

Athlete Dietary Plan Project

Athlete: Adult 5th degree black belt in USTF taekwondo martial arts

General Information

Taekwondo is a martial art that originates from Korea in the 1950s with the help of South Korean General Choi, who is known as the father of taekwondo. Although taekwondo is a modern sport, it is based on older martial arts like Tae Kwon. Initially, taekwondo was governed by the International Taekwondo Federation (ITF), but ideological and political differences caused the ITF to fracture and break into different organizations alongside it. Examples include the World Taekwondo Federation (WTF), United States Taekwondo Federation (USTF), and American Taekwondo Federation (ATF). The organizations now have differences in techniques and regulations for the sport. The client discussed later in this paper is a member of the USTF, so the discussion of the sport will revolve around the methods of the USTF.

Taekwondo, traditionally spelled as tae kwon do, translates to “way” (do) of the “foot” (tae) and “fist” (kwon). The literal translation is appropriate because the sport involves various punching and kicking techniques. In the USTF, an athlete who takes rank in taekwondo and is active in the sport will attend a school where they meet regularly each week for training. There are four main areas of training that USTF athletes practice—patterns, sparring, breaking, and self-defense (ho sin sul). Each rank learns different types of kicks, punches, jumps, and self-defense moves that build upon the techniques learned at previous ranks.

Tournaments usually consist of competition in patterns, sparring, and breaking. Patterns require athletes to have stamina because some of the moves can involve slow movements that are held for a few seconds before switching to the next movements. The length of time for patterns varies depending on the pattern, but they can last several minutes. The phosphagen energy system is the initial system used by taekwondo athletes participating in patterns before relying on glycolysis for ATP production. Breaking requires muscle strength

and power to break many boards or tiles. The length of time for the breaking athlete is short, which lasts for as long as a punch or kick takes to go through the boards. The only energy system that contributes to breaking would be the phosphagen system. Sparring can be especially challenging because it involves several minutes of stamina and the ability to make quick offensive and defensive moves. Yang et al. (2023) talk about a study that found, in taekwondo specifically, the mean energy system contributions in three 2-minute sparring matches (with one minute of rest in between each match) are 30% ATP-PCr (phosphagen), 4% glycolytic, and 66% oxidative (aerobic). The aerobic energy system produces the most ATP, but it is slower to start, so sparring taekwondo athletes need to rely on the instant ATP production of the phosphagen system for their jabs and blocks at the start of the match followed by glycolysis.

Taekwondo is classified as an explosive strength and power, speed, and muscular endurance sport. For practical purposes, Sean will be labeled as a strength and power athlete in this paper. Fink and Mikesky's *Practical Applications in Sports Nutrition 69th ed* (2021) textbook says that the athletes need 6 to 10 g per kg of carbohydrate, or calculations can be based on the acceptable macronutrient distribution range (AMDR) of 55-65% of total Calories (kcal). Protein needs for strength and power athletes include a range of 1.2 to 2.0 g per kg, or an AMDR of 10-35% of total kcal. Fat calculations for these athletes can be 2 g per kg body mass or an AMDR of 20-25% of total Caloric consumption.

Personal Information

Sean is the taekwondo athlete who participated in this nutrition evaluation project. He is a 38-year-old male who weighs 210 pounds and is six feet tall, which equals 95.5 kg and 182.88 cm in metric units. Sean has a goal weight of 195 pounds. He is a data analyst at a local school and is working on obtaining a master's degree in the field. Physically, Sean is healthy with no major health issues. There is a history of a broken 5th metatarsal in his right foot from landing poorly during a taekwondo jump, but it has since healed. He does have some mental health issues, such as depression and ADHD, which are successfully managed with medications.

With his occupation as a data analyst, most of the day is spent sitting. Sean's taekwondo school meets on Tuesday and Thursday evenings. Exercise outside of class consists of near-daily 15-minute walks around his lunch break. Sean tries to go to the gym but does not have a regular gym schedule.

There was no professional body fat percentage analysis (ex., underwater weighing, DEXA scan, bioelectrical impedance analysis, etc.), but Sean claims his body fat percentage is 22%. Based on his height and weight, Sean's BMI is 28.6, which is considered overweight.

Sean lives in an apartment with his girlfriend. There are no children, only pets. Groceries are usually purchased by his girlfriend, and she also prepares dinner. Breakfast is eaten at home. Sometimes he packs a lunch to take to work, and other times he gets lunch from the cafeteria at his job. Most nights involve home cooked meals, but sometimes he eats out or heats up convenience foods.

Client History

The Gatorade toolkit was used to obtain an initial nutrition evaluation for Sean. He follows a general diet with no modifications, and he "tries to include all the macros." It is easier to discuss Sean's food preferences with what he dislikes. Dislikes include olives, mushrooms, melons, crustacean seafood (shrimp, lobster, etc.), condiments, and sauces. His liked foods are simple—sweets. There are no known food allergies, but Sean does say that he is lactose intolerant, although he does eat cheese.

Sean has an average level of nutrition knowledge. This includes a general idea of what macronutrients are and that Calories (kcal) affect energy and weight. He knows that eating carbs can help boost energy. His level of cooking ability is low—he relies on his partner for food preparation because of a lack of cooking skills and motivation to prepare meals. Sean's level of meal planning skills is also low because he has never thought about or tried meal planning.

A typical training schedule for Sean involves his weekly classes on Tuesdays and Thursday nights. His training time in class varies depending on whether he is scheduled to help teach

those nights, which could mean he trains 2.5 hours or 1.5 hours twice a week. When he makes it to the gym, Sean focuses on using the weight machines to build muscle mass and jogging on the treadmill. Encouragement of regular gym visits for weight training and cardio, in conjunction with improved nutrition, will help improve his tournament performance. The increased muscle mass will help give power to break more boards when he competes at tournaments, and the treadmill cardio will help improve his stamina during sparring and patterns.

Below is a 2-day dietary recall for Sean:

Day 1 Recall – Wednesday April 30		
Meal	Food Item	Quantity
Breakfast	<ul style="list-style-type: none"> • Ready Clean Protein bar • Banana • Fairlife protein shake 	<ul style="list-style-type: none"> • 1 bar • 1 fruit • ½ bottle
Lunch	<ul style="list-style-type: none"> • Pretzel sticks • P3 Protein snack pack • Baby Bell cheese • Strawberries • Black berries • Catalina Crunch cereal • Dr. Pepper Zero 	<ul style="list-style-type: none"> • 1 serving • 1 package • 1 cheese • ½ cup • ½ cup • 2 servings • 1 can
Snack	<ul style="list-style-type: none"> • Peanut M&Ms 	<ul style="list-style-type: none"> • 1 package
Dinner	<ul style="list-style-type: none"> • Chicken breast • Cellentani pasta • Broccoli • Mixed Vegetables • Monterey jack cheese • Dr. Pepper Zero 	<ul style="list-style-type: none"> • 4 oz • 2 cups • ½ cup • 1 cup • ¼ cup • 1 can
Snack	<ul style="list-style-type: none"> • Tiramisu dessert cup 	<ul style="list-style-type: none"> • 1 cup
Snack	<ul style="list-style-type: none"> • Lesser evil popcorn 	<ul style="list-style-type: none"> • 2 cups

Day 2 Recall – Thursday May 1		
Meal	Food Item	Quantity
Breakfast	<ul style="list-style-type: none"> • Ready Clean Protein bar • Costco raspberry lemon muffin • Banana 	<ul style="list-style-type: none"> • 1 bar • 1 muffin • 1 fruit

Lunch	<ul style="list-style-type: none"> • Salad (w cheese and croutons) • Popcorn chicken • Steamed cauliflower and zucchini • Slice of pepperoni pizza • Meatballs in tomato sauce • Waffle biscuit • Cookie • Water 	<ul style="list-style-type: none"> • 1.5 cup, ¼ cup, 2 tbsp • 1 cup • 2 cups • 1 slice • 4 balls, ¼ cup sauce • 1 biscuit • 1 cookie • 8 oz
Pre-TKD snack	<ul style="list-style-type: none"> • Whole grain bread 	<ul style="list-style-type: none"> • 2 pieces
Dinner (leftovers)	<ul style="list-style-type: none"> • Chicken breast • Cellentani pasta • Broccoli • Mixed Vegetables • Monterey jack cheese • Dr. Pepper Zero 	<ul style="list-style-type: none"> • 4 oz • 2 cups • ½ cup • 1 cup • ¼ cup • 1 can
Snack	<ul style="list-style-type: none"> • Lesser evil popcorn • Pans au chocolate 	<ul style="list-style-type: none"> • 2 cups • 1 pastry
Snack	<ul style="list-style-type: none"> • Catalina crunch cereal 	<ul style="list-style-type: none"> • 2 servings

The table below shows the Calorie and macronutrient breakdown for this diet history based on input into MyFitnessPal.

Nutrient Breakdown for 2 Day Dietary Recall			
Total Calories	Carbohydrates (g)	Fat (g)	Protein (g)
Day 1			
2,520	307	84	134
Day 2			
3,292	370	120	183

Two days can be difficult to encompass the client's full eating habits, but it does give dietitians an idea of dietary patterns. The distribution of macronutrients for day 1 is 49% carbohydrate, 30% fat, and 21% protein. The distribution for day 2 is 45% carbohydrate, 33% fat, and 22% protein. Athletes should have a carbohydrate range of 55-65%, a protein

range of 10-35%, and a fat range of 20-25% (Fink & Mikesky, 2021). Sean's TDEE and recommended macronutrient distributions that will help him reach his goals are broken down below in the Established Goals and Meal Planning sections. Although not listed in the recall, Sean says he drinks water throughout the day.

Established Goals

These were the main nutrition-related goals that Sean and I determined:

- Improve stamina during sparring and patterns
- Decrease fat mass while preserving muscle mass

Nutrition education will be essential to help Sean reach his goal of improved stamina during sparring and patterns. A basic understanding of the function of macromolecules in the body, as well as the type of foods where they can be found, will help him make positive food choices that will enhance his training ability. He would also benefit from learning how to time his meals on competition days, which will aid his energy metabolism systems.

A one pound per week decrease in mass would be sustainable and healthy for Sean. This would mean subtracting 500 kcal from his TDEE (calculated below). Sean can be successful in decreasing his fat mass by learning what his daily Caloric goal is for promoting weight loss. Lean mass can be targeted by the body during Caloric deficits, which could impact his performance during breaking at competitions. Regular exercise should be encouraged to help muscle maintain strength. It is out of a dietitian's scope of practice to provide specific fitness instruction or create exercise plans, but they can recommend exercise and explain general guidelines for activity (150 minutes of moderate intensity exercise a week) and the physiology of exercise.

Sean does not have time constraints that would affect his ability to make these changes. He says that his partner would be willing to help implement dietary and nutritional changes that will help him succeed with his goals and improve his taekwondo performance. For cultural considerations, Sean eats a typical American diet. There are also no health

considerations that need to be made for him. ADHD medication may cause decreased appetite, so Sean should be encouraged to pay attention to his hunger cues.

The TDEE to help Sean meet his nutrition goals for improving his sport performance can be calculated with the Mifflin-St. Jeor equation for males:

$$RMR = (10 * \text{weight in kg}) + (6.25 * \text{height in cm}) - (5 * \text{age in years}) + 5$$

Based on this equation, Sean's resting metabolic rate is 1,913 kcal. To find the TDEE, his RMR must be multiplied by an activity factor. Sean's sedentary job, twice a week training, and variable gym visits give him a light activity factor of 1.375. The TDEE using this factor is 2,630 kcal. With the 500-kcal deficit suggested above in the goals section, Sean should strive for a daily Caloric intake of 2,130 Calories. The following sections break down suggestions for Sean's macronutrient breakdown and are based on Fink and Mikesky's textbook (2021).

Carbohydrates

Energy from carbohydrates provides 4 kcal per gram CHO. If the total Calorie amount is 2,130 kcal, 55-65% would be 293 g to 346 g of carbohydrates.

Protein

The recommendation of protein for athletes is 1.2 – 2.0 g per kg body fat. Sean's weight is 95.5 kg. The range of protein would be 115 g to 191 g. However, it is also important to make sure these values fall within the AMDR for protein, which is 10-35% of total Calories come from protein. 115g of protein equals 22% of the total allotted Calories. However, 191 g of protein equals 36%, which is slightly higher than the max AMDR of 35%.

Because Sean's activity level is on the lighter side, a more conservative approach would be appropriate. The higher protein recommendation will be 1.5 g/kg, which would equal 143 g of protein and is 27%.

Fat

The AMDR for fat in strength and power athletes is 20-25%. With the total daily Calories being 2,130, the grams of fat would be 59 g to 71 g. However, Sean's minimum protein and carbohydrate recommendations equal 77%, which would leave around 23% of Calories left for fat or 54 g. This value falls within the ADMR for fat and would provide adequate essential fatty acids for his health.

Energy and Macronutrient Recommendations for Athlete

Calories	Carbohydrate (g)	Protein (g)	Fat (g)
2,130	293 - 346	115 - 143	54

Meal Planning

Sean shared the staple pantry items his household has and the brands that they usually purchase. The meal plan utilizes this information to help make grocery shopping easier for him and his partner because they use some of these ingredients and the foods fall within his budget and food preferences. Water is not listed on the meal plan because Sean says he does not like drinking water with his meals. This meal plan operates under the assumption that Sean will drink water throughout the day.

Sample Day 1 Meal Plan (No TKD Class)			
Meal	Food Item	Quantity	Justification
Breakfast – 7am	Multigrain bread	2 slices	Complex carb with fiber, some protein
	Kirkland peanut butter	1 tbsp	Healthy fats, some protein
	Banana	1 medium	Complex carbs and fiber, potassium
	Non-Fat vanilla soy milk	1.5 cups	Some protein and carbs
Breakfast totals			
Calories: 613	Carbs: 100 g	Protein: 24 g	Fat: 13 g
Snack – 10 am	Almonds	1 ounce	Healthy fats
	Fairlife Protein Shake (Nutrition Plan)	1 Bottle	High in protein
Morning Snack Totals			
Calories: 337	Carbs: 10 g	Protein: 36 g	Fat: 17 g

Lunch – 12 pm	Mission whole grain tortilla	1 tortilla	Complex carb, fiber, some protein
Packed lunch	Oscar Myer turkey breast	3 oz	Protein source
	Romain lettuce leaf	1 large leaf	Vitamins (K, A, C, folate) and water
	Tomato	2 slices	Vitamins (C, K, E, folate) and potassium
	Honeycrisp apple	1 medium	Complex carb, source of fiber
	Dr. Pepper Zero	1 Can	Athlete's favorite drink, does not have added sugars
Lunch Totals			
Calories: 362	Carbs: 58 g	Protein: 19 g	Fat: 6 g
Snack – 3pm (takes afternoon walk)	Cliff bar	1 bar	Carbs for energy
Afternoon snack totals			
Calories: 266	Carbs: 43 g	Protein: 10 g	Fat: 6 g
Dinner – 6pm	Chicken breast	5 oz	Complete protein source
	Broccoli, roasted	1 cup	Fiber, vitamins (C, K, A), minerals (Ca, K, Fe)
	Cauliflower, roasted	1 cup	Vitamins (C, K, folate)
	Sweet potato, baked	1 medium	Complex carbs and fiber, vitamins (A, C, B5, B6)
	Dr. Pepper Zero	1 Can	Athlete's favorite drink, does not have added sugars
Dinner totals			
Calories: 386	Carbs: 36 g	Protein: 38 g	Fat: 10 g
Snack – 8pm	Strawberries	1 cup	Complex carbs and fiber, vitamin C

Likes dessert	Blackberries	1 cup	Complex carbs and fiber, vitamins (C, K), minerals (Mn, Cu)
	Rice cake, plain	2 cakes	Carb source
	Cool Whip	2 tablespoons	Low calorie, help make berries more dessert like for sweet tooth
Evening snack (dessert) totals			
Calories: 231	Carbs: 46 g	Protein: 5 g	Fat: 3 g
Day 1 Daily Totals			
Calories: 2,191	Carbs: 293 g	Protein: 132 g	Fat: 55 g
	54%	24%	22%

Sample Day 2 Meal Plan (TKD Class)			
Meal	Food Item	Quantity	Justification
Breakfast – 7am	Scrambled eggs	2 eggs	Source of protein and fat
	Oatmeal	0.5 cup oats	Complex carbs and fiber
	Nonfat vanilla soy	1.5 cups (use 0.5 cup for oatmeal)	Some protein and carbs
	Strawberries	1 cup, sliced	Complex carbs and fiber, vitamin C
Breakfast Totals			
Calories: 461	Carbs: 59 g	Protein: 27 g	Fat: 13 g
Snack – 10 am	Banana	1 medium	Complex carbs and fiber, potassium
	String cheese	1 stick	Some protein and fat
Morning Snack Totals			
Calories: 202	Carbs: 28 g	Protein: 9 g	Fat: 6 g
Lunch – 12:30 pm	Salad bar		
Cafeteria	Spring mix	2 cups	Vitamins (A, C, K, folate) and minerals (Mn, K, Ca)
	Tomato	½ cup	Vitamins (C, K, E, folate) and potassium

	Broccoli, raw	½ cup	Fiber, vitamins (C, K, A), minerals (Ca, K, Fe)
	Buffet line		
	Sodexo Veggie Lover Pizza	1 slice	Vegetarian option lower in saturated fats from lack of meats
	Dr. Pepper Zero	1 Can	Athlete's favorite drink, does not have added sugars
Lunch Totals			
Calories: 427	Carbs: 63 g	Protein: 19 g	Fat: 11 g
Snack – 3pm (takes afternoon walk)	Cliff Bar	1 bar	
Afternoon Snack Totals			
Calories: 266	Carbs: 43 g	Protein: 10 g	Fat: 6 g
Pre- TKD class Snack – 5pm	Lesser Evil popcorn	2 cups	Complex carbs and some fiber
Carbs and protein, less fat for pre-workout snack	Fairlife protein shake (Nutrition Plan)	1 bottle	Protein source
Pre-TKD class Snack Totals			
Calories: 284	Carbs: 21 g	Protein: 32 g	Fat: 8 g
Dinner – 8pm	Vegetarian Taco Salad		
	Black Beans, rinsed	1 cup	Plant-based protein, when eaten with rice it makes a complete protein
	Brown rice	1 cup	Complex carb and fiber, when eaten with beans it makes a complete protein
	Green bell pepper	½ cup chopped	Vitamins (C, A)
	Red Onion	½ cup chopped	Flavor, vitamins (C, folate, B6), potassium
	Tomato	½ cup	Vitamins (C, K, E, folate) and potassium

	Romaine lettuce, chopped	2 cups	Vitamins (K, A, C, folate) and water
	Tortilla strip topping	¼ cup	Makes salad more enjoyable with crunch
Dinner Totals			
Calories: 546	Carbs: 103 g	Protein: 20 g	Fat: 6
Day 2 Daily Totals			
Calories: 2,186	Carbs: 317 g	Protein: 117 g	Fat: 50 g
	58%	21%	21%

Nutrient Evaluation

Day 1 Nutrient Breakdown (MyFitnessPal)

Total	
Protein 132	Trans Fat 0
Carbohydrates 293	Cholesterol 163
Fiber 44	Sodium 2,621
Sugar 117	Potassium 4,171
Fat 55	Vitamin A 61
Saturated Fat 11	Vitamin C 519
Polyunsaturated Fat 9	Calcium 158
Monounsaturated Fat 15	Iron 99

Day 2 Nutrient Breakdown (MyFitnessPal)

Total	
Protein	117
Carbohydrates	317
Fiber	46
Sugar	77
Fat	50
Saturated Fat	16
Polyunsaturated Fat	5
Monounsaturated Fat	8
Trans Fat	0
Cholesterol	451
Sodium	2,396
Potassium	2,930
Vitamin A	139
Vitamin C	440
Calcium	174
Iron	131

RDI COMPARISON AGAINST MEAL PLAN			
NUTRIENT	RDI or Goal	Day 1 Actual	Day 2 Actual
CALORIE	2,130 kcal	2,191 kcal	2,186 kcal
CARBOHYDRATE (AMDR)	293 g – 346 g (55-65%)	293 g (54%)	317 g (58%)
FIBER	38 g	44 g	46 g
PROTEIN (AMDR)	115 g 143 g (10-35%)	132 g (24%)	117 g (21%)
TOTAL FAT (AMDR)	54 g (58%)	55 g (22%)	50 g (21%)
SATURATED FAT	24 g (<10%)	11 g	16 g
CHOLESTEROL	300 g	163 mg	451 mg
SODIUM	2,300 mg	2,621mg	2,396 mg
CALCIUM	1,000 mg	158%	174%
IRON	8 mg	99%	131%
VITAMIN A	900 µg (RAE)	61%	139%
VITAMIN C	90 mg	519%	440%
FOLATE	400 µg	242 µg	476 µg

Calories are the sum of energy given to the body by the macronutrient carbohydrates, protein, and fats. It is the Calorie count that will lead to weight loss, maintenance, or gain, depending on an individual's total daily energy expenditure. By using the Mifflin-St. Jeor equation (calculated above) to calculate maintenance Calories and subtracting 500 kcal,

Sean can achieve an estimated 1-pound weight loss per week. The suggested meal plans for both days are very slightly under the 500-kcal deficit by approximately 60 kcals. However, these plans are meant to serve as a framework that can be tweaked to add or subtract Calories. If Sean has only a 250 Calorie deficit, in theory he will still lose weight at 0.5-pound per week.

Carbohydrates are the body's preferred source of fuel that help produce the essential energy molecule, ATP. These macronutrients are found in foods as complex carbohydrates (long chains of polysaccharides like starches and fiber), simple sugars (mono- and disaccharides), and refined carbohydrates (processed carbohydrates that have fiber, bran, and nutrients during the processing). Ideally, carbohydrate intake should be composed of complex carbs or simple carbs from whole foods, and less added sugar or refined carbs. Some examples of good sources of this macronutrient are whole grains, fruits, vegetables, fortified cereals, and dairy products. The body stores unused carbohydrates in the liver and muscles as glycogen, which is essential to athletic success during training and competitions. The acceptable macronutrient distribution range (AMDR) of carbohydrates for strength and power athletes is 55-65% of total Calorie intake (Fink & Mikesky, 2021). For Sean, this would be 293 to 346 g of carbs. In the first day plan, the carb count is 54% of total kcals for the day. Because he will not have class on this day, one percent less than the ideal would be okay. The second day plan is 58% carb, which is important to fall within the AMDR range for athletes because this day's menu is meant to be eaten on a training day with taekwondo class in the evening. Athletes should ensure that carbohydrates (and protein) are replenished following training and competitions while limiting fat to avoid slowed down digestion. The dinner following taekwondo class focuses on carbs and protein with limited fat. The menus provide a mix of carbohydrate types, to provide mostly complex carbohydrates, simple sugars from whole foods, as well as some refined carbs for foods enjoyed in moderation.

Fiber is a form of carbohydrate that is undigested and can help with satiety. It comes in soluble and insoluble forms, which have different functions. Soluble fiber can help lower cholesterol in some people, and it helps to feed the beneficial commensal bacteria in the

gut (Fink & Mikesky, 2021). Insoluble fiber helps to add bulk to stool, which is important for promoting healthy bowels and stool regularity. Soluble fibers can be found in (but are not limited to) apples, beans, legumes, and sweet potatoes. Some insoluble fiber sources are leafy greens, whole grains like quinoa and brown rice, and seeds. Fink and Mikesky (2021) say that males aged 19 to 50 need 38 g of daily fiber. Both day 1 and day 2 provide over that threshold with 44 g and 46 g of fiber, respectively. Athletes need to be cautious with consuming large amounts of fiber right before training or competitions to avoid gastric and intestinal upset. The pre-workout snack suggestion for Sean on day 2 contains approximately 2.4 g of fiber, which would be unlikely to cause GI upset.

Proteins, made up of amino acids, are a macronutrient that is essential for structural growth, hormone and enzyme production, immune function, and fluid and acid-base balance. Amino acids are capable of undergoing transformation into glucose for ATP production in a process called gluconeogenesis when the body is starved for glucose. Gluconeogenesis results in the breakdown of protein structures, including muscle tissue, so adequate carbohydrate intake is necessary to avoid this problem. Weight loss has the potential to lead to breakdown of muscle mass in conjunction with fat mass, so caution to get adequate amounts is necessary. Complete protein sources (which contain all essential amino acids) come from animal products and incomplete protein sources from plants can be paired to form complete proteins. Easy protein sources are meats, dairy products, soybeans and legumes, whole grains, and protein powders and drinks. Power and strength athletes are recommended to get 1.2 to 2.0 g of protein per kg of body mass. However, it is also important to ensure that percentage of total Calorie falls within the AMDR of 10-35%. As stated above in the Established Goals section, Sean's protein goal should be 1.2 g to 1.5 g per kg for a protein intake goal of 115 to 143 g. Both days provide quantities of protein that fall within the goal range (132 g and 117 g) with acceptable ranges of 24% and 21%, respectively. The menus provide a mix of complete and incomplete proteins that ensure that all nine essential amino acids are being met.

Fats are a macronutrient that is composed of saturated and unsaturated fatty acids. The type depends on the chemical structure of the fatty acid, where one or more double bonds,

creates unsaturated fats. Saturated fats are those that are solid at room temperature such as butter, palm and coconut oil and fats found in meat and other animal products. This type of fat has been linked to an increased risk of heart disease (Fink & Mikesky, 2021). On the other hand, unsaturated fats are “healthy” fats that provide essential fatty acids and are liquid at room temperature. Rich sources of healthy fats include avocados, nuts, seeds, salmon, and flaxseed. The AMDR for fats for power and strength athletes falls between 20 and 25% (Fink & Mikesky, 2021). Both days will provide Sean with quantities of fat that fall within the AMDR range at 22% and 21%, or 55 g and 50 g, respectively. The risk to health that saturated fats bring lead to a recommendation of less than <10% of the total Calories. If Sean’s Caloric goal is 2,130 kcals, the DRI would be 24 g of saturated fat or less. On both days he falls short of this value with 11 g and 16 g, respectively. Day 2’s lunch does have some saturated fat from the pizza. However, Sean usually eats at the cafeteria at his job once a week, so it is important to illustrate that convenient foods can be paired with nutrient-dense foods to provide essential nutrients while also enjoying life. Athletes need to be conscientious of the timing of fat consumption around training and competitions. Before vigorous activity, fats should be limited because they slow down digestion and can lead to GI upset. After activities, fat should be limited to allow for Calories to mostly come from carbs and protein to replenish glycogen stores and provide amino acids for muscle repair. Sean’s pre-class snack provides more carbs and protein and less fat. Also, his post-class dinner focuses on carb and protein replenishment and only 6 g of fat.

Cholesterol is a molecule with a hydrocarbon chain connected to a sterol, which is a type of fat that forms ring structures rather than saturated and unsaturated fatty acid tails seen in triglycerides and phospholipids. This particular sterol molecule comes only from animal products or goods made with animal products like pastries or foods fried in butter and lard. Cholesterol has been associated with heart disease (Fink & Mikesky, 2021), although it does have important bodily functions such as cell membrane fluidity, steroid hormone production, and bile acid production. It is important to note that dietary cholesterol intake does not correlate with blood cholesterol, as the body has mechanisms that control cholesterol absorption (Antoni, 2023; Fernandez & Murillo, 2022). Saturated fats are more

likely to affect blood cholesterol levels due to its effect on increasing LDL (bad cholesterol) by inhibiting LDL receptor activity and upregulating LDL particle synthesis (Antoni, 2023). The guideline for dietary cholesterol is 300 mg or less (FDA, 2016). Day 1 falls below the goal range, and the food sources would include the Fairlife protein shake, turkey lunch meat, and chicken. Day 2's recommendation goes over the recommended 300 mg at 451 mg. This is likely due to the eggs, string cheese, and cheese on the pizza and in the crust.

Sodium is a major mineral and important electrolyte that plays a role in electrical functions of the body as well as fluid balance. The electrical signals control nerve function, and muscle contraction of the heart, skeletal, and smooth muscles. This electrolyte is excreted through sweat and by kidney filtration into urine. Although it plays important functional roles, sodium is capable of negatively affecting blood pressure which can in turn impact numerous bodily functions. Athlete's need to make sure that they replace the sodium (and other electrolytes) lost through sweat to avoid symptoms of hyponatremia like cramping, nausea, vomiting, dizziness, seizures, coma, or death (Fink & Mikesky, 2021). Sodium is found in processed foods from table salt (sodium chloride) addition, which can include pickles, cured ham, baked goods, and chips. The FDA (2016) lists the daily recommended value of sodium for adults and children over 4 as 2,300 mg. The two days of meal planning for Sean provide slightly more than this recommended value. Day 1 provides an estimated 2,621 mg and day 2 provides 2,396 mg. Processed foods are likely the major sources of sodium, as the mineral is added for flavor and as an antimicrobial. Despite being slightly above the recommended value, Sean should not experience any dangerous effects because no upper limit has been set for sodium (Fink & Mikesky, 2021). High sodium intake is associated with a risk of hypertension, but if Sean continues training and tries to implement more physical activity at the gym, he should lower his risk of developing high blood pressure.

Calcium is another major mineral that is essential in the diet. It plays a role in blood clotting, nerve signaling, muscle contraction, and bone structure. These functions are especially important to athletic performance. In terms of taekwondo, breaking boards can sometimes cause skin to break, which means that proper blood clotting is necessary. The

patterns, sparring, and breaking all require muscle contraction. Strong bones are needed to withstand breaking boards and weight bearing of the athletes. A few examples of good calcium sources include dairy products, canned sardines, blackstrap molasses, soybeans, cooked collard greens, and salmon cooked with the bones. For males ages 19 to 70, the calcium RDA is 1,000 mg. The nutrient tracking software (MyFitnessPal) does not provide specific quantities of calcium—it provides percentage of the daily recommended value. Both days of the meal plan provide over the RDA for calcium at 158% and 174%, respectively, which equates to 1,580 mg and 1,740 mg. The tolerable upper limit for calcium is 2,500 for males under 50, so these values do not put Sean at risk of calcium toxicity (Fink & Mikesky, 2021).

Iron is a trace mineral that is critical for oxygen transport, and it also plays a role in brain development, immune function, and energy production. For athletes, oxygen transport is particularly important for the aerobic respiration energy system. Iron deficiency can lead to a form of anemia caused by a lack of hemoglobin, which will poorly affect athletic performance by causing fatigue and exercise tolerance among other symptoms. Female athletes are at an increased risk of developing iron-deficiency anemia due to menstruation. However, Sean is male and does not have this risk. Examples of foods that are good sources of iron include fortified cereals, legumes, cooked spinach, bagels, semisweet chocolate, and various meats. The RDA for men between 19 and 50 is 8 mg (Fink & Mikesky, 2021). MyFitnessPal says Sean's meal plan provides 99% of the RDA on day 1 and 131% on day 2, which equates to 7.92 mg and 10.48 mg, respectively. The tolerable upper limit for iron is 45 mg, so Sean is well below the toxicity risk (Fink & Mikesky, 2021).

Vitamin A is a fat-soluble vitamin that forms a family of compounds called retinoids, which is made of three different forms—retinol, retinal, and retinoic acid. This vitamin is important in vision, cell differentiation, immune function, tissue repair, and reproductive health. Although all of the functions are important, for athletes, vision and tissue repair are key functions because they need to be able to see targets and repair damaged tissues. A few examples of vitamin A rich foods include cooked liver (beef and chicken), sweet potatoes, carrots, spinach, romaine, broccoli, and dairy milk. The FDA (2016) says the RDA

of vitamin A for adults is 900 retinol activity equivalents (RAE). One RAE of a vitamin A form is equivalent to 1 mcg of retinol (Fink & Mikesky, 2021). The MyFitnessPal nutrition analyzing software says that Day 1's plan provides 61% of the RDA, which would be 549 RAE, and day 2 provides 139% of the RDA or 1,251 RAE. Because vitamin A is a fat-soluble vitamin, it is capable of being stored in the body, which can put people at risk of developing toxicity if they consistently consume over the tolerable upper limit of 3,000 RAE (Fink & Mikesky, 2021). Sean's day 2 plan provides over the RDA at 1,251 RAE, but it should not cause toxicity because it is under the UL. Day 1 of his plan provides less than the RDA at 549 RAE, but as stated previously, the vitamin is capable of storage in the body, so regular consumption of the vitamin will help prevent deficiency.

Vitamin C is a water-soluble vitamin that has antioxidant power and plays a major role in collagen formation, immune health, and iron absorption. For athletes, the collagen formation function of vitamin C is important for healing any wounds that develop during their training or competitions. The oxidative stress that is produced from aerobic respiration in the oxidative phosphorylation (electron transport chain) portion of the energy system requires antioxidant molecules to help prevent oxidative injury. Vitamin C can help reduce oxidative damage by donating electrons to the reactive oxygen species that form from the process. A vitamin C deficiency is known as the disease scurvy, and can cause harmful effects like breakdown of teeth, skin, and blood vessels because of the low collagen production. Citrus fruits are rich in the vitamin, and other good sources include melons, mango, tomatoes, broccoli, and leafy greens like romaine, collard greens, and Swiss chard among numerous other foods. The FDA (2016) says that the RDA for vitamin C is 90 mg. Both days of the meal plan provide over the RDA. Day 1 is 519% (467 mg) of the recommended value and day 2 is 440% (396 mg). With the upper limit being 2,000 mg, Sean is likely to avoid the toxicity symptoms of nausea, abdominal cramps, diarrhea, and nosebleeds, as well as kidney stones and decreased absorption of other nutrients (Fink & Mikesky, 2021).

The last nutrient that will be evaluated against Sean's two day recommended meal plan is folate, also known as vitamin B9. Folate is a water-soluble vitamin that functions in cell

division and DNA synthesis, as well as neural tube development in fetuses. There is major caution for pregnant females to consume adequate amounts of folate, especially in early stages of pregnancy, to help prevent neural tube defects in children. With Sean being a male athlete, this caution will not be advised because it is a nonissue. Meeting the RDA for folate is still important because deficiency in the vitamin can cause megaloblastic anemia, where altered DNA synthesis leads to large, abnormal red blood cells with decreased lifespans (Fink & Mikesky, 2021). A few examples of folate-rich foods include liver (chicken and beef), wheat bran and enriched cereals, raw spinach, legumes, romaine, and broccoli. The RDA for folate is 400 µg (FDA, 2016). The MyFitnessPal nutrient analysis software does not account for folate levels, so the folate levels in the 2-day meal plan were calculated by hand using values from Fink & Mikesky's textbook (2021). Day 1 of the meal plan falls short of the RDA at an estimated 242 µg, but day 2 goes slightly over the RDA with 476 µg. Despite a slightly lower folate value in day 1 of the meal plan, good nutrition means following a pattern of healthy eating, so days that meet nutrient needs and surround days of a deficit in a particular nutrient will help prevent overall deficiency in that nutrient. The slightly higher folate level in day 2 will also not cause Sean any toxicity issues because folate toxicity is rare due to the water-solubility of the vitamin as well as the tolerable upper limit being 1,000 µg.

Communication

Sean has an average nutrition knowledge. He understands that there are three macronutrients, and that Caloric intake affects weight. I believe he would benefit from education that elaborates upon the macromolecule functions with a little more complexity because he has a higher-level education and some science background. He could learn information about the physiological effects and functions of the macros. He should be able to understand education about timing meals around exercise, training, and competitions as well as what nutrients should be included in those meals. An example would be prioritizing carbohydrate intake 1-4 hours before a competition with moderate protein and little fat consumption to maximize glucose availability to cells for ATP production and limit

GI upset from fats. It would also benefit Sean to learn about foods that provide certain macros and how to read a nutritional label. Some foods provide only one of the macronutrients and other provide all three with a focus on one more than the others. By learning which foods tend to provide which macros in conjunction with learning to properly understand a nutrition label, Sean will be able to plan his own balanced meal plans that meet his nutrition goals that were outlined above.

To help him with this education, infographic handouts and information packets would be easiest to convey the information. Links to reputable nutrition organizations like the FDA, USDA, CDC, Academy of Nutrition and Dietetics will also be provided. Sean will be cautioned to avoid getting nutrition information from blog posts and social media unless they link to reputable studies and agencies like the ones listed previously.

Recommendation for a Calorie and nutrient tracking app like MyFitnessPal will be encouraged to help him stay within his Caloric deficit. Finally, Sean will be advised to reach out to a dietitian for reevaluation of his nutrient needs if he increases his activity level. The activity factor used in these calculations was for light activity, so a greater increase in activity will mean his body will have increased energy needs that will require adjustment.

Reflection

This project has helped me learn about the in depth details that nutritional guidance by dietitians and licensed nutrition professionals require. It is more than simply calculating a person's Calories, carbohydrates, protein, and fat needs. Nutritional guidance requires looking at an athlete, client, or patient's whole life and health to figure out how their lifestyle (diagnoses, medications, occupation, culture, activity level, budget, schedule, etc.) affects their nutrition status and diet. Each person will require different needs and considerations when developing their nutrition plan.

If given the opportunity to do this again, I would like to do more consideration with different cultural impacts on nutrition plans. The subject of this evaluation followed an American diet which is generally the same diet I follow. I would like to experience the challenge of

learning about other cultures' food preferences and how those can be used in a nutritious diet.

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