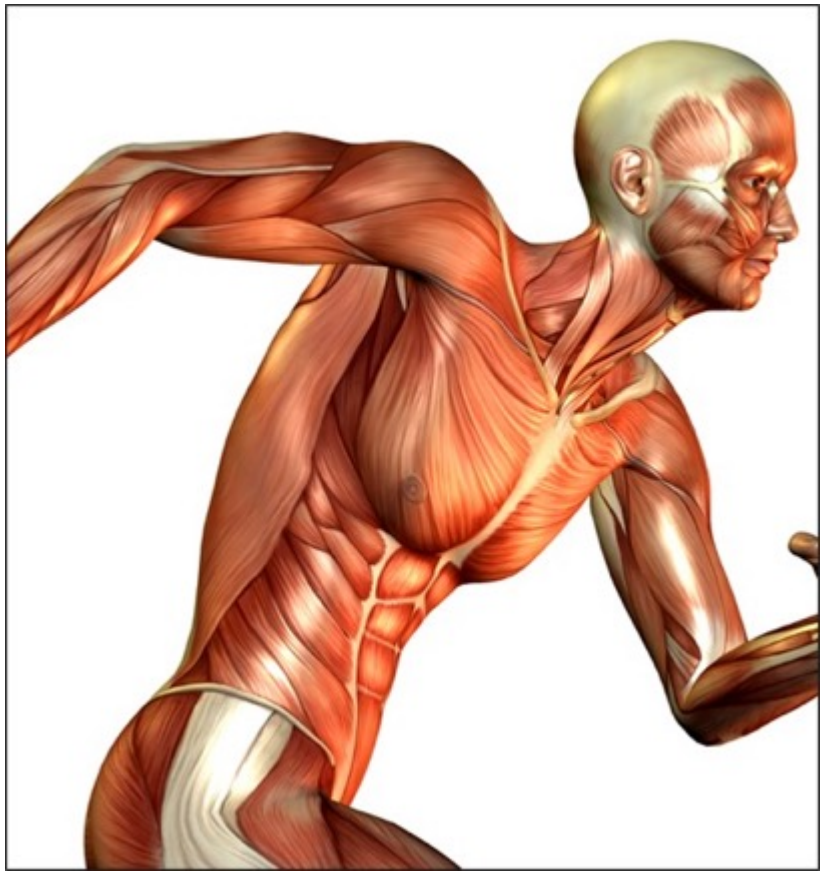
STRUCTURE

PROTEIN AND THE BODY

- Protein ~ 45% of body
- Numerous roles in the body
- Important component of recovery nutrition and muscle repair
- Important component of injury rehabilitation
- Team sport athletes sustain eccentric loads + plyometrics + physical contact = increased muscle damage/CK levels



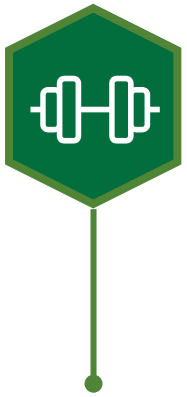
Medina D, Lizarraga A, Drobnic F. *Sports Science Exchange*. 2014;27(132):1-5
Kraemer WJ, Looney DP, Martin GJ, et. al. *J Strength Cond Res*. 2013;27(2):434-441

DAILY PROTEIN RECOMMENDATIONS

Recommended dietary allowance: *0.8 g/kg/d*

TEAM SPORTS

1.2-1.7
G/KG/D



STRENGTH

1.6-1.7
G/KG/D

POWER

1.5-1.7
G/KG/D

ENDURANCE

1.2-2.1
G/KG/D

Slater & Phillips. *J Sport Sci.* 2011;29(1):S67-77
Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc.* 2016;48(3):543-68

PROTEIN FOR RECOVERY

Amount: How much protein to be effective?

Timing: What is the best time after exercise to eat protein?

Type: Which source of protein is most beneficial for recovery?

PROTEIN AMOUNT FOR RECOVERY

260 LBS

X 0.25 (g/kg)

30G PROTEIN

~0.25-0.30

g/kg

185 LBS

X 0.25 (g/kg)

21G PROTEIN

Moore DR, Robinson MJ, Fry JL, et. al. *Am J Clin Nutr*. 2009;89(1):161-168
Witard OC, Jackman SR, Breen L, et. al. *Am J Clin Nutr*. 2014;99(1):86-95

PROTEIN TYPE

Leucine-Rich Foods	
Egg, white, raw, fresh	4.23
Whey, protein dried	4.00
Seaweed, spirulina, raw	3.92
Chicken, broilers or fryers, breast, meat only, cooked, rotisserie	3.84
Fish, tuna, light, canned in water, drained solids	3.57
Turkey, fryer-roasters, light meat, meat only, raw	3.57
Fish, cod, Pacific, cooked, dry heat	3.55
Greek yogurt	3.50
Pork, fesh, loin, boneless	3.38
Chicken breast, oven roasted	3.04
Beef, round, top round, lean only	3.00
Cheese, cottage, nonfat, uncreamed, dry, large or small curd	2.88
Cheese, low fat, cheddar or colby	2.48
Tofu, silken, extra firm	2.32
Milk, reduced fat (2%)	1.33

The best protein for recovery will have these three critical components to drive muscle protein synthesis:

1. A complete protein
2. Rapidly digested & absorbed
3. Rich in leucine

While egg and whey have the highest leucine values, from a practical standpoint all foods on this list are appropriate. For vegetarian and vegan athletes, blend foods for complete amino acids. Vary the sources!

SSE#144

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Baar K & Heaton L. *Sports Science Exchange.* 2015);28(144):1-6

PROTEIN AMOUTN + TIMING

Team sport athletes should:

- consume ~0.25 g/kg body mass protein
- immediately after training
- every 3-4 h through the day

SSE#144

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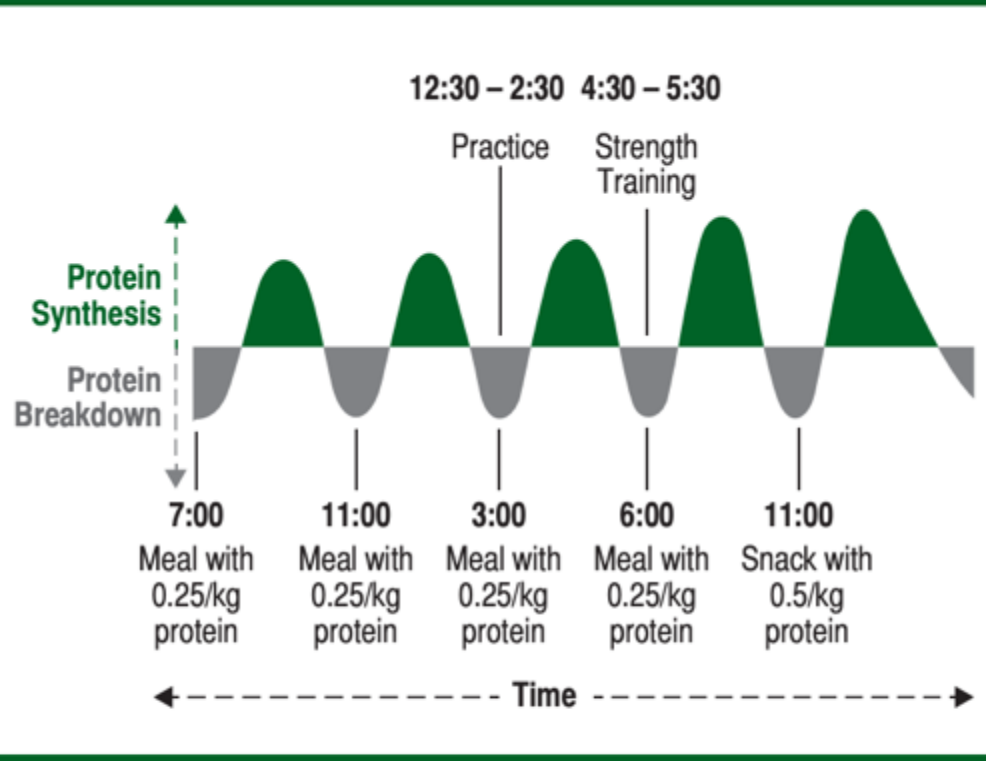

Figure 2: Optimized Daily Food Intake

A typical eating and training plan for optimal recovery during the football season. Note first that the training is positioned into the day around the timed feedings so that there is less need for supplementation and more of the recovery nutrition can be accomplished using whole foods. The second thing to note is that after training there is greater protein synthesis in the working muscles every time the athlete eats for the next 24 h.

Areta JL, Burke LM, Ross ML, et. al. *J Physiol*. 2013;591(9):2319-2331
Moore DR, Robinson MJ, Fry JL, et. al. *Am J Clin Nutr*. 2009;89(1):161-168
Baar K & Heaton L. *Sports Science Exchange*. 2015;28(144):1-6

PROTEIN TIMING BEHAVIORS

In one study, eating patterns found in high school basketball players:

- small, protein-deficient breakfast
- moderate-protein lunch
- large-protein dinner
- spread out 5-6 hours
- negative protein balance

Athletes need guidance not only eating protein after practice, but establishing a pattern throughout the day, taking into account practice times and travel

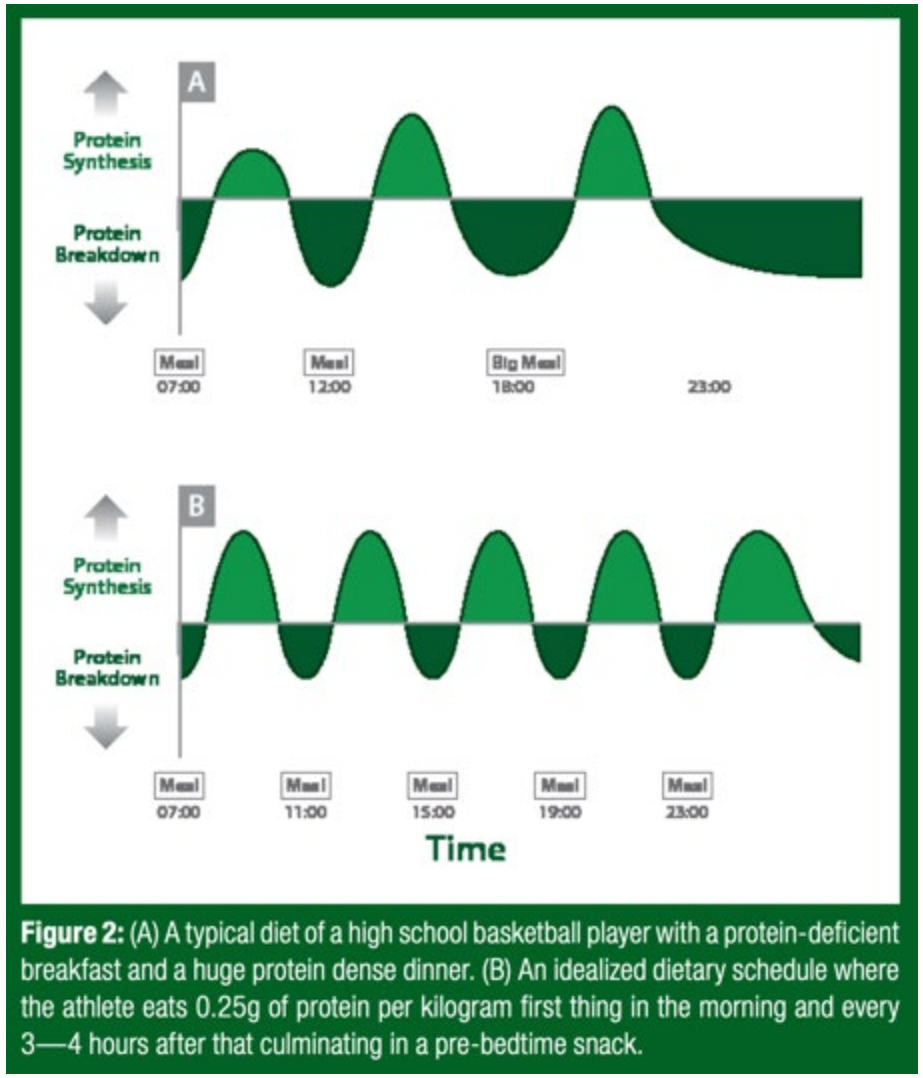

Figure 2: (A) A typical diet of a high school basketball player with a protein-deficient breakfast and a huge protein dense dinner. (B) An idealized dietary schedule where the athlete eats 0.25g of protein per kilogram first thing in the morning and every 3—4 hours after that culminating in a pre-bedtime snack.

SSE#166

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Areta JL, Burke LM, Ross ML, et. al. *J Physiol*. 2013;591(9):2319-2331
Baar K. *Sports Science Exchange*. 2016;28(166):1-4

PROTEIN AND SLEEP

- Protein intake right before bed can improve muscle recovery
- Casein (slow-digesting protein)
    - Higher amount (30-40 g)
- Could be beneficial during the season when:
    - Frequent games (baseball, basketball)
    - High muscle damage (football, rugby, hockey)

Res PT, Groen B, Pennings B, et. al. *Med Sci Sports Exerc.* 2012;44(8):1560-1569
Snijders T, Res PT, Smeets JSJ, et. al. *J Nutr.* 2015;145(6):1178-1184
Snijders T, Trommelen J, Kouw IWK, et. al. *Frontiers in Nutrition.* 2019

SUMMARY: PROTEIN

- Protein is a critical nutrient for muscle repair and recovery especially for team sport athletes who sustain high amounts of muscle damage.
- Daily amounts vary between athletes but are higher than the RDA.
- Protein should be consumed post-practice, every 3-4 hours throughout the day and before sleep.
- Types of protein should include complete protein sources that are quickly digested and absorbed and rich in leucine (whey and animal products meet all these criteria).
- Eating the right amount and types of protein at the right times contributes to optimal recovery for a team sport athlete throughout a season with high physiological demands.

EXAMPLE: PLANS FOR BASKETBALL PLAYERS

SAMPLE MENU: 63 KG (140 POUND) PLAYER

- **Breakfast:** 2 cups Life Cereal, 300 ml (10 oz) skim milk, banana, 300 ml (10 oz) orange juice
- **Snack:** Apple, 2 TBS peanut butter, 28 g (1 oz) pretzels
- **Lunch:** 1 Turkey Sandwich on Wheat Bread, 10 baby carrots, chocolate pudding cup
- **Snack (pre-practice):** 600 ml (20 oz) Gatorade, granola bar
- **Dinner:** 1.5 cups spaghetti with marinara, tossed salad with dressing, 3 pieces garlic toast, 240 ml (8 oz) skim milk

2557 kcal; 6.5 g Carbohydrate/kg body mass; 1.4 g Protein/kg body mass

SAMPLE MENU: 81 KG (180 POUND) PLAYER

- **Breakfast:** 2 cups Life Cereal, 360 ml (12 oz) skim milk, banana, 360 ml (12 oz) orange juice
- **Snack:** Apple, 2 TBS peanut butter, 56 g (2 oz) pretzels
- **Lunch:** 2 Turkey Sandwich on Wheat Bread, 10 baby carrots, chocolate pudding cup
- **Snack (pre-practice):** 600 ml (20 oz) Gatorade, granola bar
- **Dinner:** 3 cups spaghetti with marinara, tossed salad with dressing, 3 pieces garlic toast, 360 ml (12 oz) skim milk
- **Evening Snack:** 360 ml (12 oz) blueberry banana smoothie

3262 kcal; 6.5 g Carbohydrate/kg body mass; 1.6 g Protein/kg body mass

- Daily carbohydrate intake = 5-7g/kg
- Daily protein intake = 1.2-1.7g/kg
- Carbohydrates from fruits, vegetables, and whole grains for fuel.
- Protein from high quality source animal products for recovery.
- Meals/snacks spread throughout the day and evening for optimal energy and recovery

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EXAMPLE: PREGAME

- The player arrives to the locker room, weighs himself in the bathroom wearing compression shorts (219lbs)and then gets taped and dressed. He goes to the bathroom and notices even though his urine is not as dark, his USG was **1.021** so he continues to drink fluids steadily.
- At 12pm the whole team heads out for warmups and he decides to eat a banana before going out. When he arrives back to the locker room from warm-ups he takes a 20 oz sports drink that the team sports dietitian is handing out to the team.
- Overall, the player ingested **~60 g carbohydrates** from the banana and sports drink within 1 hr leading up to kickoff. He's ready to go!

EXAMPLE: DURING GAME

- The ball is kicked off a little after 1pm. Because there are many breaks in play, the player has ample opportunity to consume fluids and carbohydrates in amounts and products that he tolerates. He has undergone a sweat test during practice so he and the sports dietitian know how much fluid, sodium, and carbohydrate he needs during the game.
- He takes advantage of the times he is on the bench between each series to drink a combination of sports drinks and water.
- When he arrives back in the locker room during halftime, he adds a salt packet to a sports drink and also eats some gummies to refuel.
- For the second half of the game, he continues to drink a combination of sports drinks and water during his breaks on the bench.

EXAMPLE: POSTGAME

- After winning the game, the player arrives back in the locker room at about 4pm where a ready-to-drink carbohydrate and protein shake **(25g)** is provided by the team sports dietitian. He decides to drink this right away while he weighs out at 217 lbs **(~1% wt loss)**
- After the coach's speech, seeing the athletic trainer, taking a shower, and getting dressed, he leaves the locker room at around 5pm.
- On the way out, he finds a post-game buffet from a local restaurant in the hallway set up by the team sports dietitian. He grabs a pre-packaged meal in a to-go container consisting of a deli sandwich, baked chips, and a fruit salad **(120 g carbs, 30 g protein or 0.3g/kg)** to eat a little later when his stomach can better tolerate food.

KEY TAKEAWAYS

- ✓ Team sport activities involve high and low intensity activity over specific duration combined with skill performance
- ✓ Carbohydrate energy, hydration, and protein needs will be quite different compared to those seen with endurance type sports.
- ✓ Carbohydrates are the primary fuel during high intensity training and competition and should therefore be emphasized at many points during the day and around activity for glycogen replenishment and to meet energy demands
- ✓ Hydration should be tailored to individual needs based on sweat losses and be encouraged outside of activity with team sport athletes since many may show up to training or competition already dehydrated.
- ✓ Protein also plays a key role in many functions of the body and should be strategically incorporated with respect to time, amount, and type to help enhance recovery from highly damaging team sports

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