



PERFORMANCE NUTRITION

WHAT WORKS...WHAT DOESN'T
WHAT'S LEGAL...WHAT'S NOT

SPORTS DIETITIANS

- **Performance Nutrition Professionals Who:**
 - Practice *Evidence-Based* Sports Nutrition
 - Medical Nutrition Therapy
 - Help enhance the performance of athletes
 - Aid in recovery after exercise
 - Direct food and dietary supplement use
 - Play an active role in the recruiting process

SPORTS NUTRITION

■ Master The Basics

- Energy Balance
- Nutrient Timing
- Adequate Protein
- Weight Management & Body Composition Goals
- Adequate Hydration

■ Trendy Topics

- Paleo
- Train low...Compete High
- Intermittent fasting
- Alluring Supplements



THE ATHLETE'S PLATE





Fruit and Vegetable-Based Snacks

1-2 SERVINGS



Pasta / Rice / Wonderbread

2-3 SERVINGS



Coca Cola / PowerAid / Sodas / Energy Drinks

2-3 SERVINGS

**Yogurt / Cheese
Ice Cream / Milkshakes**

3-5 SERVINGS



**Snickers / Snack Crackers
Granola Bars / Candy**

2-4 SERVINGS

Meats and Fast Food

6-11 SERVINGS



The sports nutrition pyramid by many athletes (and many supplement companies)

Evidence-based approach by sports dietitians and other experts



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How would you build a pyramid?

LONG-TERM STRATEGIES THAT WORK

1. **Suitable energy** intake
2. **Replenish** muscle and liver **glycogen** with carbohydrates
3. **Adequate protein** intake for growth and repair of muscle tissue and to promote hypertrophy
4. **Maintain hydration**
5. Consume a diet to maintain **good health**
6. Achieve **healthy weight** and body composition goal

SHORT-TERM STRATEGIES THAT WORK

1. Consume enough food and beverages to delay fatigue
2. Minimize dehydration/hypohydration
3. Employ dietary strategies to benefit performance
 - I. Pre-comp meals, eating during training and/or comp
 - II. Caffeine, Beet Root Juice, Turmeric
 - III. Omega 3 Fatty Acids
4. Intake nutrients to support repair and recovery
5. Appropriate timing of nutrients (protein)

24

-7-

365

1 High-Volume, Low-to-Moderate Intensity / General Preparation Training Phase

- Largest daily amounts of carbohydrates intake in this period (large training days >8 to 10 g/kg/day)
- Periodize caloric and macronutrient intakes towards desired changes in body composition
- Emphasis on nutritional recovery interventions during large training blocks
- Where desired, periodic targeted low-carbohydrates availability training to stimulate aerobic adaptations

1



3

3 Taper & Competition Phase

- Lowest volume of training, with high-intensity, requires reductions in daily caloric intakes to match energy expenditures (~2800 to 4300 kcals/day for ~70 kg athlete)
- Continual monitoring of optimal body composition for competition phase
- Utilization of key trialed ergogenic aids
- Utilization of recovery protocols in competition settings



2

2 High-Intensity / Specific Preparation Training Phase

- Nutrition support high-intensity training (~3500 to 4500 kcals/day for ~70 kg athlete)
- High-quality training sessions supported by high carbohydrates-availability
- Further optimization of body composition targets towards taper and competition phase
- Trial and targeting key ergogenic aid / supplements pre-competition phase



4

4 Recovery Phase / Off-Season (or Injury)

- Nutrition recommendations similar to active to sedentary individual (~2000 to 3000 kcals/day for ~70 kg athlete)
- Some minor weight gain expected and desired
- Ergogenic supplements no longer required



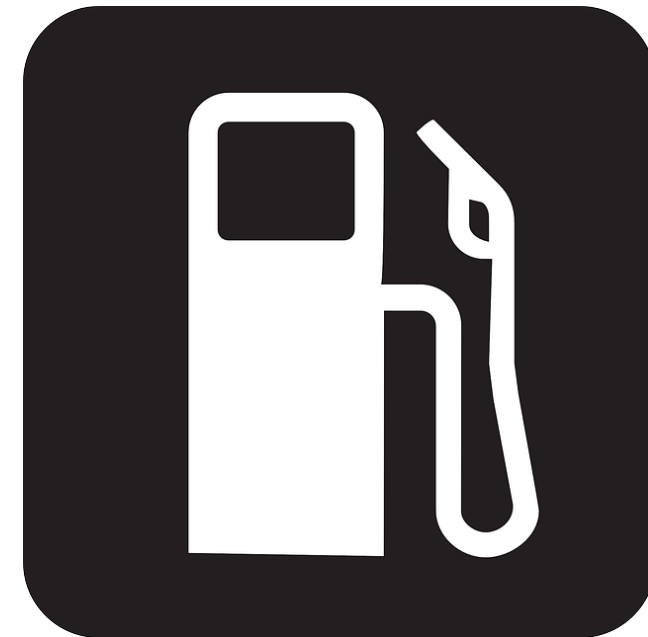
Reference
Iñigo Mujika, Trent Stellingwerff & Kevin Tipton
Int J Sport Nutrition & Exerc Metabolism, 2014

HELP ATHLETES ACHIEVE ENERGY BALANCE



UNDER FUELED

- 2013 study of 52 Female D1 Athletes to determine how the diets compared to current recommendations from Sports Nutrition Professionals
- Soccer, Basketball, Cross-Country, Track and Field
- Anthropometric measures (height, weight, body composition), 24-hour recalls, and 3-day diet records
- Findings:
 - **Daily energy intake (calories) was significantly below requirements**
 - **74% did not meet the minimum requirements for Carbohydrates**
 - **50% did not meet the minimum needs for protein**
 - **No difference in sports**



THE CONSEQUENCES

- Depleted glycogen (carbohydrate) stores
- Lowered ability to improve lactate threshold, speed, and maximal strength
- More susceptible to the immunosuppressive effects of exhaustive exercise — more prone to get injured and sick
- Without enough protein, muscles cannot adapt properly to training, even if athletes are getting enough overall energy

THE ROLE OF PROTEIN



Beef



Salmon



Fish



Chicken



Almonds



Peas



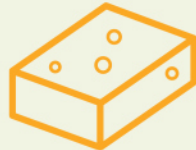
Milk



Soybean



Shrimp



Tofu



Cheese



Egg



Fried Egg



Bacon



Meat



Yogurt

HOW TO BUILD MUSCLE



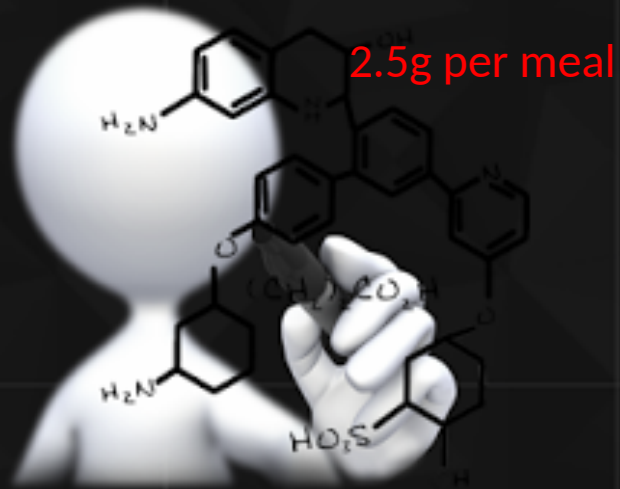
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Positive muscle protein balance is achieved when the rate of new muscle protein synthesis exceeds that of muscle protein breakdown

Muscle mass gain is maximized through the synergistic effect of resistance training and adequate protein intake

HOW TO BUILD MUSCLE



25g

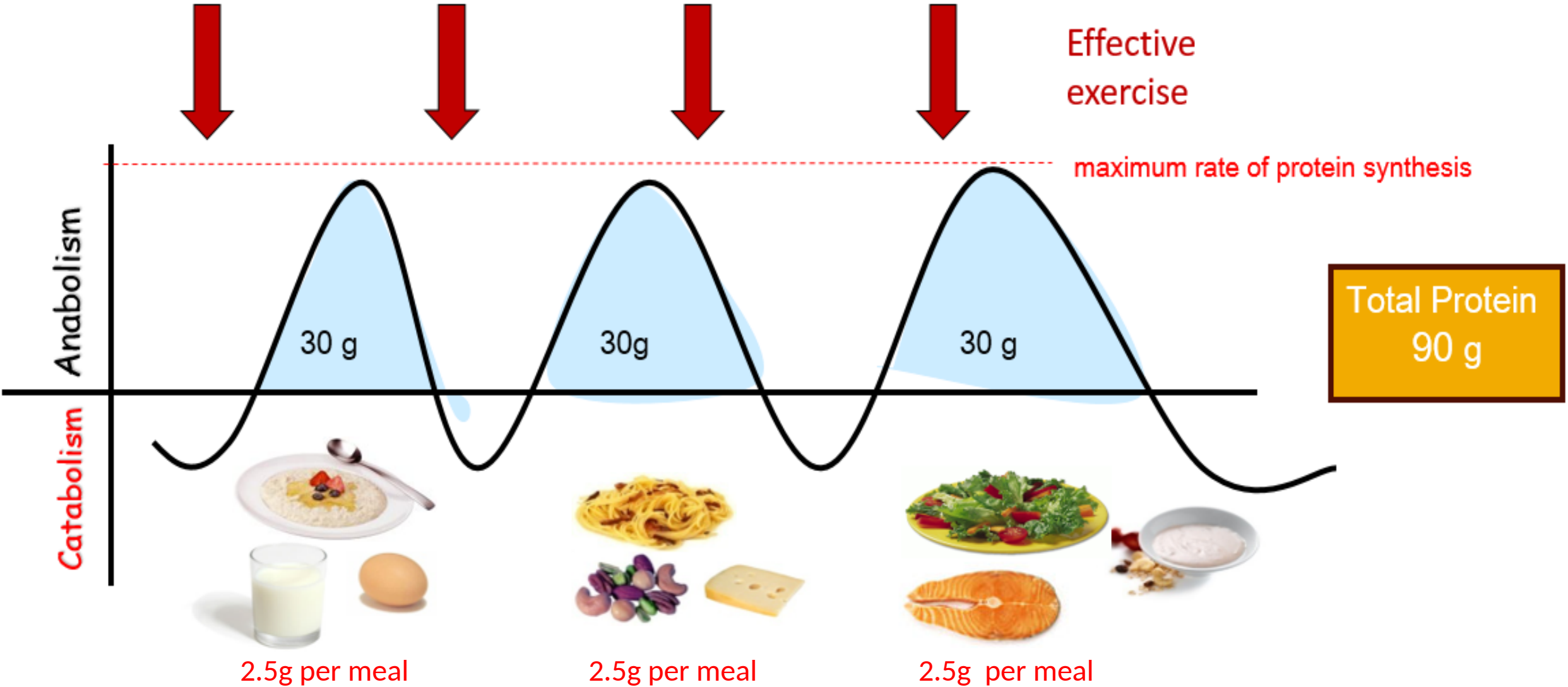


Leucine is a key amino acid in stimulating muscle protein synthesis. It is probably a primary reason why whey protein is so effective

Muscle protein synthesis is a saturable process at protein ingestion doses of approximately 20–25 g

Ingestion of proteins immediately post-exercise promotes a marked rise in the rate of muscle protein synthesis

EXERCISE AND PROTEIN DISTRIBUTION





1 can white tuna

= **41g** protein
3.3g leucine



3 oz. chicken breast

= **25g** protein
1.8g leucine



1 scoop (28 g)
whey protein isolate

= **24g** protein
2.5g leucine



3 large eggs

= **19g** protein
1.5g leucine



1 single-serving
Greek yogurt

= **15g** protein
1.5g leucine



8 oz. chocolate
milk

= **8g** protein
0.8g leucine

CONSIDERATIONS FOR PROTEIN INTAKE IN MANAGING WEIGHT LOSS IN ATHLETES

Designed by @YLM Sport Science



A large body of evidence now shows that **higher protein intakes** (2–3 times the protein Recommended Dietary Allowance of 0.8 g/kg/d) **during periods of energy restriction** can enhance fat-free mass preservation, particularly when combined with exercise



1.



Fat Free Mass -sparing effect of higher protein diets may relate to the maintenance of the anabolic sensitivity of skeletal muscle to protein ingestion

2.

Athletes aiming to reduce fat mass and preserve muscle mass should be advised to consume protein intakes in the range of $\sim 1.8\text{--}2.7$ g/kg/day



3.



The target level of protein intake within this recommended range requires consideration of a number of case-specific factors including the athlete's body composition, habitual protein intake and broader nutrition goals

INDIVIDUALIZATION!

4.

Athletes aiming to reduce fat mass and preserve muscle mass should adopt a moderate energy deficit (-500 kcal) & maintain resistance training at the same time



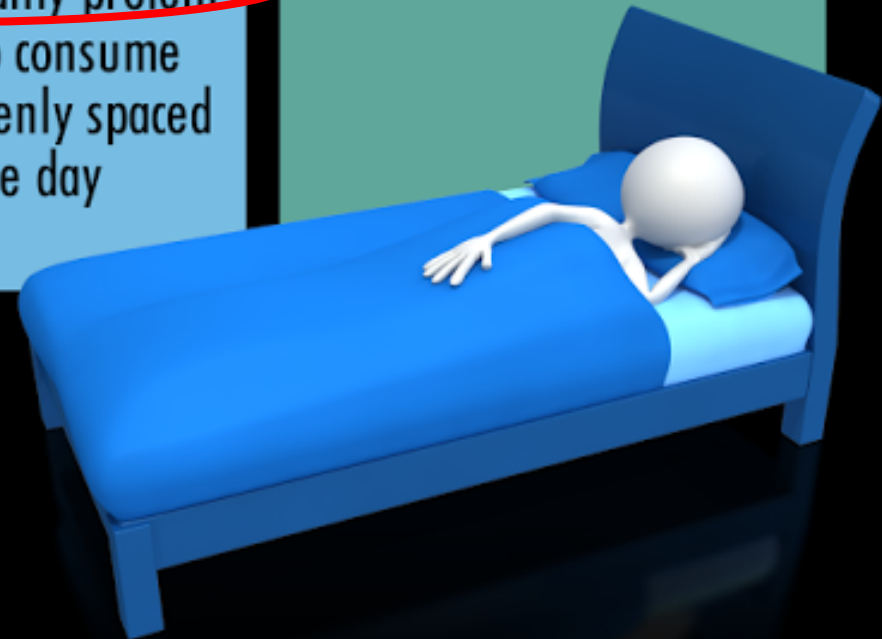
5.



Athletes should focus on consuming high-quality protein sources, aiming to consume protein feedings evenly spaced throughout the day

6.

Post-exercise consumption of ~ 20 g from protein sources with high leucine content and rapid digestion kinetics (i.e. whey protein) is recommended to optimise exercise-induced muscle protein synthesis.



7.

When protein is consumed as part of a mixed macronutrient meal and/or before bed slightly higher protein doses may be optimal

Protein before sleep results in greater increases in muscle mass and strength

Protein supplement:
28 grams of protein plus 15 grams of carbohydrate before sleep



12 weeks of resistance training with protein or placebo

greater strength gain

44 males
Protein (n=22)
Placebo (n=22)

Snijders et al. J
Nutr 145(6):
1178-84, 2015

“ Protein ingestion before sleep is an effective strategy to increase muscle mass and strength gains during resistance exercise training “

greater increase in muscle cross sectional area (quadriceps)

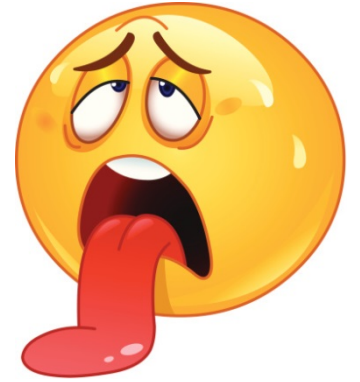


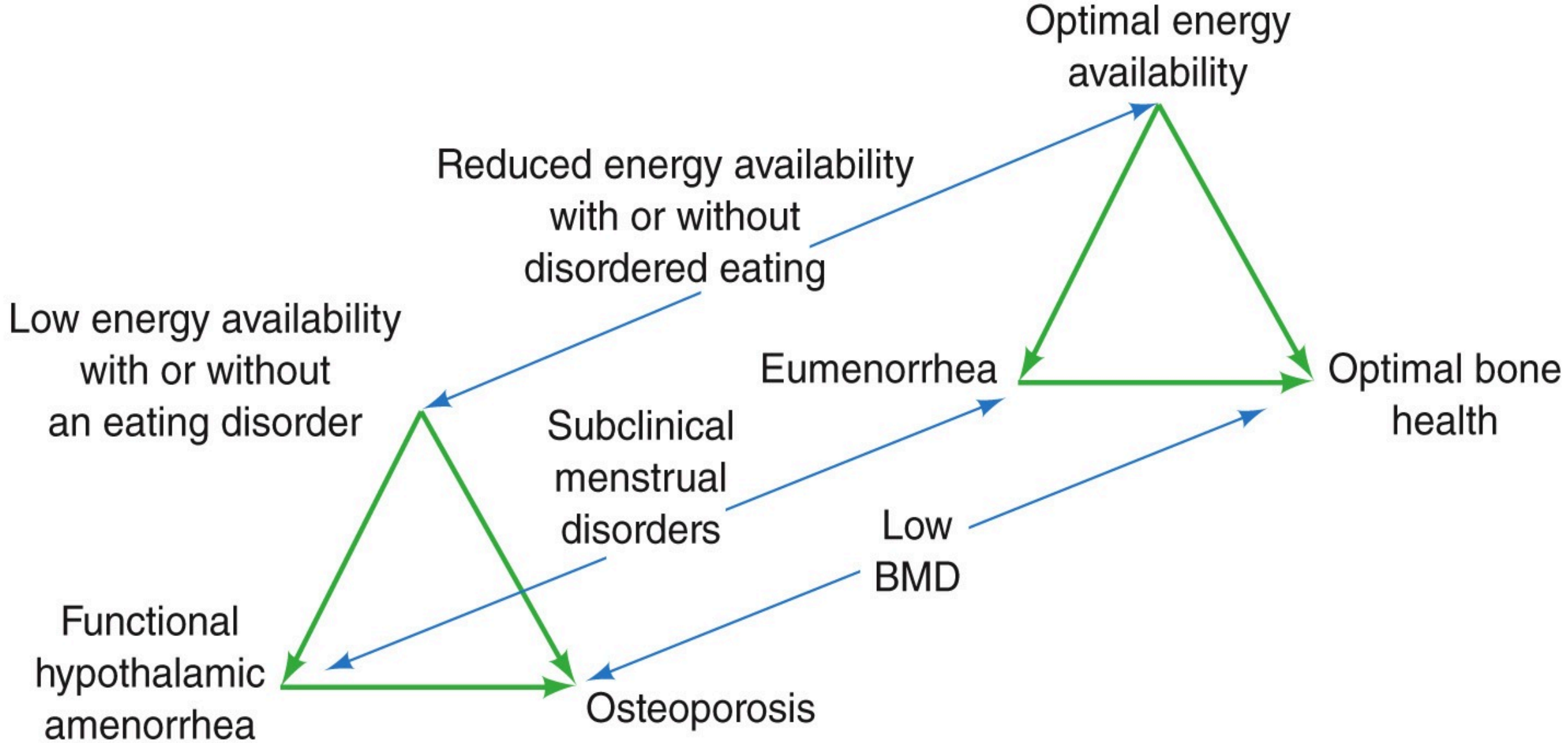
PROTEIN AND INJURIES

- Nutrition is important for optimal healing.
- Injuries often result in an immobilized limb, a reduction in physical activity, and loss of muscle mass, strength, and function.
- Proper nutrition can minimize the negative consequences of injury and help speed the recovery process.
- Consuming inadequate energy and protein prolongs the inflammatory response and slows healing.
- Injury causes an increase in muscle protein breakdown and a proper diet can help minimize the loss of muscle tissue and speed the restoration of muscle proteins.

SIGNS OF UNDER-FUELING

- Fatigue that doesn't end with rest
- Inability to finish workouts
- Unexplained drop-off in performance
- Pre-occupation with food
- Mood changes such as irritability, anxiety, depression, and severe emotional ups and downs

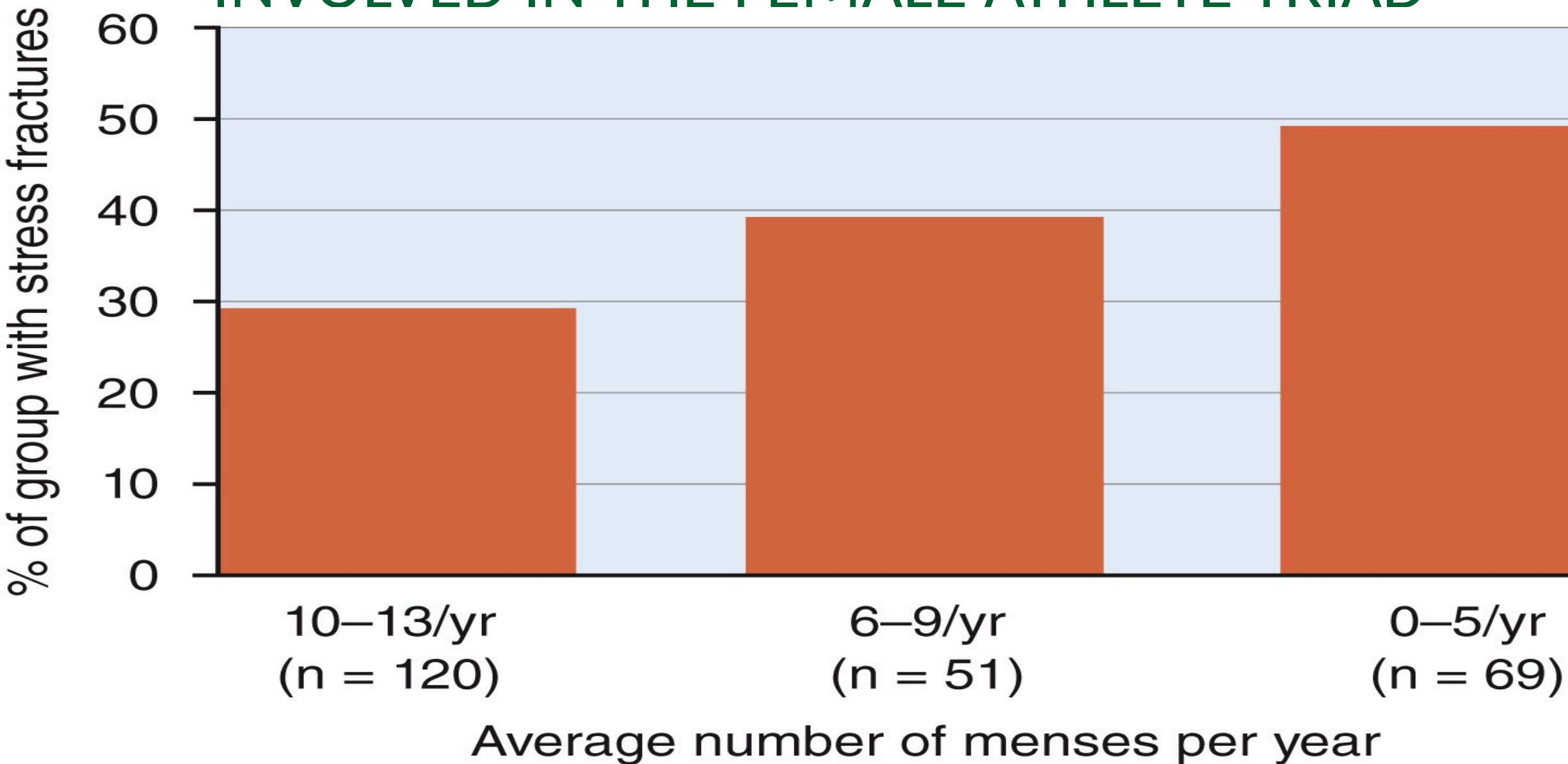




LOW BONE MINERAL DENSITY IS A THIRD FACTOR INVOLVED IN THE FEMALE ATHLETE TRIAD



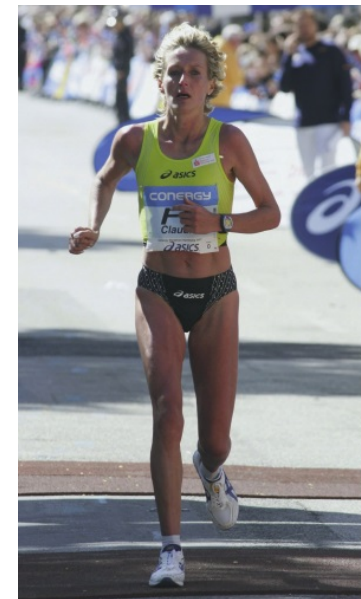
LOW BONE MINERAL DENSITY IS A THIRD FACTOR INVOLVED IN THE FEMALE ATHLETE TRIAD



What is Relative Energy Deficiency in Sport?

The syndrome of RED-S refers to impaired physiological functioning caused by relative energy deficiency, and includes but is not limited to impairments of metabolic rate, menstrual function, bone health, immunity, protein synthesis, and cardiovascular health.

The cause of RED-S is the scenario termed “low energy availability”, where an individual’s dietary energy intake is insufficient to support the energy expenditure required for health, function, and daily living, once the cost of exercise and sporting activities is taken into account.



Physiological consequences of eating disorders on health and performance

Relative Energy Deficiency in Sport (RED-S)

Short Term RED-S:

- Temporary (and unsustainable) performance increase due to lower weight
- Decreased strength, speed, and stamina
- Dehydration

Long Term RED-S

- Loss of bone density (and future osteoporosis)
- Increased risk of stress fractures and other injuries
- Disrupted metabolic rate, menstrual function, immunity, and protein synthesis

SPORTS PERFORMANCE

Negatively Effected by Low Energy Availability

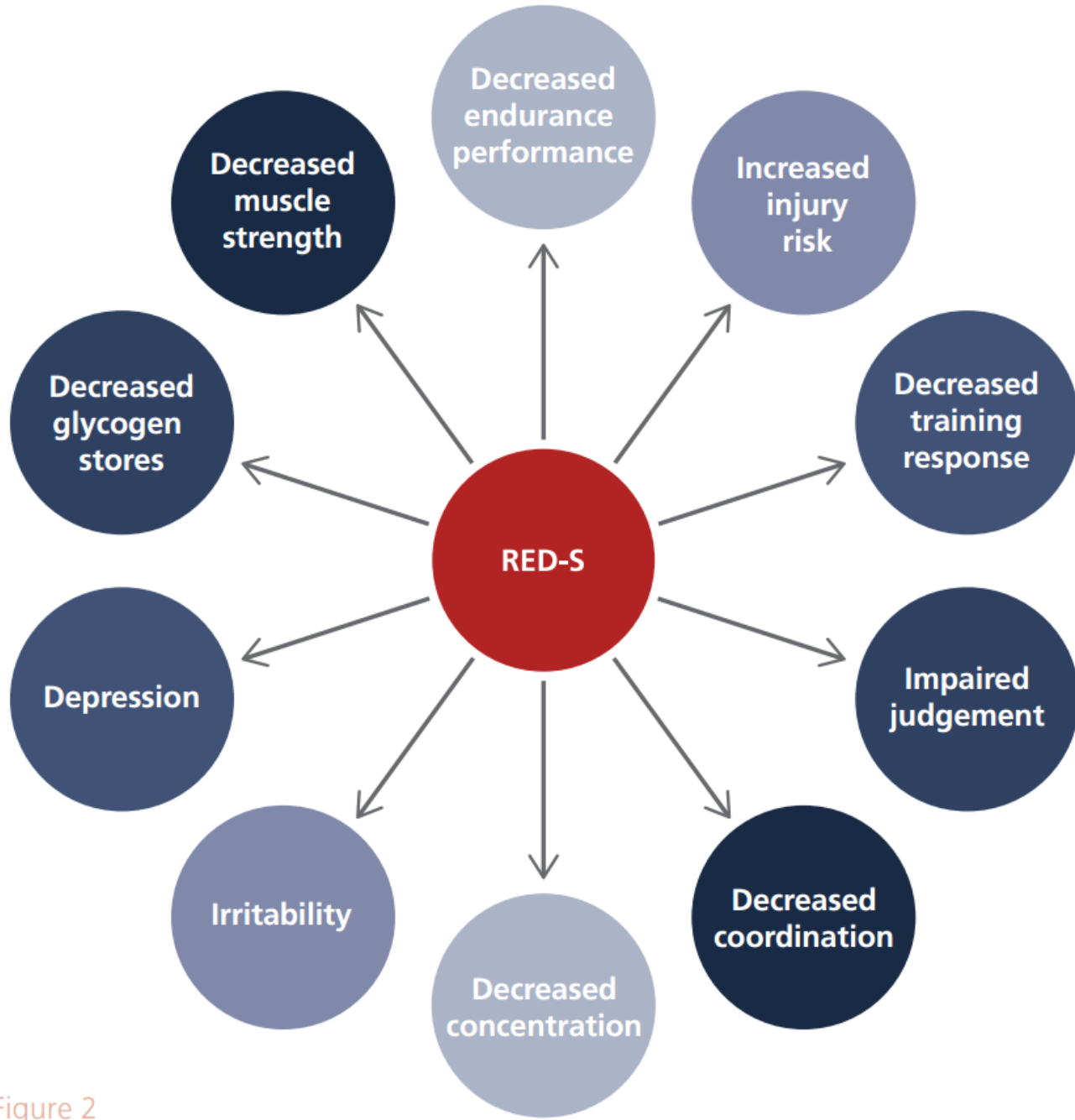


Figure 2

HEALTH CONSEQUENCES

Psychological issues can be both the cause and the result of low energy availability

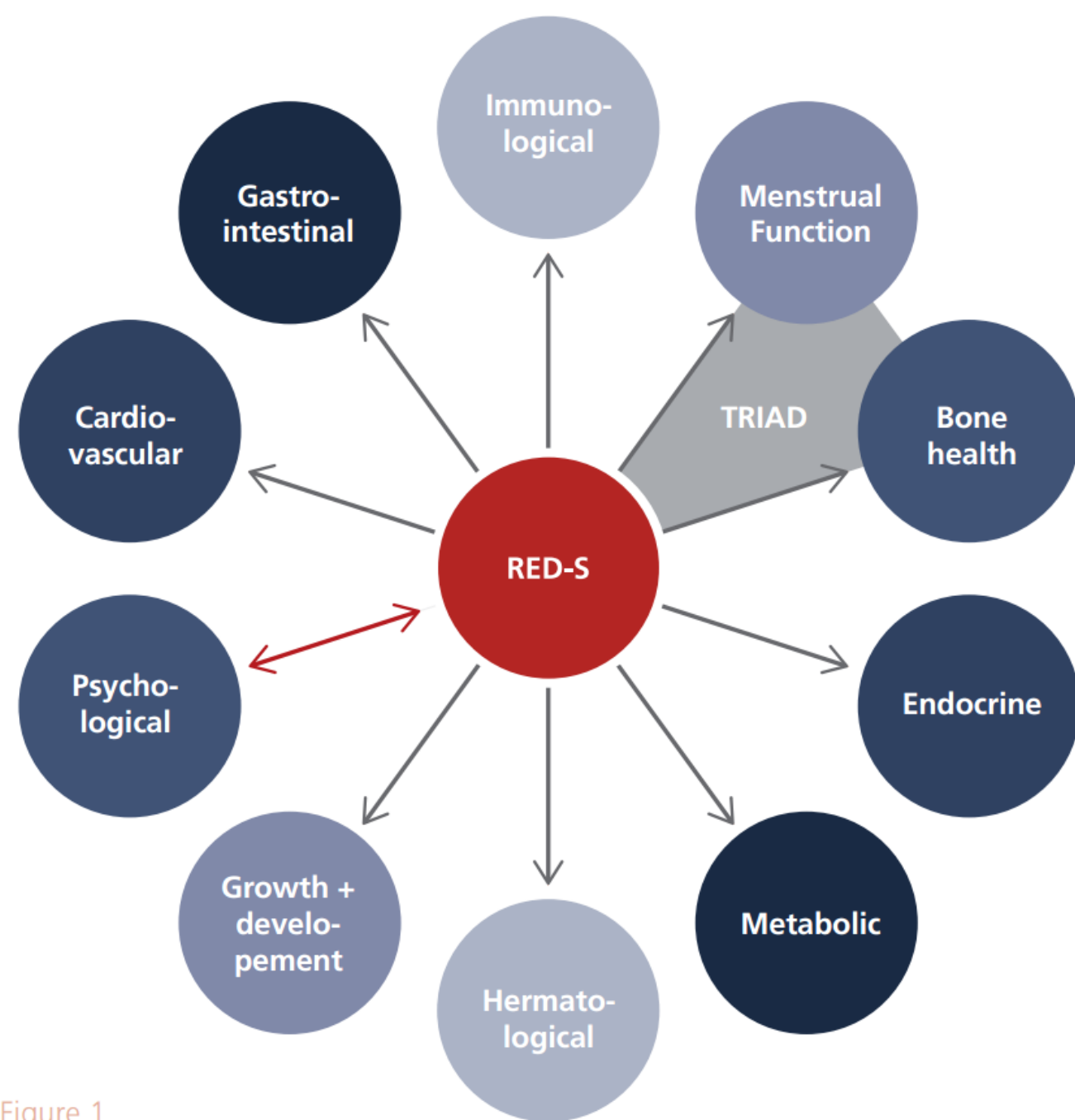


Figure 1

ENCOURAGE...SUPPORT...REFER

- Encourage and model healthy eating and behaviors
- Discourage weight loss during the season
- Encourage fueling for optimal performance
- Encourage athletes to eat enough and to eat well
- Encourage athletes to pay attention to how they feel
- Create and support a healthy culture
- Refer athletes to Sports Dietitian if you suspect eating issues

LATEST TRENDS

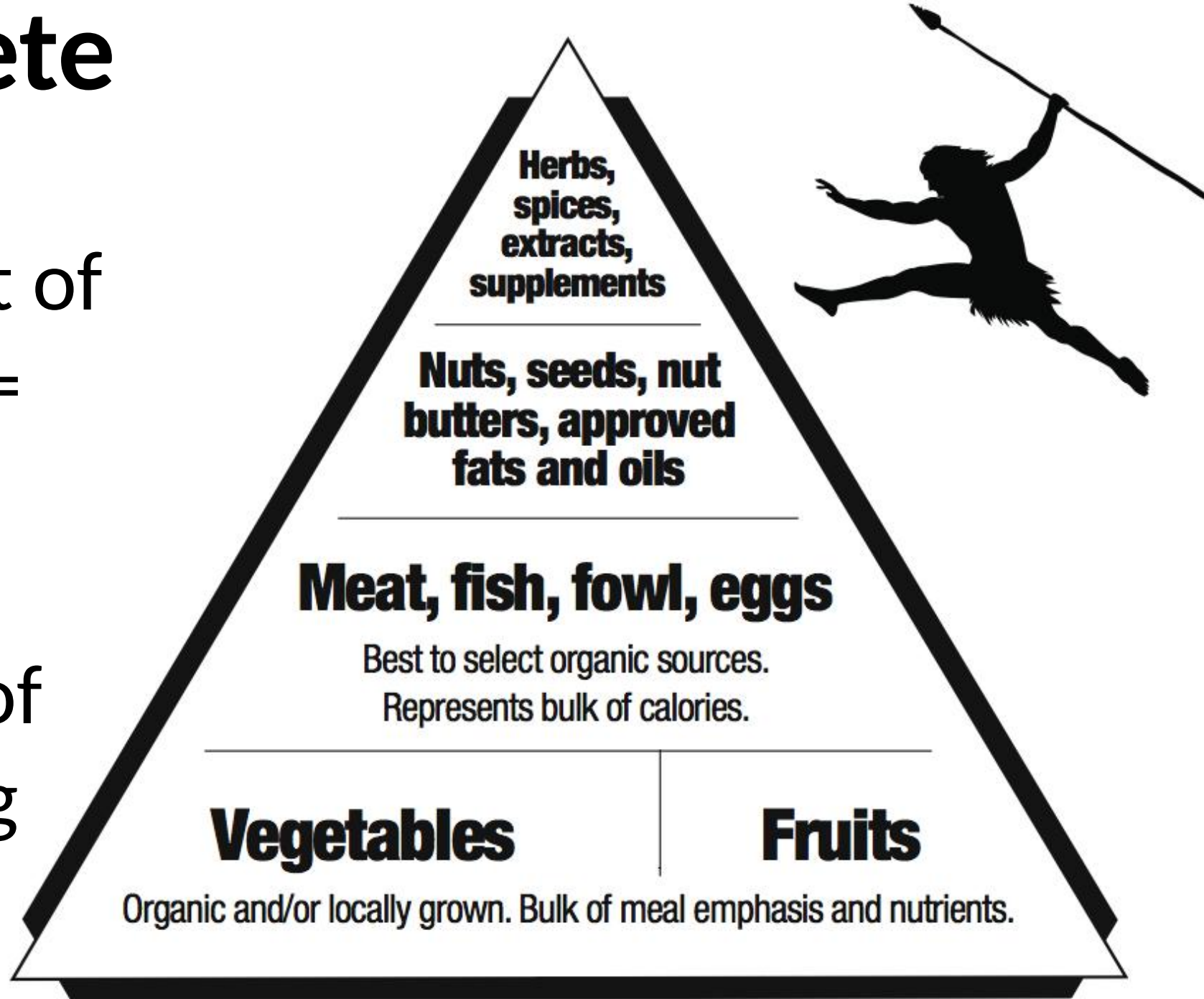
- Paleo
- Supplements
- Intermittent Fasting
- Train Low/Compete High



150 lb. Athlete

Minimum amount of
carbs at 5g/Kg/d =
340 g/d

~29 small pieces of
whole fruit at 12 g
per serving



Strategies to reduce carbohydrate availability during endurance training sessions

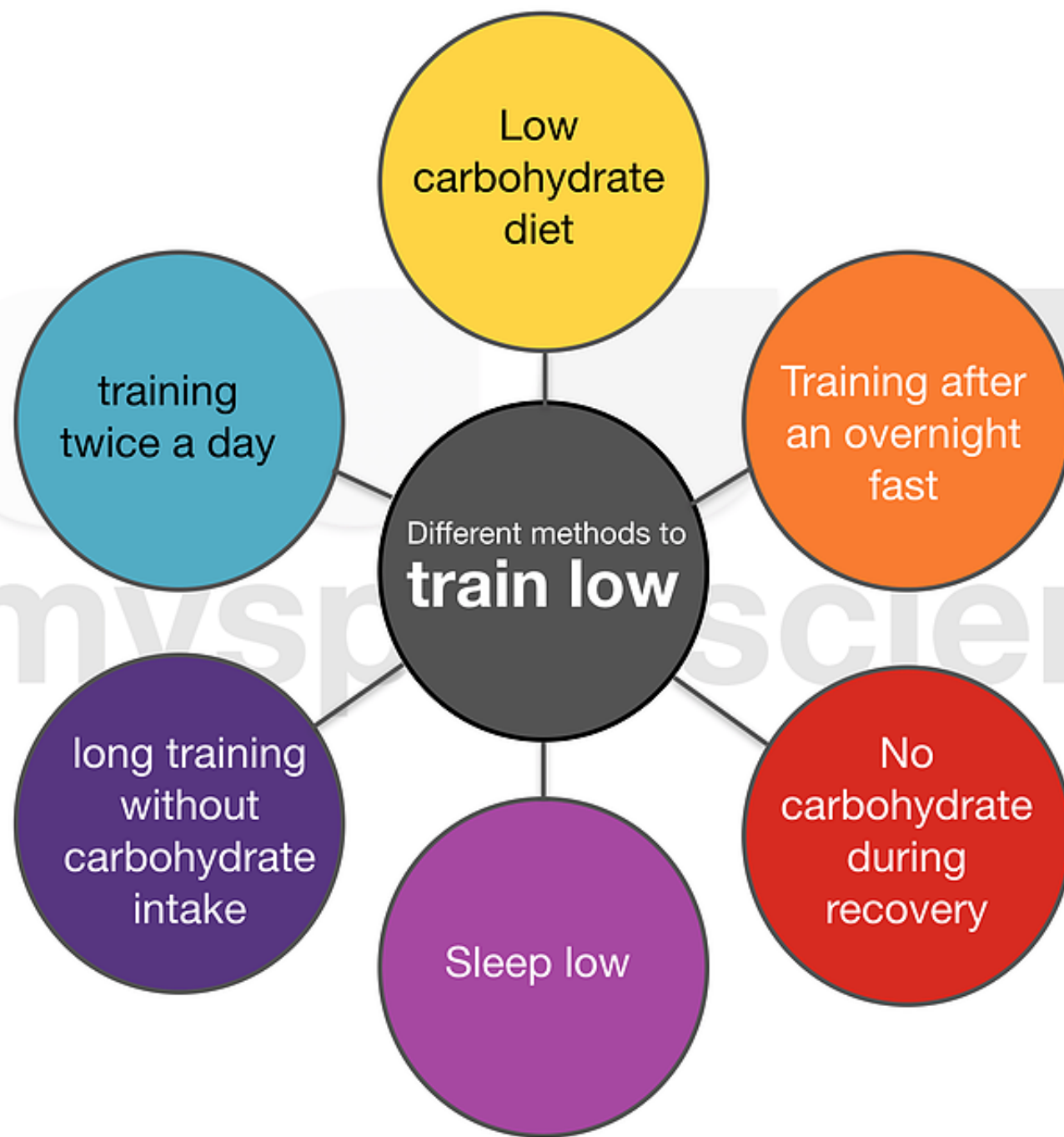


Designed by @YLMSSportScience

Deliberately training in conditions of reduced carbohydrates availability can promote training-induced adaptations of working muscle and fat loss



**ONLY DURING THE “OFF SEASON”
NEVER “IN SEASON”**



Foodfight: high carb or low carb?

Maybe we can abandon the idea that one diet is significantly better than another for everyone in all conditions?

Low carb or high carb? There is a time and a place and what is best, depends on the individual and his goals

A HIGH carb diet is better



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WHAT WORKS



■ Carbohydrates

- Meet energy need of sport
- Endurance
- Intensity



■ Protein

- Muscle protein synthesis
- Recovery

■ Fats

- Omega 3 FAs

■ Preventing/Treating Nutritional Inadequacies

- Iron
- Vitamin D
- Calcium



Setting **CARBOHYDRATES** intake targets for athletes

By Louise Burke and Inigo Mujika, IJSNEM 2014

Designed by
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Low

Light,
Skills

Prolonged metabolic stress
to induce aerobic adaptation

**DAILY COMPETITION /
TRAINING VOLUME**



**INTENSITY OF
SESSION**

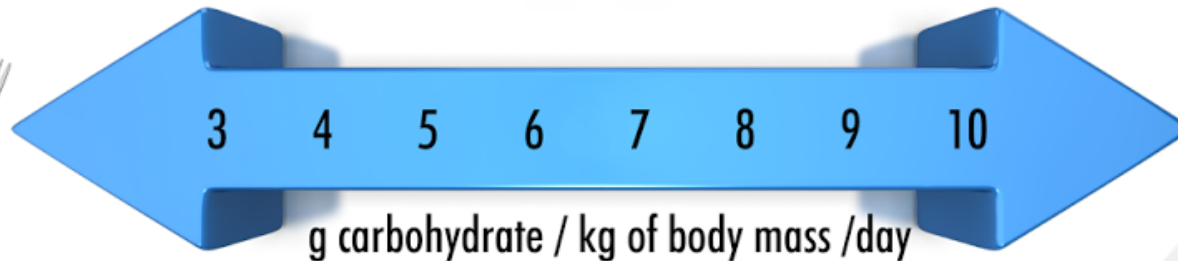
GOAL OF SESSION

High

VO₂max,
Competition



High quality training /
optimal competition outcome





Lower, including energy deficit for weight loss

BODY SIZE

High
including needs for growth

Low

LEAN BODY MASS AS PERCENTAGE OF BODY MASS

High



Maybe unnecessarily over-fuelled

FEEDBACK FROM EXPERIMENTATION

Often runs out of fuel in session

Muscle glycogen less limiting for completion of session

Less need for carbohydrates intake over total day or around sessions

Some sessions may be deliberately done with low carbohydrate availability

High muscle glycogen requirement for completion of training or optimal competition performance

Promote opportunities for carbohydrate intake in total day and around session



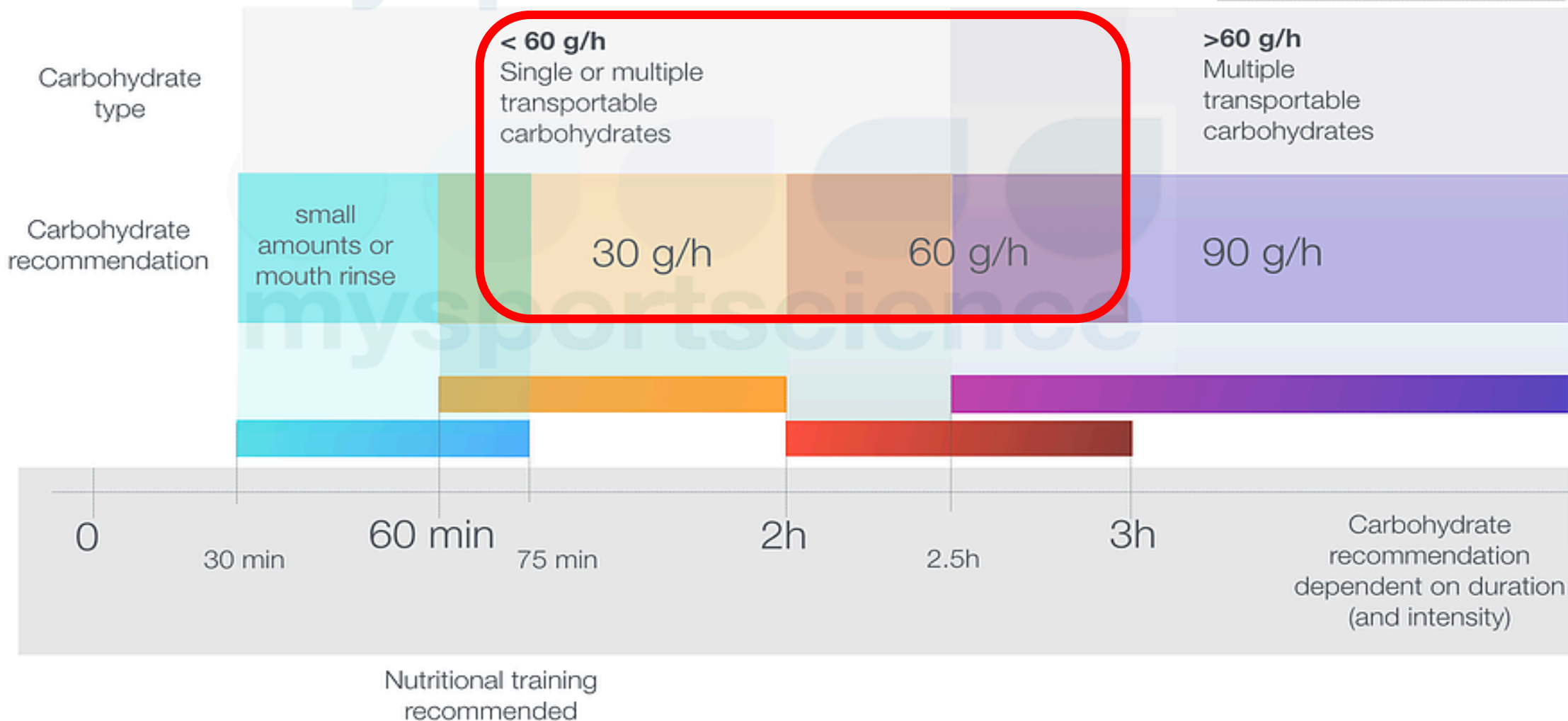
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Recommendations chart

Carbohydrate intake **during** exercise

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Carbohydrate recommendation dependent on duration (and intensity)





THE PRE-EVENT MEAL

Reference: AIS Sports Nutrition, 2009

Designed by @YLM Sport Science

1. Remember, food consumed during the event and the week leading up is just as important as the pre-event meal
2. Eat 3-4 hours before exercise and a light snack 1-2 hours prior as well
3. Food eaten before exercise should provide adequate carbs if <60 min
4. For early morning exercise, encourage a light snack 1 hour before and fuel during the event as well as needed
5. If athlete is too nervous to eat a full meal, steadily snacking during the hours prior to the event is encouraged

FUELING FOR RECOVERY

REFUEL muscles with carbohydrates (body weight/2 = grams of carbs).
REPAIR and rebuild muscles with 20-30 grams of high-quality protein.
REHYDRATE with fluids and electrolytes lost during working out.

FUELING STATION: 15-60 MIN. AFTER TRAINING



Chocolate Milk and Almond Refuel

20g Protein • 53g Carbs

1 ½ cups low-fat chocolate milk

1/4 cup almonds



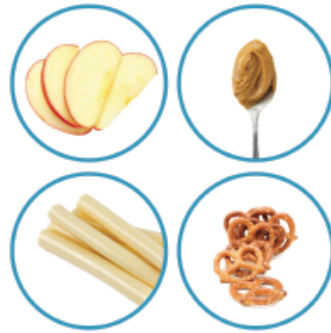
Blueberry Yogurt Parfait

22g Protein • 41g Carbs

6 oz. Greek yogurt topped with:

1/4 cup granola

1 cup blueberries



Snack Extravaganza

20g Protein • 70g Carbs

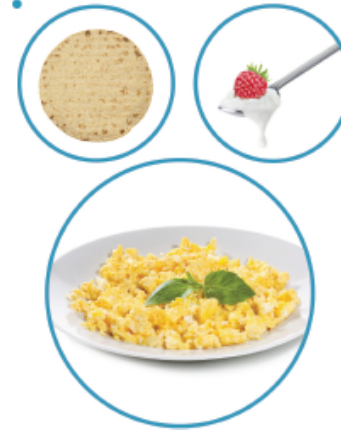
1 string cheese

1 cup apple slices

1/4 cup pretzels

2 tbsp. peanut butter

TRAINING TABLE MEAL: 3-4 HOURS AFTER TRAINING



Egg Wrap with Yogurt Parfait

28g Protein • 40g Carbs

2 scrambled eggs with 1/4 cup Cheddar cheese

1 whole wheat tortilla

1/2 cup plain yogurt with 1 cup raspberries



Fuel Up Stir Fry

33g Protein • 59g Carbs

3 oz. chicken breast with 1/8 cup teriyaki sauce

1 cup brown rice

1 ½ cups stir fry vegetables



Chicken Fiesta Bowl

40g Protein • 68g Carbs

1 cup brown rice topped with:

1/2 cup black beans

3 oz. chicken breast

1/8 cup salsa

1/2 cup lettuce

1/8 cup shredded Mexican blend cheese



For advice on customizing a nutrition plan, consult a sports dietitian.

- For 2-a-day workouts, this recovery window is even more important.
- If you have a low appetite after exercising, a liquid food option may be the best place to start.
- Within two hours of working out drink 16-24 oz. of fluid for every pound lost during exercise.

GMU SPORTS PERFORMANCE NUTRITION CHECK LIST

1	Eat a balanced breakfast every day (to fuel your muscles and your brain)	✓
2	Eat every 3 hours during the day (to maintain energy to the body and brain)	✓
3	Eat 2-3 pieces of fruit each day (to obtain vital essential nutrients & energy for performance)	✓
4	Eat 3-4 servings of vegetables each day (to obtain essential nutrients for performance)	✓
5	Choose “quality” carbohydrates (for sustained energy and more nutrients)	✓
6	Limit fried foods (with excess fat and poor nutritional quality)	✓
7	Refuel within 30 minutes after training session, practice, and/or game? (to refill gas tank, repair muscles and build lean body mass)	✓
8	Consume a high quality, balanced dinner every day (to refuel & repair muscles)	✓
9	Consume a small nutrient dense snack before bed (to top of muscles and brain)	✓
10	Drink <i>at least</i> 3-4 L (100-135 oz or 13- 17 cups) of water each day (to replace loses and prevent dehydration)	✓
	Consume at least 2 sources of omega 3s each week (tuna, salmon, walnuts, chia or flax seeds) to	