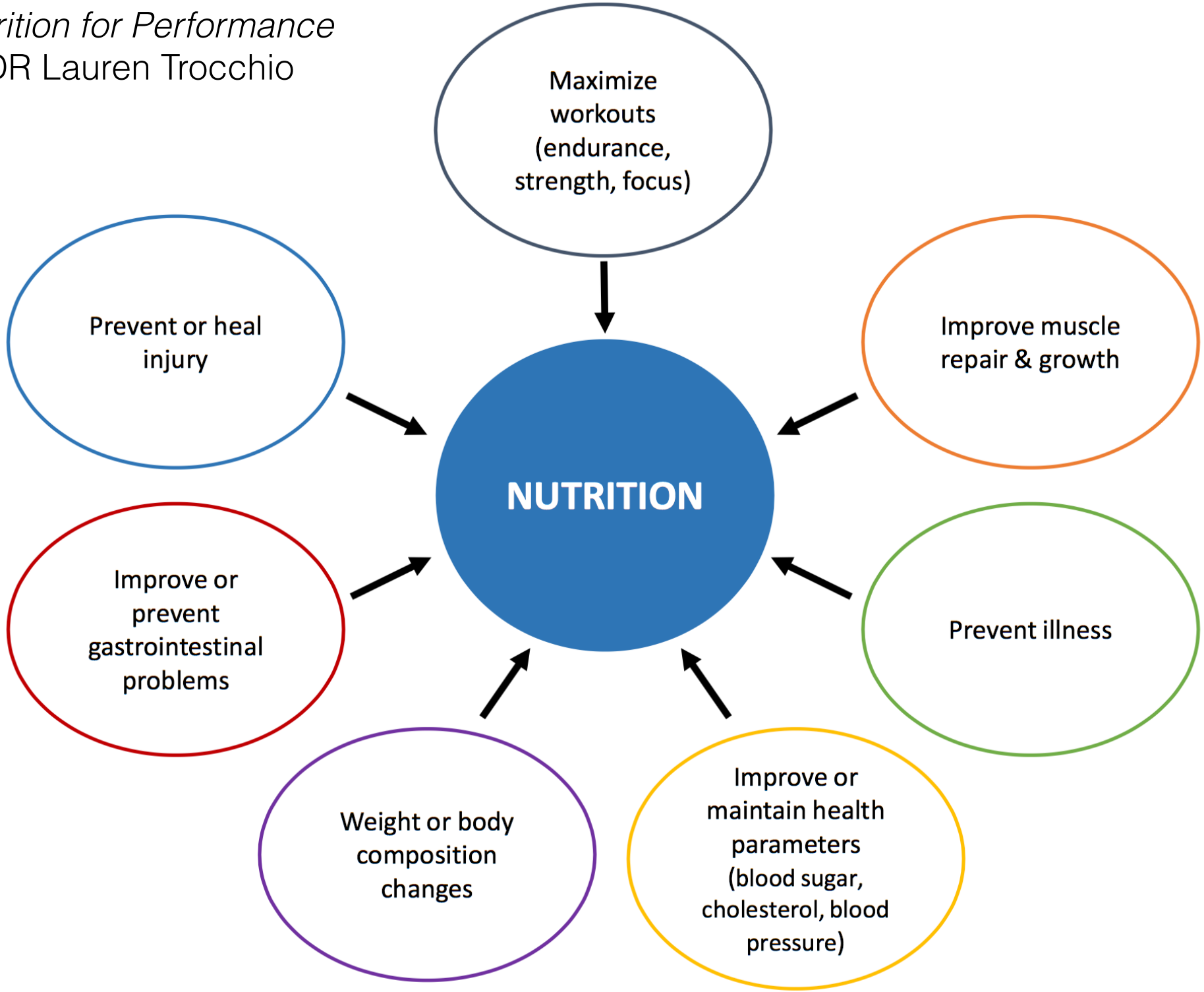
Sport Nutrition

Chuck Woolridge

PART 1

Nutrition for Performance
LCDR Lauren Trocchio



EVIDENCE BASED ANALYSIS:

Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine:

Nutrition and Athletic Performance

EVIDENCE BASED ANALYSIS:

The IOC **consensus statement**: beyond the Female Athlete Triad:

Relative Energy Deficiency in Sport (RED-S)

Mountjoy M, Sundgot-Borgen J, Burke L, et al. Br J Sports Med 2014;48:491–497.

IMPORTANT CONSIDERATIONS:

Training and nutrition are strongly related in positive adaptation.

IMPORTANT CONSIDERATIONS:

Elite athletes at high risk of injury and illness.

IMPORTANT CONSIDERATIONS:

Training is dynamic, thus **nutrition** support must be adaptive.

IMPORTANT CONSIDERATIONS:

Nutrient intake should be scaled to body mass.

IMPORTANT CONSIDERATIONS:

Goals are different for training vs. racing.

ENERGY

ENERGY:

Basal **M**etabolic **R**ate (**BMR**)

+

Thermic **E**ffect of **F**ood (**TEF**)

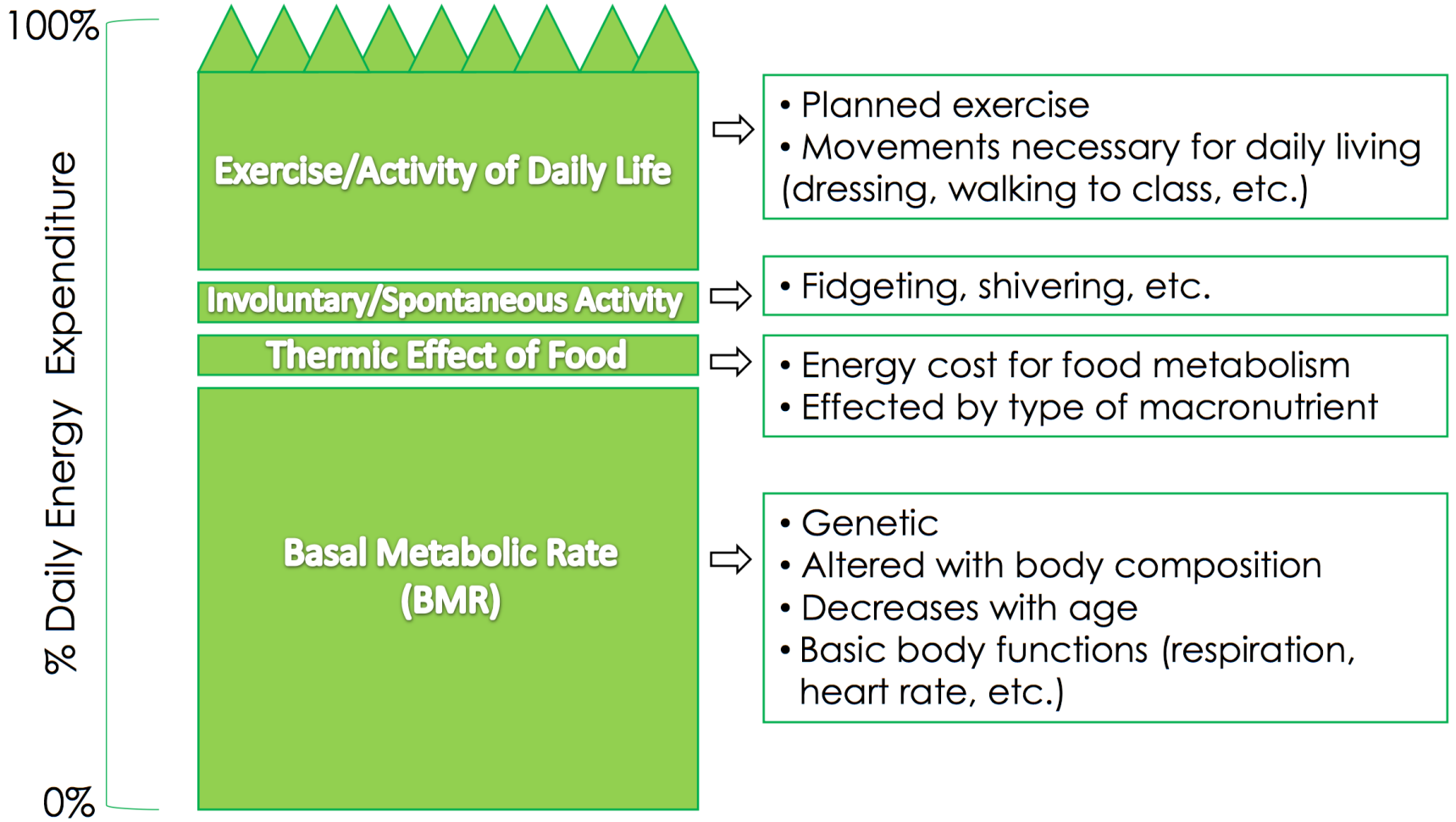
+

Thermic **E**ffect of **A**ctivity (**TEA**)

=

Total **E**nergy **E**xpenditure (**TEE**)

ENERGY:



Adapted from Clinical Sports Nutrition, *Louise Burke and Vicki Deakin*

ENERGY:

Athlete energy requirements change day to day.

ENERGY:

Factors that determine energy requirements:

Stress, Age, **F**at **F**ree **M**ass (**FFM**), Emotions, Injuries, Temperature, Altitude, Drugs, Medications, Menstruation

ENERGY:

Example Female

Weight = 105 lbs

Height = 5’4”

Body Fat = 12%

Sedentary **TEE** = 1706.5 kcal

ENERGY:

Example Female

Weight = 105 lbs

Height = 5’4”

Body Fat = 12%

Sedentary **TEE** = 1706.5 kcal

Athlete **TEE** = 2701.9 kcal

ENERGY:

Example Male

Weight = 135 lbs

Height = 5’8”

Body Fat = 6%

Sedentary **TEE** = 2119.6 kcal

ENERGY:

Example Male

Weight = 135 lbs

Height = 5’8”

Body Fat = 6%

Sedentary **TEE** = 2119.6 kcal

Athlete **TEE** = 3356.0 kcal

ENERGY:

Insufficient **E**nergy **I**ntake (**EI**)

and/or

high **T**otal **E**nergy **E**xpenditure (**TEE**)

may result in

low **E**nergy **A**vailability (**EA**).

ENERGY:

Low **E**nergy **A**vailability (**EA**) may result in…

Endocrine, Gastrointestinal, Renal, Neuropsychiatric, Musculoskeletal, and Cardiovascular **disfunction**.

ENERGY:

Low **E**nergy **A**vailability (**EA**) may result in…

Relative **E**nergy **D**eficiency in **S**port (**RED–S**)

Mountjoy M, Sundgot-Borgen J, Burke L, et al. Br J Sports Med 2014;48:491–497

ENERGY:

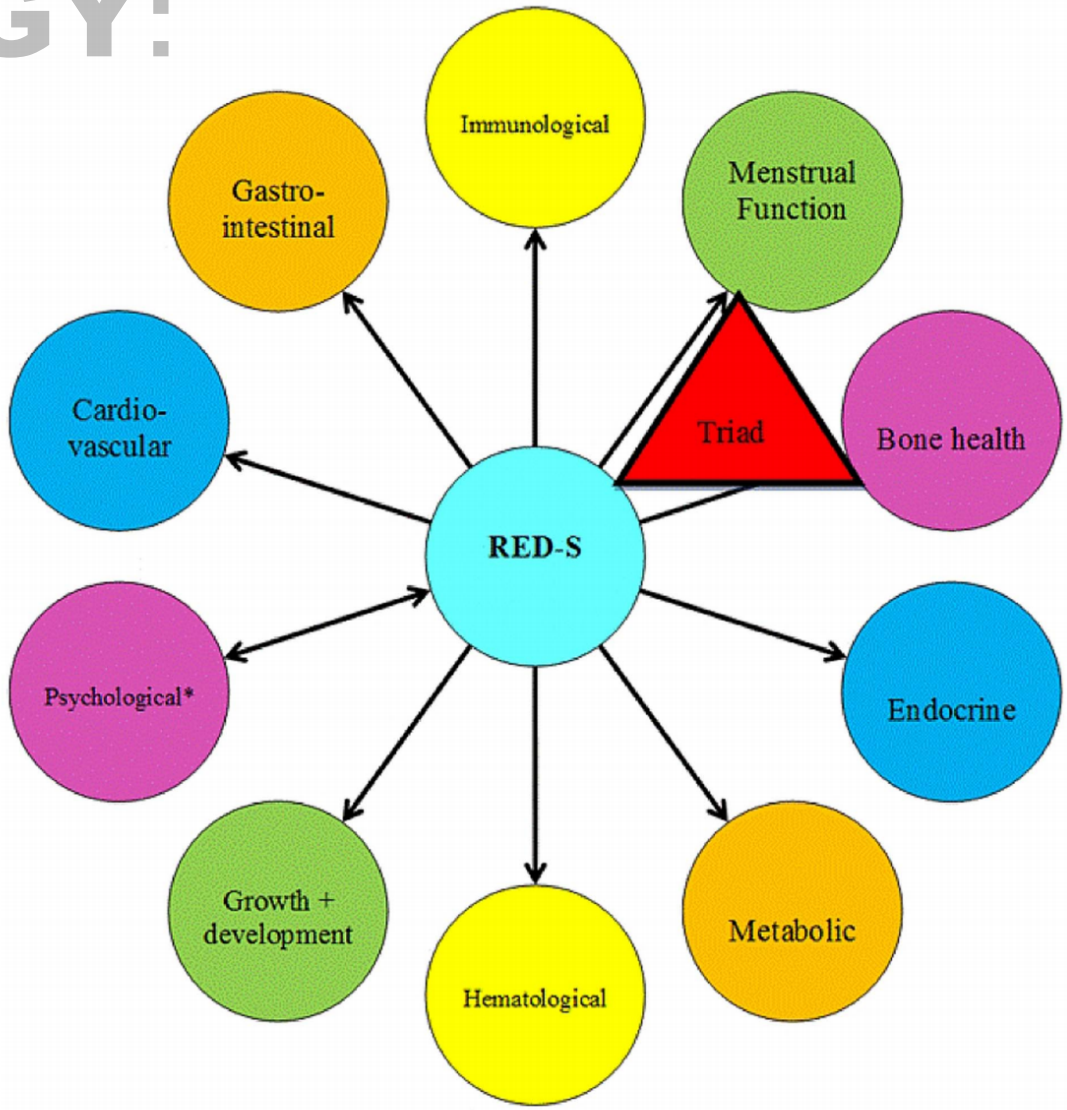


Figure 1 Health Consequences of Relative Energy Deficiency in Sport (RED-S) showing an expanded concept of the Female Athlete Triad to acknowledge a wider range of outcomes and the application to male athletes (*Psychological consequences can either precede RED-S or be the result of RED-S). Adapted from Constantini.[54]

ENERGY:

Mountjoy M, Sundgot-Borgen J, Burke L, et al. Br J Sports Med 2014;48:491–497

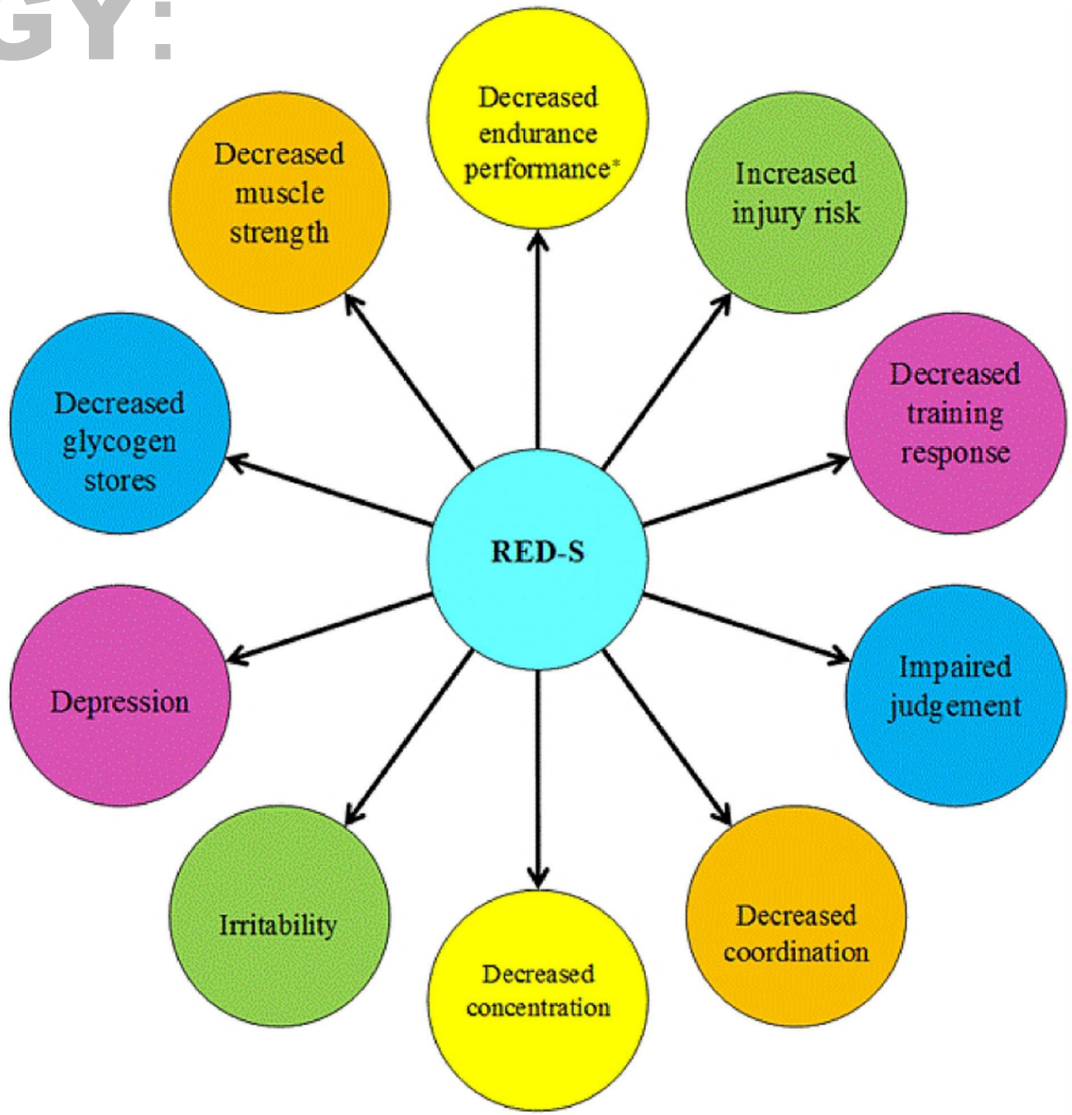


Figure 2 Potential Performance Effects of Relative Energy Deficiency in Sport (*Aerobic and anaerobic performance). Adapted from Constantini.[54]

MACRO NUTRIENTS

MACRONUTRIENTS:

Carbohydrates =

–Most efficient fuel.

–Critical catalyst for adaptation.

MACRONUTRIENTS:

Carbohydrates =

High availability promotes high quality training.

Low availability impairs quality, increases stimulus.

MACRONUTRIENTS:

Carbohydrates =

Insufficient carbohydrate intake impairs protein synthesis.

10. Whole Wheat Pasta

*You don't need me to tell you that pasta is high in carbs. One cup of whole-wheat spaghetti provides 37 grams. As with other grain-based foods, whole-grain pasta supplies more nutrition, yields longer-lasting energy, and promotes less fat storage than regular pasta. Serve it with a protein, such as shellfish or meatballs made with lean ground beef or turkey, and you get a lower glycemic index meal for even longer-lasting energy. Photo: **www.shutterstock.com***

3. Brown Rice

*Cereal grains such as brown rice are among the richest sources of carbohydrate. One cup of brown rice has 45 grams of carbohydrate. Whole grains such as brown rice are considered healthier than refined grains such as white rice because they contain more fiber, vitamins, and minerals. They are also absorbed more slowly (their glycemic index is lower), so they provide more lasting energy and promote less fat storage. Photo: **www.shutterstock.com***

6. Old-Fashioned Oatmeal

Old-fashioned oatmeal is an ideal pre-exercise breakfast choice. It's easy to eat and digest and provides a ton of carbs: one half-cup gives you a whopping 54 grams! Add a sliced banana and wash it down with a glass of OJ and you'll take in 100-plus grams of carbohydrate. Photo: www.shutterstock.com

5. Lowfat Yogurt

Lowfat milk-based foods such as yogurt are very rich sources of carbohydrate. A six-ounce serving of lowfat blueberry yogurt supplies 26 grams of carbs. Lowfat yogurt is a better choice before and immediately after exercise because it has a higher glycemic index, so the carbs go to work quickly. Most yogurts, even those with fruit in them, contain added sugar, which is totally unnecessary and less healthy. So try to find a brand with no added sugar. Photo: www.shutterstock.com

1. Bananas

Because they are easy to eat and digest and are loaded with fast-acting carbohydrates (one large banana provides 31 grams of carbs), bananas make the perfect pre- or post-exercise snack. Just be sure to have your banana with some form of protein after exercise to promote muscle recovery and repair. Photo: www.shutterstock.com

MACRONUTRIENTS:

Protein =

–Key building material for muscle.

–Critical for tendons, bones.

MACRONUTRIENTS:

Protein =

Training stimulus can trigger protein synthesis in muscles for at least 24 hours. Thus, multiple protein meals following training session is effective.

MACRONUTRIENTS:

Protein =

Athletes ***do*** benefit from protein intake above **R**ecommended **D**aily **A**llowance (**RDA**).

*[**1.6 – 1.8** grams per kg body mass per day]*

MACRONUTRIENTS:

Protein =

Experienced athletes need less than novice athletes.

Greater intensity and/or greater volume training increases need.

MACRONUTRIENTS:

Protein =

TIMING: 15-25 grams within 2 hours of exercise = greatest gains.

TYPE: **Milk** based protein = greatest gains, favorable body composition.

MACRONUTRIENTS:

Protein =

Insufficient carbohydrate intake
Impairs protein synthesis.

…in case you forgot.

Albacore Tuna

Few foods provide more protein per calorie than albacore tuna. One can of white albacore tuna packed in water provides 41 grams of high-quality protein in just 220 calories. Albacore tuna is also a good source of vitamin B12, a very important vitamin for runners because of its role in cellular energy production. Photo: www.shutterstock.com

Almonds

Plant foods do not provide as much protein — or as high-quality protein — as animal foods. But when it comes to plant foods, almonds are a very good protein source. One ounce of dry-roasted, salted almonds contains six grams of protein. Almonds are also an excellent source of vitamin E, fiber, and unsaturated fats. Photo: www.shutterstock.com

Low-Fat Yogurt

Yogurt contains two forms of milk protein, whey and casein, both of which have perfect PDCAA scores of 1.0. Milk proteins are also rich in a protein fraction called glycomacropeptide (GMP), which is a powerful hunger killer. Therefore, calorie-for-calorie, low-fat dairy foods, such as low-fat yogurt, satisfy the appetite longer than most other foods. They are also a great source of calcium. Photo: www.shutterstock.com

MACRONUTRIENTS:

Fat =

A **necessary** nutrient used for energy, cell membranes, absorption of vitamins.

MACRONUTRIENTS:

Alcohol =

–Excessive calories (7 kcal).

–Suppresses lipid oxidation.

–Increases unplanned consumption.

MACRONUTRIENTS:

Alcohol =

Impairs metabolism, glycogen storage, rehydration, thermoregulation, coordination, concentration

MACRONUTRIENTS:

Optimal Nutrient Ratio =

60 / 20 / 20 **???**

40 / 30 / 30 **???**

MACRONUTRIENTS:

Optimal Nutrient Ratio =

"Percentages are meaningless, because it is the absolute amount of carbohydrate and protein that matters…"

–Asker Jeukendrup, PhD

MACRONUTRIENTS:

Optimal Nutrient Ratio =

"How much you need depends on your goals and the amount of training you do."

–Asker Jeukendrup, PhD

Desert Vista High School

Energy Balance Estimation (*Boy's Cross-Country*)

Fall 2017

Individualized Macronutrient Intake & Hydration Program

Estimated Daily Energy Expenditure (dietary calories)	Daily H_2O Consumption (ounces)	Post-Training CHO Intake (dietary calories)	Post-Training CHO Intake (grams)	Post-Training PRO Intake (dietary calories)	Post-Training PRO Intake (grams)
3,233	137	269	71	71	18

Total Daily CHO Intake (dietary calories)	Total Daily CHO Intake (grams)	Total Daily PRO Intake (dietary calories)	Total Daily PRO Intake (grams)	Total Daily FAT Intake (dietary calories)	Total Daily FAT Intake (grams)
2,128	560	424	106	681	73
66%		*13%*		*21%*	

Nutrition for Performance
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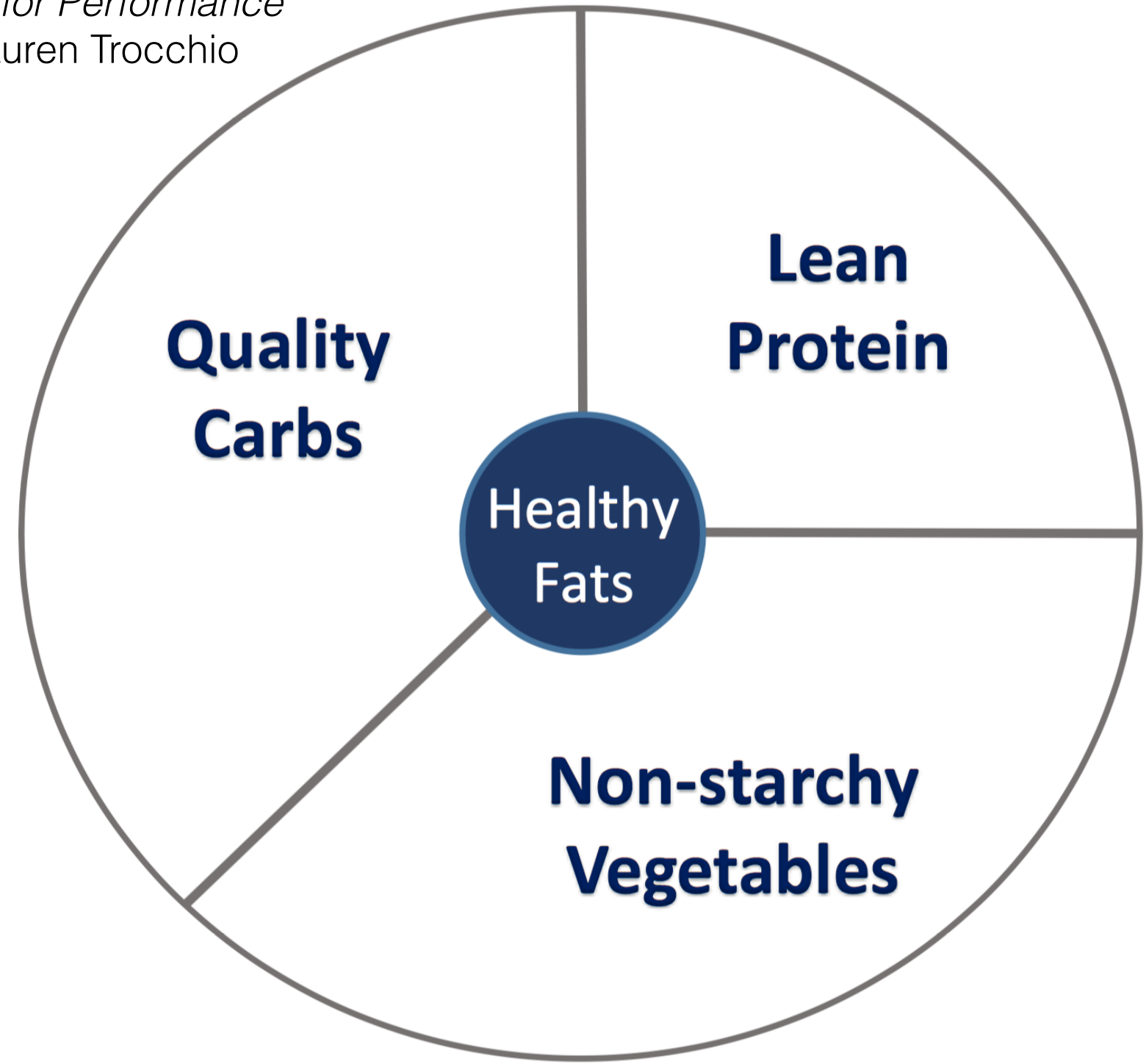

PART 2

MICRO NUTRIENTS

MICRONUTRIENTS:

Iron =

–Critical for **hemoglobin** and oxygen transport.

MICRONUTRIENTS:

Iron =

Foot strike hemolysis, rapid growth, high altitude, menstruation, blood donation, injury may cause **deficiency**.

MICRONUTRIENTS:

Iron =

Athletes do benefit from iron intake above **R**ecommended **D**aily **A**llowance (**RDA**).

*[**>18** mg girls / **>8** mg boys]*

MICRONUTRIENTS:

Iron =

No agreement on use of **ferritin** as indicator of iron deficiency. Suggested problematic threshold ranges from **<10** to **<35**.

MICRONUTRIENTS:

Iron =

Best source = Heme Iron.

Iron intake immediately following exercise is not advised due to elevated hepcidin (regulatory hormone).

Beetroot

Lack of Blood No More

Beetroots are known to be one of the best and effective uses against anaemia (a low haemoglobin count). The iron-rich veggie is known for repairing and reactivating your red blood cells, furthermore enhancing the supply of oxygen to every part of your body. For runners especially, this helps sustain their overall bodily endurance and stamina. You can incorporate beetroots into your salads or in your smoothies and health juices.

Apricots (Khubani)

Better Dried (Source)

Interestingly, dried apricots are far more preferred than their fresh counterparts, as they tend to contain a much higher level of nutrients. They provide an ideal source of iron, fibre, antioxidant carotenoids and potassium. The potassium proves quite vital for a runner's body as it helps maintain healthy rates of blood pressure. A sufficient amount of the fruit's inclusion into your dietary system helps beyond just fulfilling your daily iron requirements.

Seafood

A Healthy (and Tasty) Addition to Your Diet (Source)

Little did we know that we have an abundance iron rich foods right under the sea! Fish is often opted by athletes to help prevent anaemia and maintain high levels of iron. Many of the popular fatty fishes like tuna and salmon - as well as other seafood like mussels and oysters - are very rich in iron and vitamin D. It's very important to make fatty fishes, like baked or roasted salmon, or any other kind of seafood a part of diet at least three times a week.

Whole Grain Bread

Whole Grain Goodness (Source)

A single slice of whole grain bread is believed to contain about 6% of the daily iron requirement for your body and it is incidentally a very good source of non-heme iron. This will ultimately help the body effectively fight any form of iron deficiency. Runners, athletes and health enthusiasts usually replace their staple intake of white with whole grain wheat bread.

MICRONUTRIENTS:

Vitamin D =

–Regulates calcium and phosphate absorption.

MICRONUTRIENTS:

Vitamin D =

Promotes decreased risk of stress fracture, decreased risk of respiratory illness, reduced inflammation, injury prevention, improved neuromuscular function, increased muscle fiber size.

MICRONUTRIENTS:

Vitamin D =

Lack of exposure to sunlight (UVB) primary cause for deficiency.

Supplementation above **RDA** may be required.

Wild-caught fish

(425 IU in 3 oz salmon, 547 IU in 3 oz mackerel)

ROSS WOODHALL/GETTY IMAGES

Canned fish

(154 IU in 3 oz tuna, 270 IU in 3.5 oz sardines)

DIGICOMPHOTO/GETTY IMAGES

Oatmeal

(150 IU in 1 packet)

IMAGE SOURCE/GETTY IMAGES

Orange juice

(137 IU in 1 cup)

TETRA IMAGES/GETTY IMAGES

MICRONUTRIENTS:

Calcium =

–Bone growth, maintenance, repair.

–Muscle contraction, nerve condition, blood clotting.

MICRONUTRIENTS:

Calcium =

Risk of calcium deficiency increased by low **E**nergy **A**vailability (**EA**) and menstrual dysfunction.

MICRONUTRIENTS:

Calcium =

Dangers of calcium deficiency:
Low bone density, stress fractures.

MICRONUTRIENTS:

Yogurt

Plain yogurt tops the list of all calcium-rich foods. An 8 ounce serving contains 452 milligrams of calcium. Low-fat fruit yogurts also rank fairly high, averaging 345 milligrams.

Cooking Greens

Many green vegetables traditionally boiled, stir-fried or steamed are high in calcium. Top choices on the USDA list include collards, spinach, turnip greens, kale, okra, pak-choi and dandelion greens. They range from 178 milligrams of calcium per 1/2 cup for collards to 74 milligrams of calcium per 1/2 cup for dandelion greens.

Seafood

Sardines and salmon are each high in calcium. A 3 ounce portion of Atlantic sardines delivers 325 milligrams of calcium, while the same amount of pink salmon yields 181 milligrams. The same serving size of canned blue crab, canned clams and cooked rainbow trout also contains decent amounts of calcium, ranging from 73 milligrams to 86 milligrams.

Tofu

Like other soy foods, tofu is high in calcium. One-half cup of firm tofu averages 253 milligrams of calcium, according to the USDA. Consider adding baked, stir-fried or mashed tofu to your recipes.

MICRONUTRIENTS:

Antioxidants =

–Protects cells from oxidative damage.

Distance runners have higher oxidative stress.

Many fruits and some vegetables contain high levels of carotenoids, vitamins, phenols, flavonoids and glutathionine. These antioxidants, according to the USDA Agricultural Research Service, can act as free radical scavengers, decompose peroxide, quench singlet and triplet oxygen as well as inhibit some enzymes. By decreasing the high levels of free radicals generated by metabolism, antioxidants decrease oxidative stress and prevent biochemical and physiological injury that can lead to functional impairment or cell death.

Various free antioxidants have been associated with lower cancer and heart disease mortality rates, according to the USDA Agricultural Research Service. Kansas State University research suggests that eating plenty of foods high in antioxidants helps slow the processes associated with aging and protect against many chronic diseases.

Juicy tomatoes are packed with three types of antioxidants – Lycopene (that gives tomato its bright red colour), Vitamin C and Vitamin A. Vitamin C is one of the most potent kind of antioxidants that you can derive from fruits and vegetables. The lycopene in tomatoes is best absorbed when they are cooked.

If you're looking to load up on antioxidants, have a handful of raisins. Dark raisins are packed with anthocyanins that give you an energy boost. Sprinkle them on your breakfast oats, throw them in a salad or blend some with your smoothie. Interestingly, raisins contain at least three times the amount of antioxidants as grapes

Coffee

While many people drink coffee throughout the day for a kick of caffeine, they probably don't know that according to *Men's Health*, it is the number one source of antioxidants in the American diet. The antioxidants in it are called chlorogenic acid which helps to prevent worsening bad cholesterol and weight gain. Keep in mind that these benefits are only prominent with black coffee and diminish the second that sugars, sweeteners, and whipped cream is added.

Nutrition for Performance
LCDR Lauren Trocchio

Sample Daily Plan

(150lb Runner)	**MEAL PLAN**
Pre-Workout (run)	1 English muffin 1 tsp jam *Water*
Post-workout/Breakfast	2 eggs 1 cup oatmeal made with milk 1 cup melon
Lunch	Black bean veggie burger in whole wheat pita Spinach, onions, tomatoes ½ Avocado 1 orange
Afternoon Snack/Pre-workout	1 banana Small handful almonds
Post-workout	12 oz chocolate milk Pear
Dinner	4 oz salmon (made with olive oil) 1 large sweet potato (with 1-2 tsp butter) 1 cup steamed broccoli

Daily Protein Intake Goal:		106	grams
7:15 A.M.	Post-Practice	18	grams
7:50 A.M.	Breakfast	24	grams
12:30 P.M.	Lunch	24	grams
6:30 P.M.	Dinner	24	grams
9:00 P.M.	Pre-Sleep	18	grams

Daily Water Intake Goal:		137	Ounces
4:15 A.M.	Awakening	---	
4:30 A.M.	Light Snack	7	Ounces
4:55 A.M.	Pre-Practice	7	Ounces
7:15 A.M.	Post-Practice	15	Ounces
8:20 A.M.	Pre-Period I	7	Ounces
9:15 A.M.	Pre-Period II	7	Ounces
10:15 A.M.	Pre-Period III	7	Ounces
11:30 A.M.	Pre-Period IV	10	Ounces
12:30 P.M.	Lunch	15	Ounces
1:10 P.M.	Pre-Period VI	7	Ounces
2:10 P.M.	Pre-Period VII	10	Ounces
3:15 P.M.	Afternoon	15	Ounces
5:15 P.M.	Evening	15	Ounces
8:00 P.M.	Night	15	Ounces

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