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Sports Nutrition

Carol Mack, PT, DPT, SCS, CSCS, PN-1

- Presenter Disclosure: Financial: Carol Mack has received an honorarium for presenting this course. Non-financial: Carol Mack has no relevant non-financial relationships to disclose.
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Learning Outcomes

After this course, participants will be able to:

- Identify at least three strategies of when and how to refer or collaborate with a licensed nutrition professional.
- Describe at least two scientific principles each behind macro and micronutrients and hydration.
- Identify at least three principles on how nutrition can affect injury recovery, training, and health.

COLLABORATION

*"Nutrition is part of the professional scope of practice for PTs. However, because each state has its own jurisdictional scope of physical therapy practice, **PTs should check their state practice act**, which may be silent on nutrition, and state laws governing nutritional practice."*

- American Physical Therapy Association (APTA)

State of Ohio Dietetics laws and rules

http://codes.ohio.gov/orc/4759

- "Only a licensed dietitian can provide nutrition care including: assessment, goal setting, counseling, or advice.This law does not apply to OH licensed professionals practicing within their own scope of practice in which nutrition care is specified."

(A) "Practice of dietetics" means any of the following:

(1) Nutritional assessment to determine nutritional needs and to recommend appropriate nutritional intake, including enteral and parenteral nutrition;

(2) Nutritional counseling or education as components of preventive, curative, and restorative health care

(3) Development, administration, evaluation, and consultation regarding nutritional care standards

Other questions…

Scenarios in which health care professionals legally can use nutrition tools in practice:

1. You are licensed as a nutritionist/dietitian. You are a nutritionist and/or dietitian whose academic training, professional credential, and professional experience meet the law's specifications to be licensed in your state.
2. Your health care license includes nutrition. Your profession is licensed in your state, and your defined scope of practice includes language outlining the use of specific nutrition tools — such as dietary counseling, supplements, and herbal therapy — as part of your practice.
3. Your health care license is exempt from nutrition law. Your profession is licensed in your state, and the nutrition law contains an exemption for "licensed health professionals" in general or for your profession specifically to freely use nutrition tools, or to use nutrition tools as an adjunct to your primary profession.
4. You are exempt from licensure. Your profession or work in the community is not licensed in your state, but you are identified in the state nutrition law as being exempt from requiring a nutrition license to use some or all stated nutrition tools.
5. Nutrition care is not criminalized. The nutrition licensure law in your state does not criminalize people who do not have the license; instead, it protects the use of the titles "nutritionist" and/or "dietitian," or there is no licensure law for nutrition.

- Center for Nutrition Advocacy

Role of PT Diet Nutrition

- House of Delegates P06-19-08-44. *It is within the professional scope of physical therapist practice to screen for and provide information on diet and nutritional issues.*
- Full position statement found here: https://www.apta.org/apta-and-you/leadership-and-governance/policies/role-of-pt-diet-nutrition

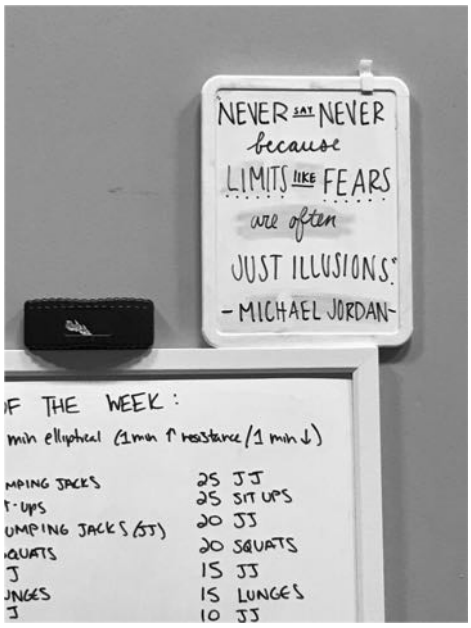
Physical Therapy scope of practice

- *"It is within the professional scope of physical therapist practice to screen for and provide information on diet and nutritional issues to patients, clients, and the community."*

When to refer

- For specific advice
  - Counting calories, protein grams, etc
  - Meal plans
  - Specific conditions (diabetes, post-op conditions)
- Specific testing
- https://www.eatright.org/find-an-expert

METABOLISM & ENERGY BALANCE



Energy transformation

- WE DON'T REALLY PRODUCE ENERGY:
  - Law of Thermodynamics: energy is never created nor destroyed
  - Human body converts energy stored in food
- Energy transfer: chemical bonds that bind molecules of food break >> energy released >> fuels processes to form ATP

ATP

- Body's energy currency
  - Needs a constant supply
- Sources:
  - "New" nutrients
  - Stored nutrients
- Made from triglycerides and glycogen

Energy Systems

- ATP needed for every movement, exercise, function
- Provided to working muscles via three pathways:
  - Phosphogen system (aka ATP-PCr)
  - Glycolytic
  - Oxidative phosphorylative pathway

Baechle, Earle 2008
Bishop, Girard, Mendez-Villanueva 2011

Phosphagen System

- AKA Adenosine triphosphate-Phosphocreatine (ATP- PCr) pathway
  - First system to kick in
    - Short term (~10 seconds)
  - Makes ATP from ADP + P using creatinine kinase

Phosphagen System

- Olympic weightlifing, 100m sprint
- Finite supply of intramuscular ATP and PCr
  - System capacity very limited

Glycolytic Pathway

- Takes over after PCr runs out (ex: 400m sprint)
  - ~6 - 30 seconds
- Breaks down stored muscle glycogen, blood glucose, glycerol backbone from tryglycerides
  - Makes 4 ATPs but "costs" 2
    - 2 ATP from 1 glucose
  - Also creates 2 pyruvate and 2 NADH's

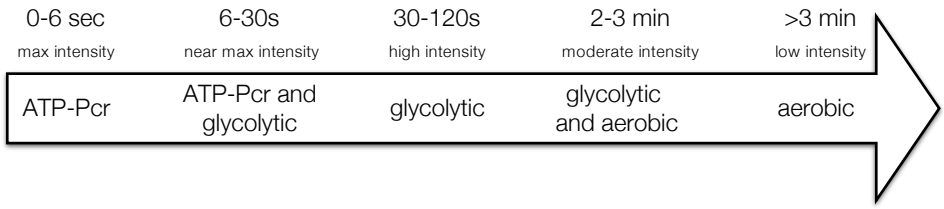
Glycolytic Pathway

- Releases hydrogen ions - fatigues muscles
  - NAD+ picks up hydrogen and pyruvate
    - creates lactic acid
  - Lactic acid buffers hydrogen and carries them out of our cells
    - **does not** cause fatigue and muscle burning!
- After ~90 seconds of intense exercise:
  - Acid buildup in muscles cause body to slow down
  - Aerobic system takes over

Oxidative phosphorylative pathway

- Keeps up endurance
  - Two processes:
    - Krebs cycle
    - Electron transport
- Pyruvate (from glycolysis) converted into acetyl-CoA
  - Acetyl CoA = chemical entry point for Krebs cycle
  - Both fats and proteins can be broken down into A-CoA
- Every turn of the Krebs wheel:
  - 1 ATP, 2 Co2, 8 H+ (NADH and FADHL2)

Energy system continuum



Nutrient metabolism

- Carbohydrate metabolism:
  - **Glycogenesis:** glucose to stored glycogen
  - **Glycogenolysis**: glycogen to glucose
  - **Glycolysis**: glucose to pyruvate
  - **Krebs cycle and electron transport chain:** Acetyl-CoA to ATP, CO2, H2O
  - **Gluconeogenesis**: non-carbs to glucose

Carbohydrate metabolism

- **Glycogenesis:** glucose to stored glycogen
  - Glycogen = storage form of dietary carbs
    - Varies in size

Carbohydrate metabolism

- **Glycogenolysis:** glycogen to glucose
  - Stimulated by glucagon and epinephrine

Carbohydrate metabolism

- **Gluconeogenesis:** non-carbs to glucose
  - Four main compounds:
    - Pyruvate (from glycolysis)
    - Lactate (from glycolysis)
    - Most amino acids
    - Glycerol (from triglycerides)

Nutrient metabolism

- Fat metabolism: 6 pathways
  - Ketone formation
  - Cholesterol synthesis

Nutrient metabolism

- Cholesterol synthesis
  - Cholesterol…
    - Helps cell membrane function
    - Absorbs dietary fat
    - Basis of steroid hormones
    - Synthesizes bile salts

Nutrient metabolism

- Protein
  - Amino acids…
    - Give body structure, strength
    - Make many hormones, cell signaling molecules
    - Make enzymes
    - Make immune system chemicals (immunoglobulins, antibodies)
    - Make transport proteins

Energy value of FOOD:

- Measuring energy:
  - 1 gram fat = 9.44 kcal
- But… humans are not bomb calorimeters!

Energy value of FOOD:

- Calories on food labels: approximations
  - Due to…
    - Outdated data
    - Imprecise analytical methods
    - Product variety
    - Soil, growing conditions
    - Ripeness at time of harvest
    - Animals' diet
    - Length of storage
    - Preparation/method/cooking time

Metabolism

- Basal metabolic rate (BMR)
- Resting metabolic rate (RMR)
- Thermic effect of feeding (TEF)
- Exercise activity
- Non-exercise activity thermogenesis (NEAT)

- **Total daily expenditure = TDEE**
  - **RMR + physical activity + TEF = TDEE**

CONTINUED

Estimating energy needs

- Main concepts:
  - Oxygen consumption goes up as energy demand goes up
  - Bodies differ in energy needs, depending on genetics, bodyweight, age, sex
- ***As we need and use more oxygen, we need and use more energy!***

CONTINUED

Energy balance

- Factors:
  - Individual environment
  - Genetics and epigenetic expression
  - Hormones
  - What we can digest/absorb
  - Physiological/psychological stressors

Exercise

- Type of training affects use of energy
  - High intensity, short duration
  - Low intensity, long duration
- Training effect

Body functions

- Reproductive function
- Cognitive function
- Metabolic function
- Recovery, repair

MACRO NUTRIENTS

mac·ro·nu·tri·ent

/ˌmakrōˈn(y)o͞otrēənt/

noun BIOLOGY

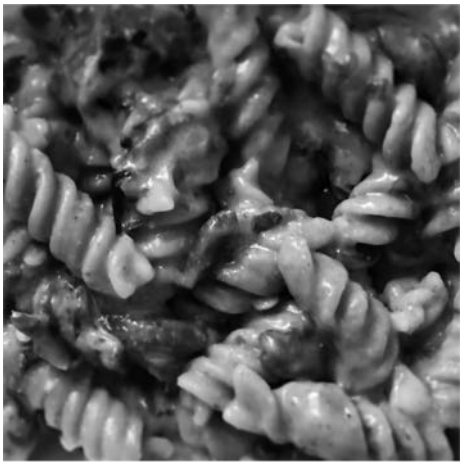
a type of food (e.g. fat, protein, carbohydrate) required in large amounts in the diet.

- a chemical element (e.g., potassium, magnesium, calcium) required in large amounts for plant growth and development.

- Macros affect…
  - Hormones
  - Immune system
  - Cells
  - Metabolism

Carbohydrates

- Monosaccharides
- Oligosaccharides
- Polysaccharides



Digestion

- Broken down into monosaccharides
  - Released into bloodstream as glucose
- Stored in muscles and liver
  - More muscle >> more “storage space"
- Excess - converted into triglycerides

Glycemic index (GI)

- How quickly/significantly food can raise blood sugar
  - Too fast: insulin response
- Glycemic load: GI x serving size
- Insulin index: amount of insulin body produces in response

Glucose transport

- Insulin stimulates glucose uptake in muscle and fat
- Muscle contraction brings glucose into cells
  - Insulin sensitivity, glucose uptake better after exercise

Carbs in the diet

- Body, brain need certain amount glucose
- Depends on…
  - Body size
  - Activity level
  - Lean mass
  - Type of activity
  - Age
  - Genetics
  - Food tolerance

Carbs in the diet

- Most often: slower-digesting, high fiber
- Less often: faster digesting, lower-fiber

Carbs: bottom line

- Carb **amount** important
  - *1 serving = 1 cupped handful*
- Carb **type** important

- Carb **sensitivity** matters
- Carb **timing** matters

Fiber

- Soluble:
  - Oats, oat bran, dried beans, flax, chia, oranges/bananas, carrots

- Insoluble fiber:
  - Plant cell walls

- *Minimum* intake: 25g/day
  - Optimal: 35g for women and 48 for men
  - Caution with inflammatory bowel disease, colitis!

Fat

- Carbon and hydrogen
- Arrangement determines type
  - All bonds full = saturated
  - Open bonds = unsaturated

Digestion

- Broken down into fatty acids and glycerol
- Enters blood several hours after eating
- Do not dissolve in water
  - Can't travel in blood on its own
  - Carried in a lipoprotein

Lipoproteins

- Labs: want to know number of LDL particles and HDL
- Total cholesterol to HDL:
  - Goals:
    - Males 5:1 or fewer (3.5:1 or lower = optimal)
    - Females 4.4:1 or lower (3.4:1 = optimal)
- Tryglycerides to HDL cholesterol
  - Goal 4:1 or lower; 2:1 optimal

Lipoproteins

- "Highway" analogy
  - LDL: cars
  - HDL: ambulances
  - Passengers: cholesterol and fat
  - Guardrails: blood vessel lining
- Too many cars = more crashes into guardrails
- Ambulance at crash takes passengers to hospital (liver)
- Bottom line: main concern is number of cars on the road (LDL). Not passengers (cholesterol).

Fat in the diet

6 major roles:

- Energy
- Makes, balances hormones
- Forms cell membranes
- Forms brain and nervous system
- Transports fat-soluble vitamins A, D, E, K
- Gives us two fatty acids we can't make on our own

Saturated fats:

Hydrocarbon chains "saturated" with hydrogens

- Found in beef/pork/lamb
- Does **not** necessarily cause heart disease…
  - *In the "low fat craze," we didn't get healthier. Or slimmer. Or fitter.*

Fat in the diet

Most dietary sources are some combination saturated, polyunsaturated, monounsaturated fat

- Optimal: 1/3 polyunsaturated, 1/3 mono, 1/3 sat
  - Creates favorable hormonal environment
  - Manages inflammation
  - Supports immune function
- *1 serving = 1 thumb*

Trans fat

Comes from industrial fat processing ("hydrogenation")

- Two types:
  - Full hydrogenation
  - Partial
- FDA, 2015 conclusion: artificial trans fats in processed foods not generally recognized as safe
  - Phase partially hydrogenated oils out of all food products

Omega-3 and Omega-6

- Omega-3:
  - Alpha-linolenic acid (ALA)
    - Plant sources: Flax, chia, hemp, walnut
  - **Docosahexaernoic acid (DHA)**
  - **Eicosapentaenoic acid (EPA)**
    - Marine sources: algae, fish

Omega-3 and Omega-6

- Omega-3:
  - Keeps cell membranes fluid
  - Improves brain development
  - Cardiovascular, nervous system function
  - Immune health
    - Risk for illness- heavy training, chronic stress, exposure to pathogens

Omega-3 and Omega-6

- Omega-3: anti-inflammatory
  - Dilate blood vessels
  - Prevent blood coagulation/clumping
  - Decrease pain
- Omega-6: pro-inflammatory
  - Constricts blood vessels
  - Blood clotting
  - Increase pain

Omega-3 and Omega-6

- Bottom line:
  - Need both omega-3 and omega-6
- Ratio was more balanced (2:1 to 8:1 in favor of omega-6)
- Current ratio: 10:1 to 20:1
- How to improve ratio:
  - Eat fewer processed foods, fats (corn, soybean oil)
  - Eat varied plant & animal foods (fatty fish, wild game)
  - *Consider supplementing omega-3

Protein

- Amino acids

Digestion

- For every 100g amino acids…
  - 80g goes to liver
    - Protein synthesis
    - Catabolization
  - 20g into systemic circulation
    - "Amino acid pool"

Protein in the diet

- Body is always breaking down/building new protein
  - *Can't store like carbs, fat*
- Bottom line:
  - Body needs a range of AA's
    - Balance occurs naturally if variety of less-processed food
  - Almost all foods contain some protein- can get it from many sources

Protein in the diet

- 3 categories of amino acids:
  - Non-essential: can be made in the body
  - Essential AA's: have to get from food
  - Conditionally essential AA's: can synthesize, but not always efficient

Protein in the diet

- Meeting protein needs:
  - "Average person"
    - .8g of protein per kg of body mass
      - 55g per day for a 150 lb person
      - 72g for a 200 lb person
  - *BARE MINIMUM!
  - *1 serving = 1 palm size*

Protein in the diet

- Meeting protein needs:
  - Athletes:
    - Endurance: at least 1.0g; up to 1.6
    - Strength/power: 1.6-2.0
    - Mixed sports (soccer, basketball, martial arts): 1.4-1.7
  - May need more at the start of training, then less
- Do **not** need more than 2.2 g/kg per day

Campbell, et al. International Society of Sports Nutrition position stand: protein and exercise

Protein in the diet

- Needs go up if…
  - Frequent, hard training
  - Heavy physical job
  - Injured, sick, post-op recovery
  - Losing protein for other reasons (chronic physical stress or poor digestion)
- Needs go down…
  - Kidney disease
  - Some metabolic diseases
  - Liver disease
  - Gastric emptying issues

Protein in the diet

- Meeting protein needs:
  - Athletes:
    - Endurance: at least 1.0g; up to 1.6
    - Strength/power: 1.6-2.0
    - Mixed sports (soccer, basketball, martial arts): 1.4-1.7
  - May need more at the start of training, then less
- Do **not** need more than 2.2 g/kg per day

Campbell, et al. International Society of Sports Nutrition position stand: protein and exercise

Plant based diets

- Eat enough to meet energy needs
- Eat as much variety as possible
  - Avoid building diet around cereal, grain, processed foods
- Include at least 1 cup cooked beans/legumes per day
  - Legumes = lysine source
  - Need 30-45 mg/kg of lysine per day (2-3 gm for a 150lb adult
- Plant-based protein supplement if if needed

Protein supplementation

- "REAL FOOD FIRST"
  - If needed -
    - Whey, casein, milk protein blend…
    - Egg white
    - Plant based proteins
      - pea, hemp, rice

Protein supplementation

- What to look for:
  - At least 2.5gm of leucine
  - Few additives
  - Tolerable ingredients
  - Reputable company
    - Third party testing: NSF, Informed Choice certified

MICRO-NUTRIENTS

Micronutrients

- Need less quantity than macros
  - Balance between too much and too little

Vitamins

Organic compounds we need to live/thrive

- Participate in all metabolic processes
  - B3 co-enzyme involved in electron transport
- Can't make vitamins ourselves
- Categorized as fat-soluble or water-soluble:

Fat-soluble vitamins

- Vitamins A, D, E, K
- Travel bound to dietary fat
  - Not eating enough fat- won't get key vitamins

Water soluble vitamins

- B's & vitamin C

Cooking matters…

- Some micronutrients best absorbed…
  - When raw
  - When cooked
  - When structures broken down (cutting,crushing)
- Ex:
  - Spinach: iron, calcium when cooked, Vitamin C when raw
  - Water-soluble vitamins lost in water during cooking/storage
  - Fat-soluble more stable with cooking
    - Add olive oil to leafy greens for A and K

Micronutrients

Bottom line:

- Eat a wide range of whole, less-processed plant/animal foods
- Build diet around foods that are full of micronutrients
- Deficiency symptoms (or excess symptoms) often nonspecific
- Micronutrient needs vary between people

Special scenarios

- Iron deficiency:
  - Quality sources animal protein - lean red meat, dark poultry
  - Add pineapple or citrus fruit
    - Vitamin C will help absorb
  - Cooked spinach
- Female athletes, menstruation, plant-based eaters, endurance athletes

Special scenarios

- Osteoporosis:
  - Sources of calcium:
    - Tahini
    - Tofu
    - Almonds
    - Kale
      - Easier to absorb if steamed
    - Cooked spinach

Special scenarios

- Stress fractures:
  - Nutrition-related factors that increase risk:
    - Low dietary calcium intake
    - Low serum vitamin D
    - Low body weight
    - Low energy availability

Special scenarios

- Plant based diets
  - Need 1-1.5 cups **cooked** beans/legumes per day of plant based eating
- Legumes = **lysine source** (low in plant based diets)
  - Need 30-45 mg/kg of lysine per day (2-3 gm for a 150lb adult)
  - 1 cup legumes usually contains 1 gram lysine

Plant based diets

- Consider supplements:
  - Plant based protein
  - Iron
  - Omega-3:
    - At least 2 g added ALA/day (flax, chia, hemp, walnuts)
    - 500-1000mg combined DHA + EPA
  - Magnesium, zinc (check multivitamin
  - Calcium: need 1000 mg/day

Plant based diets

- Consider supplements:
  - Vitamin D: 1000- 4000 IU days without sun or winter months
  - B-12 (unless consuming fortified foods)
    - Fortified foods
    - Nutritional yeast
      - 3-5 mcg/day from food, 10-100 from supplements
  - Iodine: 75-100 mcg every few days

Special scenarios

- Medications:
  - Can interfere with micronutrient absorption
    - Ex: oral contraceptives and B2 absorption
- Disordered eating/restriction:
  - Can make deficiencies worse
- Malabsorption syndromes:
  - Chron's, ulcerative colitis, celiac, pancreatitis
  - Bariatric or other abdominal surgeries (ostomies)
  - Cancer, HIV, alcoholism, other chronic diseases

Workout recovery

- Beet juice: high in nitrates
  - Dilates blood vessels
  - Improves blood flow and muscle efficiency.

Workout recovery

- Tart cherry juice:
  - High in antioxidants and anti-inflammatory polyphenols
    - Decreases muscle damage during hard workouts
    - Reduces pain post-training, improve recovery
    - Improves sleep
    - Boosts immune system

Workout recovery

- Other considerations:
  - Omega 3's
  - Vitamin D
    - Suboptimal levels associated with stress fx, injuries, poor performance
    - Many roles

Vitamin D

- Vitamin D
  - Most recognized for role in bone health
  - Also has roles in…
    - Muscle repair/remodeling
    - Immune function
    - (possible) muscle strength - D3

Special scenarios

- Workout recovery
  - Other considerations:
    - Curcumin
    - Collagen + vitamin C
      - Improved tendon function, injury healing
      - Vitamin C is co-factor

Special scenarios

- Nutrient timing
  - Planning/eating foods, dietary supplements.
  - Timing and type of food after high volume or intense exercise:
    - Enhances recovery and tissue repair
    - Augments muscle protein synthesis (MPS)
    - Improves mood

International society of sports nutrition position stand: nutrient timing

Nutrient timing

- Key points
  - High volume exercise depletes glycogen stores
    - More than 60 min at over 70% VO2max:
      - 30-60g carbs per hour
        - 6-8% carb-electrolyte solution every 10-15 min

International society of sports nutrition position stand: nutrient timing

Nutrient timing

- Key points
  - Resistance exercise
    - Carbs or carbs + protein
      - Increases muscle glycogen stores,
      - Improves muscle damage
      - Greater acute and chronic training adaptations

International society of sports nutrition position stand: nutrient timing

Nutrient timing

- Key points
  - Post-exercise
    - Protein immediately to 2 hours post stimulates MPS
  - *"Meeting the total daily intake of protein, preferably with evenly spaced protein feedings (approximately every 3 h during the day), should be viewed as a primary area of emphasis for exercising individuals."*

International society of sports nutrition position stand: nutrient timing

Probiotics

- Live microorganisms; confer health benefit on host
  - Linked to gut and immune health
    - Strain, dose-dependent

International Society of Sports Nutrition Position Stand: Probiotics

Probiotics

- Athletes:
  - Certain probiotics strains can increase absorption of key nutrients
  - Higher risk for respiratory tract infections (URI)
    - *"70% of the immune system is located in the gut and probiotic supplementation has been shown to promote a healthy immune response."*
  - Specific probiotic strains can reduce number of episodes, severity and duration URI's

International Society of Sports Nutrition Position Stand: Probiotics

Probiotics

- Athletes:
  - Minimal effective dose depends on specific validation studies
  - Potential benefits on:
    - Body composition, lean mass
    - Decreased cortisol
    - Reduction exercise-induced lactate
    - Improved mood

International Society of Sports Nutrition Position Stand: Probiotics

WATER & FLUID BALANCE

Hydration

We are 55-60% water!

- On average, we get 1L (4 cups) water from our food each day, depending on what we eat
  - Raw fruits, veg = mostly water
  - Cooked whole grains/legumes = absorb fluid from cooking
  - High fat foods = very little water

- How much do we need?
  - Body regulates thirst >>> take in more when needed
  - **LAG TIME** between lost fluid and thirst!

Hydration

We are 55-60% water!

- Majority athletes in professional sports, collegiate athletics, high school, youth sports arrive at workouts hypohydrated.

- "When access to fluids based on thirst and voluntary fluid intake is adequate during activity, humans replace roughly **two- thirds** of sweat losses" - *NATA position statement, Fluid replacement for the physically active*

.

Hydration

How much to drink???

- Most adults need 3L (12 cups) fluid each day
  - 1L (4 cups) from food
  - 2L (8 cups) from fluid intake
- More water needed if…
  - Bigger person
  - Sick/lost water via diarrhea/vomiting
  - Warm, dry weather
  - Hard exercise

Estimating fluid needs:

By body weight

- For every KG, need 30-40 mL H2O
  - 110lb person (50kg) = 1.5-2.2 L per day
  - 220lbs (100 kg) = 3-4L

Dehydration

Not enough water, too much solute

- Losing more than taking in

- Percentage of body water loss and consequences…
  - .5%: increased strain on the heart
  - 1%: reduced aerobic endurance
  - 3%: reduced muscle endurance
  - 4%: reduced strength, motor skills, heat cramps
  - 5%: heat exhaustion, cramping, fatigue, reduced mental capacity
  - 6%: physical exhaustion, heatstroke, coma
  - 10-20%: death

Dehydration symptoms

Don't typically notice thirst until **loss of 1-2%** of body water

- Beyond 2%:
  - Headache
  - Fatigue
  - Low BP
  - Dizziness/fainting
  - Nausea
  - Flushing
  - Rapid HR

Dehydration symptoms

- *"We can't 'train' to become better at being dehydrated - we don't adapt to it; must replenish lost fluids."*

Hyponatremia

Too much water relative to sodium (low)

Potentially life threatening; 10-20% distance athletes

- *NATA position statement, Fluid replacement for the physically active*

- Sodium below 135
- Three types:
  - Low blood volume
    - Total volume blood, water, sodium down
  - High blood volume
    - Major increase blood volume, total body water
  - Normal blood volume
    - Sodium decreases

Hyponatremia

- Initial symptoms:
  - GI discomfort (nausea/vomiting)
  - Headache
  - Swollen hands, feet
  - Confusion and/or restlessness
- Athletes at risk when rehydrating without electrolytes

Hyponatremia

- Bottom line:
  - Fluid replenishment crucial BUT don't over-drink
  - Plain water usually fine for normal people under normal conditions, short bouts of exercise
  - When replacing a lot of fluid- consider electrolyte solution

Hydration strategies

Match plan to athlete *__highly individualized__*

- Baseline:
  - Normal people not exercising, comfortable temperate environment
    - 2L (8 cups) per day + water rich whole foods (fruits/veg)
- Endurance athlete: calculate needs based on body weight
  - Then, calculate sweat rate
  - Include carb + electrolyte + protein in recovery drinks
  - Test sweat composition
  - Urine color chart *first void

Hydration strategies

Calculate sweat rate

- Weigh in without clothes
  - Run (or exercise) 60 min without drinking water
  - Weigh in again without clothes
- 1# lost = 16 oz fluid
  - To replace each pound, need 20 oz fluid

Hydration strategies

Match plan to athlete

- **Moderate**-intensity activity **<2 hrs and/or high-intensity <1 hr**
  - **Step 1**: 5-1L during activity (2-4 cups)
  - **Step 2**: .5-1 L (2-4 cups) after workout
  - **Step 3**: .25-5 L (1-2 cups) at each meal
  - Add ons…
    - *Extra recovery boost?* 10-15g protein after workout
    - *Gaining weight or muscle mass?* Protein + carb drink during workouts
      - 30-45g carb + 15g protein in 500-600ml of H2O every hour during training

Hydration strategies

Match plan to athlete

- **Moderate**-intense **over 2 hrs** and/or **high-intense over 1 hr**
  - **Step 1:** .25-5 L (1-2 cups) 30-60 min before
  - **Step 2:** 30-45 g carb + 15g protein + electrolytes (sodium/potassium) in 600 mL H2O every hour of workout
  - **Step 3:** 30-45 g carb + 15 G protein + electrolytes (Na/K) in 600 mL after
  - **Step 4:** .25-.5 L (1-2 cups) H2O at each meal

Hydration strategies

- Tips….
  - Multiple bouts of training/competing
  - Triathletes, adventure racers
  - Sip, don't chug!
    - We can only absorb 1.5L (6 cups) liquid/hour
    - Avoid GI upset
  - Err on the side of more dilute
  - Endurance athletes who sweat a lot - need more electrolytes; some companies make "endurance" line of supplements

FOOD BEHAVIORS & CHANGE PSYCHOLOGY

What is good nutrition?

GOAL = to improve performance, health, and body composition

- Controls energy balance
- Gives us nutrients
- Helps us look, feel, perform our best
- Is outcome-based and can be measured
- Sustainable for both us and the planet
- Removes limiting factors
  - Genetics and epigenetics
  - Exercise (changes how the body uses nutrients)
  - Physiology
  - Mindset
  - Environment
- **Looks for strengths and wins**

What is good nutrition?

- Most effective nutrition programs:

1. Ask people to care about their food and eating
2. Focus on food quality
3. Eliminate nutrient deficiencies
4. Control appetite and food intake
5. Promote regular exercise

How to "coach"

Three types of patients/clients:

- **Patient #1: Low compliance**
  - Goal: boost compliance
  - Needs:
    - **Clear understanding** of why change is important
    - **Confidence** in ability to do what is asked
      - *TALK to them about this!
    - **Clear instructions** - keep it simple!
    - Simple habits **they feel successful** in doing
  - Strategy: **make it too easy!**

How to "coach"

Three types of patients/clients:

- **Patient #2: high compliance, low results**
  - Goal: measurable progress
  - Strategy:
    - Experiment with new (somewhat more challenging) habits
    - Individualize

How to "coach"

Three types of patients/clients:

- **Patient #3: high compliance, high results**
  - Goal:
    - Prevent burnout
    - Build sustainable habits
  - Strategy:
    - Praise
    - Permission to be imperfect
    - Cautious attention
    - Occasional challenge

How to "coach"

Two powerful phrases

- *How's that working for you?*
- *Show me*

Other strategies:

- Change talk
- Continuum
- "Crazy questions"

INJURY RECOVERY

Injuries

Good nutrition can:

- Mange inflammation
- Support immune function
- Support repair and rebuilding

Injury recovery

Body restores balance

- Inflammatory stage:
  - Body clears out damaged cells
- Proliferation stage:
  - New vasculature develops
  - O2, nutrients return
- Remodeling stage

Injury recovery

Tips:

- Eat enough total food
  - Adequate nutrients critical during recovery
  - Metabolic rate can increase during this time
- Eat more anti-inflammatory fats
  - Omega-3 fatty acids (oily fish, flax, chia, hemp seeds)
  - Monounsaturated fats (olive oil, avocados, nuts…)
- Minimize processed carbs, added sugars
  - May increase inflammation

Injury recovery

Tips:

- 1-2 fists of vegetables at each meal
- 1-2 handfuls fruit at most meals
  - **Foods rich in vitamin C**
    - Guava, red bell pepper, broccoli, green bell pepper, **grapefruit**, kohlrabi, papaya, Brussels sprouts, **kiwi, mango, oranges, pineapple, berries**
  - **Vitamin A:**
    - Carrots, pumpkin, sweet potato, spinach, collards, kale, watercress, beets, winter squash, tomatoes, dried apricots, mango
  - **Zinc:**
    - Mushrooms, spinach, sesame seeds, pumpkin seeds, green peas, baked beans, cashews, whole grain, wheat germ, cocoa
  - **Copper:**
    - Mushrooms, green leafy veg, barley, soybeans, tempeh, sunflower seeds, navy beans, garbanzos, cashews, molasses, dark chocolate, cocoa powder

Injury recovery

Supplementation:

Check with pharmacist/doctor for medication interactions!

- 5-10g fish oil (1g algae oil) daily
- Multivitamin and mineral (with D, C, A, copper, zinc)
- Vitamin A:
  - Supports early inflammatory response
  - Reverses post-injury immune suppression
  - Assists collagen formation
  - 10,000 IU/day for 2-4 weeks post

Injury recovery

Supplementation:

Check with pharmacist/doctor for medication interactions!

- Vitamin C:
  - Enhances neutrophil, lymphocyte activity with acute injury
  - Collagen synthesis
  - Powerful antioxidant, immune system modulator
  - 1000-2000 mg/day for 2-4 weeks post

Injury recovery

Supplementation:

Check with pharmacist/doctor for medication interactions!

- Copper:
  - Forms RBC's
  - Works with C to form elastin, strengthen connective tissue
  - 2-4 mg daily for 2-4 weeks post
- Zinc:
  - Deficiency associated with poor wound healing
  - 15-30mg/day for 2-4 weeks

Injury recovery

Supplementation:
Check with pharmacist/doctor for medication interactions!

- Protein:
  - Supplement if not enough from food
  - 20 - 40 gm protein per meal (3 meals/day)
- Tumeric
  - Anti-inflammatory; wound healing
  - Add to food every day or 400-600 mg supplemental extract 3x/day (or as described on label)

Injury recovery

- Supplementation:

Check with pharmacist/doctor for medication interactions!

- Garlic
  - Inhibits inflammatory enzymes
  - Affects macrophage function
    - 2-4g of whole garlic clove each day (1 clove = 1 g) or 600-1200 mg supplemental aged extract
- Bromelain
  - Anti-inflamatory plant extract from pineapple
  - Analgesic (unsure of mechanism)
  - 500-1000 mg/day for inflammation management
- Boswelia
  - Anti-inflammatory
  - 300 mg 3x/day

CONTINUED

References

- See PDF