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Assessing the Nutrition Knowledge of Track and Cross-Country Athletes

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Introduction

Research shows that 76% of athletes arrive at practice and/or games already one percent dehydrated.[1] Furthermore, roughly 84% of athletes have engaged in disordered eating patterns and as 70% of female athletes have been found to be falling short in their energy needs. These statistics show the importance of exposing athletes to appropriate sport nutrition education which allows athletes the opportunity to fuel their bodies well, prevent injuries, and improve performance. Additionally, Ouachita does not have a sports nutrition registered dietitian on campus to be used as a resource. Due to these statistics, there is reason to believe athletes are at a disadvantage due to poor knowledge of nutrition pertaining to hydration, fuel and protection for the body. Ouachita athletes are no different, nor are they immune from these challenges: they need to be educated properly on sports nutrition.

Review of Literature

A variety of components contribute to the success of an athlete, and their diet is key. The nutritional needs of an athlete vary depending on the sport. Energy and protein needs differ among different types of athletes. It is not a "one-diet-fits-all," though that is a common misconception.[2] Optimizing the nutrition of athletes is significant due to the role nutrition plays in supporting athletes physically and mentally. Both macronutrients and micronutrients actively work to supply the maximum capacity an athlete needs. The use of specialized sports nutrition acts to improve biochemical, immune and endocrine body functions. Macronutrients, minerals and vitamins each serve to restore energy balance at different stages of sport exercise. [3]

Athletes need to use a range of dietary strategies to improve performance, with maximizing glycogen stores as a key strategy for many. To do this, carbohydrate intake needs to be monitored. If consumed before exercise, this allows the body to maintain high levels of

carbohydrate oxidation and prevent hypoglycemia.[4] Many athletes do not meet their carbohydrate needs, and often think carbohydrates are the enemy. Nevertheless, carbohydrates are the body's main fuel source and are significant to an athlete's endurance. Low carbohydrate availability is disadvantageous to athletic performance due to reduced muscle glycogen causing muscular fatigue and a drop in intensity (<60% VO2max), and a reduction in circulating blood glucose for central neural nourishment thus impairing cognition.[5]

Protein intake is significant in the way it helps build and restore muscle that is broken down during exercise. This is an important metabolic component of muscle remodeling, adaptation to training, and increasing muscle mass.[6] An athlete should consume one gram of protein per pound of lean body weight.[7] Though this is the recommendation, some athletes consume too much protein, while others need to consume more.[8] Protein is sometimes considered as the only answer to build muscle, gain lean weight, or maintain strength; but, often forgotten, the body needs carbohydrates (glucose) in order to allow the muscle cell to use the protein.[9] The timing of protein intake is significant to note as protein should be consumed within one hour of post-resistance exercise as this increases muscle hypertrophy compared to waiting two hours and above.[10] An athlete needs a balance of both carbohydrate and protein to maximize the nutritional benefits that can be achieved.

Not only are accurate carbohydrates and protein levels important for athletes, fats are also needed to help prevent injury and improve performance. Unsaturated fats are recommended to aid athletes in reaching energy goals for the day.[11] Unsaturated fats include peanut butter, avocado, olive oil, nuts and seeds, among many other food items. These specific fats offer a sustainable, long-lasting source of energy for endurance-based activities such as walking, swimming, and biking. Additionally, these fats help the body to absorb essential fat-soluble

vitamins and regulate hormone production of estrogen and testosterone, and provide insulation for organs in the body, and act as a shock absorber for the body.[12] Fats also directly improve bone health which directly impacts overall health and performance.

Due to many athletes suffering from dehydration, the recommendation for athletes to maintain adequate levels of hydration is to start the day hydrated by minimizing fluid losses during exercise to no more than two percent of their body weight.[13] If more than two percent of body weight is lost in fluid, endurance is negatively affected. Electrolytes are another helpful way to keep the body hydrated, especially after long workouts and hot days. Symptoms of dehydration are prone to be overlooked and underrated. One of these symptoms includes feeling thirsty. If an athlete starts to feel thirsty and is relying on thirst to keep themselves hydrated, the odds are they are already in a state of dehydration. Other symptoms such as dizziness, tiredness, dry mouth, and dark yellow urine should be taken seriously as these are signs that dehydration has progressed. Dehydration "reduces aerobic endurance performance resulting in increased body temperature, heart rate, perceived exertion, and possibly increased reliance on carbohydrate as a fuel source"[13] Athletes have continued to believe that fluid intake was not beneficial and merely circumstantial. Negative effects are exacerbated when exercise is performed in a hot environment.[14] To improve hydration, athletes should maximize fluid intake of water, sports drinks, sugar free beverages, and milk to reach the specific fluid goal that is set by sport specifically.

Injuries among athletes are unfortunately common, regardless of the sport. Playing the sport comes with risks and an athlete will at least incur one injury in his or her career.[15] Nutrition has significant implications for injury prevention and enhancement of the recovery process. This is due to the effect of nutrition on the overall physical and psychological well-being of the

athlete, as well as healing of the tissue.[15] Protein intake, antioxidants, creatine, and omega-3 fatty acids are highlighted due to their roles in preventing muscle loss and promoting injury healing. Protein and creatine aid in reducing muscle loss during injury as well as speeding up the healing process[15], as antioxidants and omega 3 fatty acids aid in decreasing inflammation.

At Ouachita specifically, athletes participating in sports such as women's soccer, women's track, men's tennis, men's track, men's cross country, and men's soccer have all reported injuries rating higher than the national average injury rate. As of 2023, the injury rate per athlete by team at Ouachita had men's soccer and wrestling tied with 1.2 injuries per athlete, and women's soccer close behind with 1.1 injuries per athlete.[16] Furthermore, the Ouachita health department and sports training facilities treated 47% more injuries in the year 2023 with 10,311 treatments, than in the year 2022 with 6,994 treatments.[16]

The amount of injuries Ouachita athletes have endured over the past few years are staggering and should not go unnoticed. Proper nutrition plays a vast role in aiding to prevent injuries and allows for a smoother recovery from injury. In order to provide Ouachita athletes with the resources that are needed, their nutrition knowledge needs to be assessed to then provide resources to better understand knowledge gaps. Therefore, the purpose of this thesis is not only to assess the nutrition knowledge of athletes, but also to create beneficial resources and draw attention to the extreme need for a sports dietitian on campus.

Nutrition for the Student Athlete Study Class

During the Summer of 2023, Dr. Wesley Kluck at Ouachita Baptist University along with a team that included Professor Danielle Watson, a registered dietitian, Ashleigh Hams, ATC, and Dakota Wilson, strength and conditioning coach, presented the injury statistics to a room full of sport coaches in order to reveal the vast amount of injuries on campus, as well as the need for

specialized nutrition and aid for the sports teams. The meeting consisted of brainstorming ways the nutrition department at Ouachita could provide helpful nutrition information to the sports teams. Therefore, the University created the one-hour course “Nutrition for the Student Athlete”.

In the Fall of 2023, the course included three students, Emma Kathleen Conner, Laynie White, Reece Gray, with Professor Watson as our instructor. The first priority of the class was to create menus for the away games of each fall sports team at Ouachita. These sports included volleyball, men’s and women’s soccer, cross country, and football. The goal was to provide balanced meal options for pre and post-competition from several different meal spots in the location where the teams would be traveling.

As the semester progressed, the class brainstormed additional ways to aid the sports teams in nutrition education. The class knew the degree of nutrition knowledge deficit the athletes on campus were experiencing and wanted to find ways to bridge the gap, and to make sure they had a credible source of nutrition information.

One way to reach a majority of athletes is through social media, and thus the idea of starting an Instagram page with the purpose of sharing insightful nutrition information, meals, and fun facts led to the creation of *@obutigersfuel.* The main aspiration for starting the Instagram page was to improve the nutrition knowledge of athletes, with the hopes of decreasing the number of injuries seen at Ouachita. Improved nutritional status could also help athletes compete at peak performance levels.

The Pre-Test Survey

In order to know whether the Instagram accomplished its goal, a pre-test survey was created to survey the nutritional knowledge of the Ouachita track and cross- country runners. Track and cross-country runners were chosen as the athletes to survey due to the size of the team

and familiarity with the runners on the team. Before the survey was sent to the runners, the Institutional Review Board at Ouachita reviewed the proposal for research and approved the action. The pre-test survey was created on Google Forms and was then sent via GroupMe to the track and cross-country team, totaling approximately 100 runners. A total of 24 runners participated in the pre-test survey, with the goal of receiving 20 surveys which is 20% of the entire team.

The pre-test survey included multiple choice and Likert scale questions. The participants answered 14 questions, topics ranging from hydration, sources of nutrition information, specific nutrients, meal examples, and timing of meals for races. The survey was edited for a couple of weeks before the final survey was sent to the runners. A copy of the pre-test survey is shown below in Table 1.

Table 1: Pre-Test Survey Questionnaire

1. What is your classification?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
2. What was your gender assigned at birth?
    a. Male
    b. Female
3. What sports do you participate in?
    a. Track
    b. Cross country
    c. Both
4. Where do you usually go to find nutrition information? Check all that apply.
    a. Family
    b. Friends
    c. Social media
    d. Yourself
    e. Coach
    f. Teammates

g. Textbooks
h. Evidence based research journals
i. Internet
j. Other

5. What is the body's preferred fuel source?
    a. Fats
    b. Carbohydrates
    c. Protein
    d. Vitamins and Minerals
6. What nutrient is needed to restore muscle breakdown after a workout?
    a. Fats
    b. Carbohydrates
    c. Protein
7. What nutrient replaces energy stores in the body after a workout?
    a. Fats
    b. Carbohydrates
    c. Protein
8. What nutrients are most beneficial for a post race snack?
    a. Carbohydrates only
    b. Carbohydrates and protein
    c. Protein only
    d. Fat only
9. What would be the best meal to have 1-2 hours before a meal if a morning race?
    a. One piece of fruit
    b. Dry cereal with low fat milk and a piece of fruit
    c. Bacon egg and cheese biscuit
    d. Nothing
10. What do you currently rate your nutrition knowledge about your sport specifically, 1 being no knowledge and 10 being an expert in sports nutrition?
    a. 1 (no knowledge)
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7
    h. 8
    i. 9
    j. 10 (expert)
11. What are the signs of dehydration? Choose all that apply.

a. Increased fatigue
b. Dizziness
c. Dark yellow urine
d. Light yellow urine
e. Nausea
f. Cramping

12. How many days per week do you typically eat breakfast?
    a. Everyday
    b. 1-2 times a week
    c. 3-4 times a week
    d. 5-6 times a week
    e. Never
13. Do you currently follow any sports nutrition related social media?
    a. Yes
    b. No
14. If yes, where? Choose all that apply.
    a. Instagram
    b. Tik tok
    c. Twitter
    d. Threads
    e. Facebook
    f. I do not follow any sports nutrition related social media

The rationale for many of the questions asked stems from the basic nutrition knowledge a track runner would need to know for peak performance from nutrition, prevention of injury, and fueling to feel their best. Questions one through three are general questions to gather information of the specific demographics of runners being surveyed. Question four assessed the source of the athletes' nutrition knowledge. Questions five through nine are nutrient questions geared towards runners specifically and information that a track runner should know.

Question 10 assessed where each runner thought their current nutrition knowledge fell within the Likert scale. Question 11 evaluated the runners' knowledge on the signs and symptoms of dehydration since this is a huge issue within running.[13] Question 12 revealed the number of runners who eat breakfast with the goal to educate on the importance of starting the

day with a balanced meal instead of skipping it. Questions 13 and 14 determined if these runners were receiving nutrition information from other sources on social media, specifically which social media platforms.

Pre-Test Results

The pre-test results were gathered within two weeks of sending the survey to the runners. Twenty-four responses were received. Of the 24 responses, 9 (37.5%) of the participants were freshmen, 7 (29.2%) were sophomores, 5 (20.8%) were juniors and 3 (12.5%) were seniors. There were 19 (79.2%) female participants and 5 (20.8%) male participants. The majority of the runners participate in both track and cross country (66.7%) and only 8 (33.3%) participants solely run track.

The participants usually find their nutrition information from themselves, as 18 (75%) participants chose "yourself" as where they go to find nutrition information. Sixteen (66.7%) participants find nutrition information from family, and 13 (54.2%) participants from social media. Twelve participants (50%) find nutrition information from the internet, 11 (45.8%) participants find nutrition information from friends, 9 (37.5%) participants from coaches, six (25%) participants from teammates, as well as textbooks and evidence-based research journals. One (4.2%) participant found nutrition information from an athletic trainer, as well as one (4.2%) participant from books.

When asked "what is the body's preferred fuel source?" 21 (87.5%) participants answered correctly with "carbohydrates". Two (8.3%) participants answered, "vitamins and minerals" and one (4.2%) participant answered "protein." The next question asked which nutrient is needed to restore muscle breakdown after a workout, and 23 (95.8%) participants answered correctly with "protein" while one (4.2%) participant answered "fats." When asked

what nutrient replaces energy stores in the body after a workout, 16 (66.7%) participants answered correctly with “carbohydrates”, six (25%) participants answered incorrectly with “fats”, and two (8.3%) participants answered incorrectly with “protein”.

All participants answered correctly with “carbohydrates and protein” as being the most beneficial post-race snack combination. When asked what would be the best meal to have one-2 hours before a morning race, 19 (79.2%) participants answered correctly with “dry cereal with low fat milk and a piece of fruit”, three (12.5%) participants answered “bacon, egg and cheese biscuit”, one (4.2%) participant answered “one piece of fruit”, and one (4.2%) participant answered “nothing”.

The participants were asked to rate their sport-specific nutrition knowledge using a Likert scale. Four (16.6%) participants reported poor nutrition knowledge, ten (41.6%) participants reported moderate nutrition knowledge, and ten (41.6%) participants reported high nutrition knowledge. In depth results from this question are shown in Figure 1 below.

Figure 1: Rating Nutrition Knowledge

When asked to identify the signs of dehydration, zero participants chose “light yellow urine”, which was the one incorrect option. Every other answer choice is a sign of dehydration.

Twenty-three (95.8%) participants answered “increased fatigue” correctly, 24 (100%) participants answered “dizziness” correctly, 24 (100%) participants answered “dark yellow urine” correctly, 16 (66.7%) participants answered “nausea” correctly, and 20 (83.3%) participants answered “cramping” correctly.

The participants were asked how many days per week they typically eat breakfast. Fifteen (62.5%) participants answered “everyday,” one (4.2%) participant answered “5-6 times a week”, three (12.5%) answered “3-4 times a week”, two (8.3%) participants answered “1-2 times a week”, and three (12.5%) participants answered “never.”

When asked if the participants currently followed any sports nutrition related social media, 16 (66.7%) participants answered “no” and 8 (33.3%) participants answered “yes.” The eight participants that answered yes to following sports related social media accounts, 37.5% (nine participants) answered Instagram, with TikTok resulting in 16.7% (four participants), and both Twitter and Facebook at 4.2% (one participant).

The Instagram: OBU Tigers Fuel

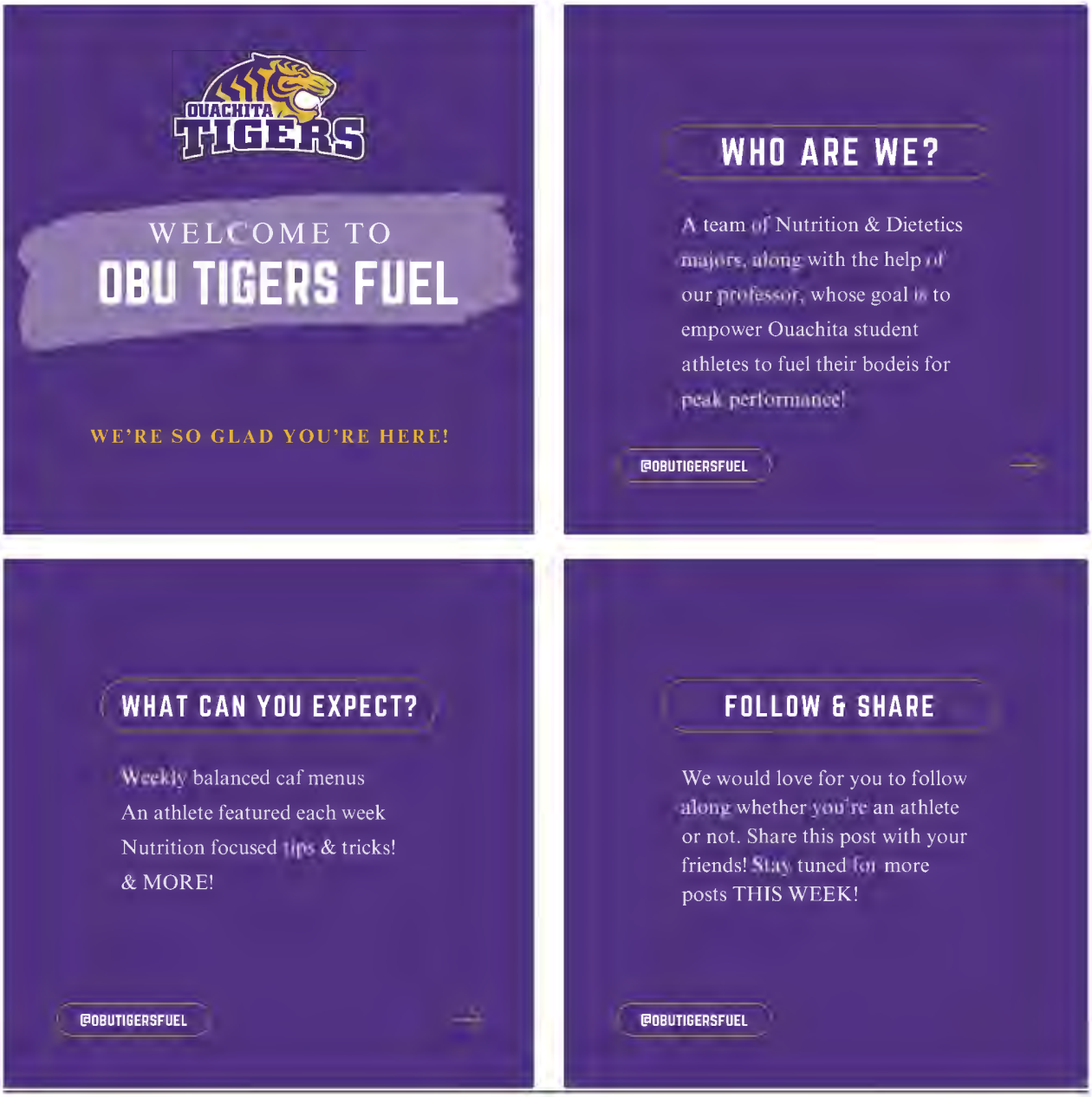
With the goal to increase sports nutrition knowledge among athletes, the class created the @obutigersfuel Instagram page. The Instagram was first approved by the communications office at Ouachita, and the communications office created a profile picture for the page.

Before posting began, Instagram needed to have a branding vision, as well as specific structure to the posts throughout the week. The branding was set to incorporate the Ouachita colors of purple, gold and white, as well as complimentary colors of light purple, light yellow and gray. The fonts used for each post are also important as it creates a sense of consistency. Two fonts were chosen in order to have variability among title and body texts. A branding board was created to keep all of the posts on track. See Graphic 1 below.

Graphic 1: Branding Board

An introduction post was the first post of @obutigersfuel in order to welcome the followers to the page, let them know the goal of the page and what to expect. See Graphics 2-5 below. A “Meet the Team” post was also created to allow the followers to put faces to the Instagram page and create familiarity with who is behind all the posts. This also helped to establish credibility of the page, it highlighted Professor Watson to show a registered dietitian was leading the team. See Graphics 6-10 below.

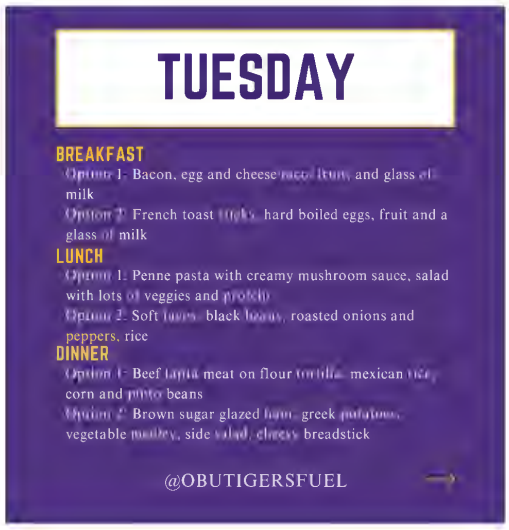
Graphics 2-5: Introduction Post



Graphics 6-10: Meet the Team

Posts such as meals of the week were decided to be posted on Sundays. These posts consist of balanced meal ideas from the Ouachita Commons cafeteria. The meals of the week start with Monday and go through the following Sunday. There are two different meal options provided at every breakfast, lunch, and dinner. At the end of each carousel post, two different slides explain how variety is important, and these recommendations are just guidelines; to be sure the athlete or viewer is tailoring each meal to their own needs. There is also a "when in doubt" slide at the very end of these posts reminding the viewer that there is always the option to build-your-own sandwich or salad. See Graphics 11-20 below.

Graphics 11-20: Meals of the Week Example



THURSDAY

BREAKFAST

Option 1: Bowl of oatmeal, hard boiled eggs, fruit, glass of milk

Option 2: Yogurt with fruit and granola, turkey sausage links, scrambled eggs, glass of milk

LUNCH

Option 1: Pulled pork, slaw, turmeric rice, steamed broccoli, dinner roll

Option 2: Baked sweet potato, sautéed squash and zucchini, gardenburger patty, side salad

DINNER

Option 1: Chicken stir fry, rice, roasted vegetables, side salad

Option 2: Herb chicken breast, green beans, turmeric rice with red beans, side salad

@OBUTIGERSFUEL

FRIDAY

BREAKFAST

Option 1: Buttermilk biscuit, scrambled egg, turkey bacon, fruit, glass of milk

Option 2: Mixed berry smoothie, scrambled eggs, bacon, French toast sticks

LUNCH

Option 1: Chicken tenders, baked potato, mixed vegetables, side salad, dinner roll

Option 2: Stuffed peppers, cucumber salad, baby carrots, dinner roll

DINNER

Option 1: Cajun chicken breast, red beans and rice, glazed carrots, side salad

Option 2: Braised pork, basmati rice, brussels sprouts, side salad

@OBUTIGERSFUEL

SATURDAY

BRUNCH

Option 1: Bowl of oatmeal, scrambled eggs, turkey sausage, fruit, glass of milk

Option 2: Grilled lemon chicken breast, potato wedges, yellow squash and zucchini, side salad

DINNER

Grilled chicken thigh, green beans, white rice, side salad

@OBUTIGERSFUEL

SUNDAY

BRUNCH

Option 1: Bowl of oatmeal, turkey sausage links, fruit, glass of milk

Option 2: Italian sausage with onions and peppers, white rice, roasted vegetables, side salad

DINNER

Roast beef, black eyed peas, steamed carrots, oven roasted fries, side salad

@OBUTIGERSFUEL

DON'T FORGET!

LISTEN TO YOUR BODY

Drink a glass of water with each meal, supplementing with Gatorade or choclate milk as a recovery drink after practice!

GET CREATIVE WITH YOUR PLATE

These meals are not exhaustive lists! Some of the best meals in the OSU come from mixing and matching different menu items. Keep your personal preferences in mind when fueling your body!

@OBUTIGERSFUEL

WHEN IN DOUBT

BAGEL/ TOAST STATION

Toast a bagel or some bread, add peanutbutter and a banana!

SALAD BAR

Build a salad full of greens, veggies, add some protein (turkey, ham, chicken from sandwich station), cheese, and dressing of choice!

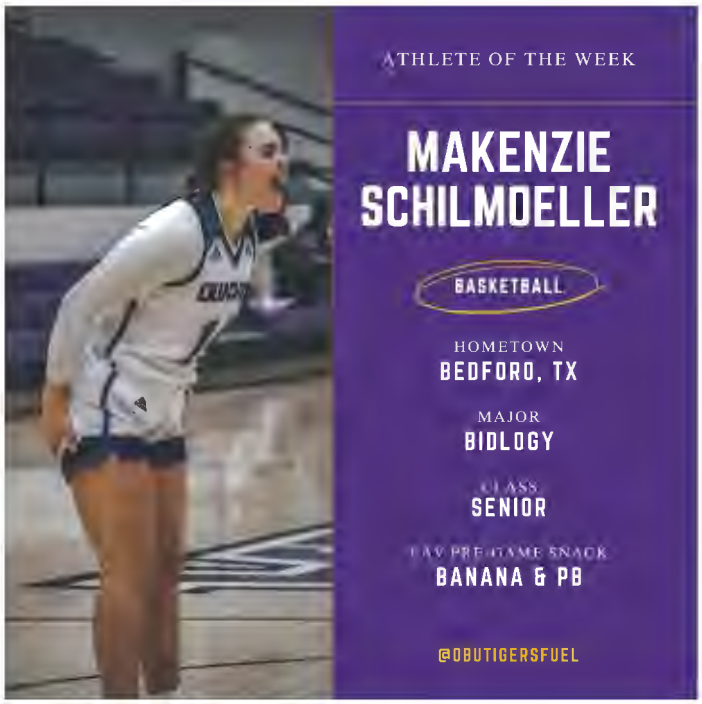
SANDWICH STATION

Build a sandwich with bread of choice, veggies, meat(s) of choice, cheese, and sauce! Pair with carrots, side salad, or baked chips!

@OBUTIGERSFUEL

The class decided to post athlete of the week posts each Wednesday. These posts highlight a specific athlete from a different sport each week. This is also a great way to boost viewers and followers to the entire page as the athlete highlighted may have friends or family members viewing the post, which then leads to the overall page. With these posts, there is importance in posting not only a variety of sports, but also showcasing different nationalities as well as alternating between male and female athletes to allow for a more diverse and equal opportunity for all athletes. See Graphics 21-23 below. To reach this goal, the class created a Google form sent out via email to many athletes to complete with information such as their name, hometown, sport, and favorite pre or post-game snack. See Figure 2 below.

Graphic 21: Athlete of the Week Purple



Graphic 22: Athlete of the Week Gray

Graphic 23: Athlete of the Week Light Purple

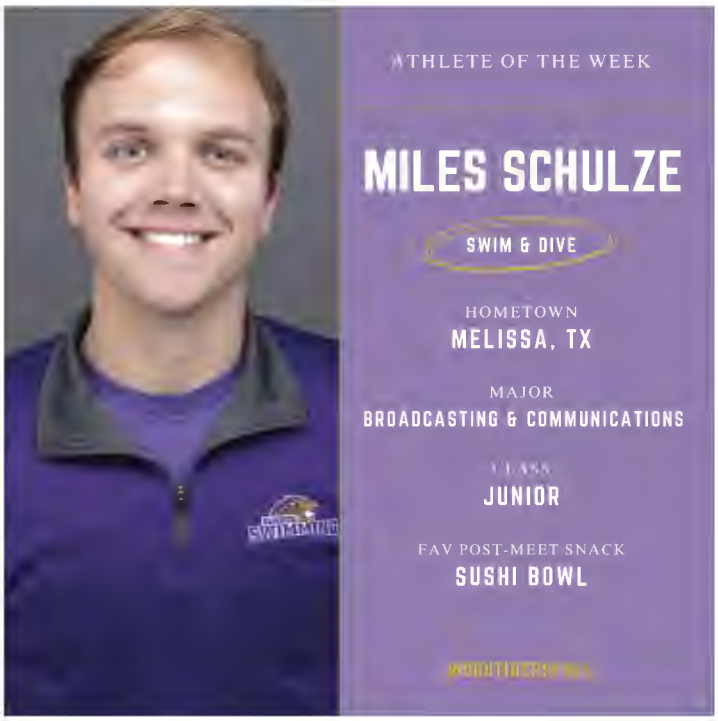


Table 2: Athlete of the Week Questionnaire

1. What is your name?
2. What is your phone number?
3. What is your hometown?
4. What is your classification?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
5. What is your major?
6. What sport do you play? You can include the position if you would like!
7. How long have you played your sport?
8. What is your favorite pre/ post game snack?
9. Please provide a clear picture of yourself either playing your sport or a headshot for us to use on the OBU Tigers Fuel Instagram. Thank you!

Fridays were determined to be the "fun post" of the week. This gives freedom and variability in the topic that is posted each week. Ideas in the beginning for Friday posts consisted of a post about hydration, meal ideas in the Student Center, seasonal produce, and specific nutrient posts among many others. Friday posts were created to hit some of the areas that nutrition knowledge was lacking in the track and cross-country runners.

The first Friday post pertains to sleep, and how important sleep is for a student athlete. This post includes stats of how many hours an athlete needs to sleep each night, what an

inadequate amount of sleep can do to physical and cognitive performance, as well as injuries, endurance, and metabolism. The post also provides examples of what poor sleep can look like in specific sports. Good sleep hygiene is also included on the post to encourage athletes to acquire the best sleep and sleep routines they can. See Graphics 24-27 below.

Graphics 24-27: How Important is Sleep for a Student Athlete?

The next Friday post provides examples of pre and post practice snacks. This post is a way to reach athletes with tangible information that can be applied to their diets directly. The post also explains why pre and post practice/ game snacks and meals consist of specific nutrient amounts, and how the timing of the snack/ meal is pertinent to recovery. See Graphics 28 and 29 below.

Graphics 28 & 29: Pre & Post Practice Snacks

Chick Fil A is a very popular food choice for students on Ouachita's campus. Because of this, a Friday post all about balanced options and ways to pair different items at Chick Fil A for a meal seemed fitting. This Friday post includes graphics of food items Chick Fil A offers such as the cool wrap, grilled nuggets, and Greek yogurt parfait. The next slide shows how to pair each of the individual food items together for a balanced meal. Examples such as the cool wrap with fresh fruit, grilled nuggets and waffle potato chips, and the egg white grill sandwich with the yogurt parfait are given. See Graphics 30 and 31 below.

Graphics 30 & 31: Best of the Best at Chick Fil A

Building a balanced salad in the cafeteria can seem daunting, and even confusing on where to start. But, if done correctly, building a balanced salad is great fuel for the day and can be paired with a sports drink or milk for extra carbohydrates if an athlete has an afternoon practice or game. A Friday post was created in reel form to show how to build a balanced salad in the cafeteria in real time. The reel also includes insightful facts about each of the foods on the salad to further explain the benefits from bulking up a salad. See Graphics 32-34 below.

Graphics 32-34: How to Build a Balanced Salad (reel)

As spring break of 2024 was quickly approaching, road trips snacks were about to become more prevalent. To help in choosing road trip snacks that are fun and balanced, a Friday post was created showcasing food items such as trail mix, peanut butter crackers, and beef jerky among other snacks. See Graphic 35 below.

Graphic 35: Road Trip Snacks

The last Friday post made before the post-test survey was sent out again to the track and cross-country teams was a hydration post. This post consisted of ways to adequately hydrate before, during and after exercise. Facts about different sports drinks were also provided and the differences between regular and sugar free sports drinks were compared. See Graphics 36-39 below.

Graphics 36-39: Hydration

Post-Test

To track whether the @obutigersfuel page was helpful in increasing nutrition knowledge among athletes, a post-test survey was administered to runners of the track and cross country teams again. The post-test consisted of the same questions as the pre-test, with one minor change. One question was added to survey whether the participant followed the Instagram page. The post-test survey through Google Forms was sent out via GroupMe again on March 6, 2024.

Post-Test Results

The number of participants who responded to the post-test survey decreased compared to the number of participants who responded to the pre-test survey. Twelve runners participated in the post-test-survey. Extreme efforts, such as contacting several runners to fill out the survey, telling their friends, and contacting both coaches, were made to gather more participants but some efforts failed. The runners were in season at this time, making it a little more difficult to receive responses compared to the previous fall semester. The track and cross-country coaches were contacted in hopes of increasing the number of responses, and through that effort, 12 participants submitted a survey. Because of this decrease in data, the post-test may be skewed, but should not be fully discarded. Rather, this should push for further study in regard to this limitation, discussed later.

Of the 12 participants, two (16.7%) were freshmen, six (50%) participants were sophomores, three (25%) participants were juniors, and one (8.3%) participant was a senior. Additionally, seven (58.3%) participants were female, and five (41.7%) participants were male. This is a more even split between female and male participants than in the pre-test survey.

A majority (83.3%) of the participants run both track and cross country, and only two (16.7%) participants run track only. When asked where the participants go to find nutrition information, nine (75%) participants answered the “internet”, seven (58.3%) answered both “yourself” and “social media”, six (50%) participants answered “family” and five (41.7%) participants answered both “friends” and “teammates.” Four (33.3%) participants answered “textbooks”, three (25%) answered “evidence-based research journals” and one (8.3%) answered “coach.”

When asked to answer, “what is the body’s preferred fuel source?” all of the participants answered correctly with “carbohydrates.” The next question pertaining to which nutrient needed to restore muscle breakdown after a workout, 11 (91.7%) participants answered correctly with “protein” and one (8.3%) participant answered “fat”. When asked what nutrient replaces energy stores after a workout, six (50%) participants answered correctly with “carbohydrates,” four (33.3%) answered with “fats” and two (16.7%) answered with “protein.”

All of the participants answered correctly when asked what nutrients are most beneficial for a post-race snack when answering with “carbohydrates and protein”. Nine (75%) participants answered correctly when asked which meal would be the best to have one-two hours before a morning race when answering with “dry cereal with low fat milk and a piece of fruit.” Two (16.7%) participants answered, “one piece of fruit” and one (8.3%) participant answered, “bacon egg and cheese biscuit.”

The participants again rated their perceived nutrition knowledge about their specific sport. One (8.3%) participant reported poor nutrition knowledge, six (50%) participants reported moderate nutrition knowledge, and five (41.7%) participants reported high nutrition knowledge. See Figure 2 below.

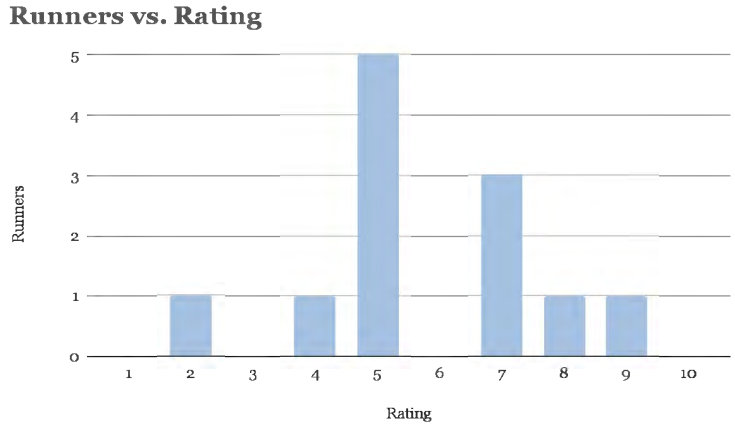


Figure 2: Post-Test Rating Nutrition Knowledge

When asked to identify the signs of dehydration, two (16.7%) participants answered "light yellow urine" which was incorrect. All participants answered correctly with "increased fatigue," "dizziness," and "dark yellow urine." Ten (83.3%) participants answered correctly with "nausea" and 11 (91.7%) participants answered correctly with "cramping."

Results show that one (8.3%) participant never eats breakfast, one (8.3%) participant eats breakfast three to four times a week, two (16.7%) participants eat breakfast five to six times a week, and eight (66.7%) participants eat breakfast every day. Six (50%) participants answered "yes" when asked if they follow any sports nutrition related social media and of those six, five (83.3%) of them said they follow @obutigersfuel on Instagram. Six (50%) participants answered "no" when asked if they follow any sports nutrition related social media. Of the six (50%) that answered "yes" to following sports nutrition related content, 100% of the six participants answered "Instagram", with TikTok and Twitter only being followed by one (8.3%) participant each.

Discussion

The results between the pre-test survey and the post-test survey vary from question to question. Key differential findings to note are the classification differences between the pre and post-test surveys. There were more freshmen participants in the pre-test than there were in the post-test, but there were more sophomore participants in the post-test than pre-test. This could add weight to the results, as there is a chance upper classmen in general have more experience and nutrition knowledge than freshmen would. More research would need to be applied to this theory in order to confirm.

Interestingly, a more even split in between genders was found in the post-test than in the pre-test. This could aid in the understanding between female and male runners, and whether or

not the nutrition knowledge differs among gender. Further research should be done to test this theory.

When asked where the participants go to find nutrition information, answers such as "yourself" decreased from pre to post-test surveys, and "Internet" increased from pre to post-test surveys. Figure 5 shows the differences in the results pertaining to this question between the pre and post-test surveys. This allows the conclusion that more participants are turning to other sources besides themselves when seeking nutrition information, and instead seeking counsel whether that be from family, friends or the Internet. However, not all of those specific sources may be credible. It is important to lead athletes to quality sports nutrition to ensure they are properly educated and therefore fueling and protecting their bodies well.

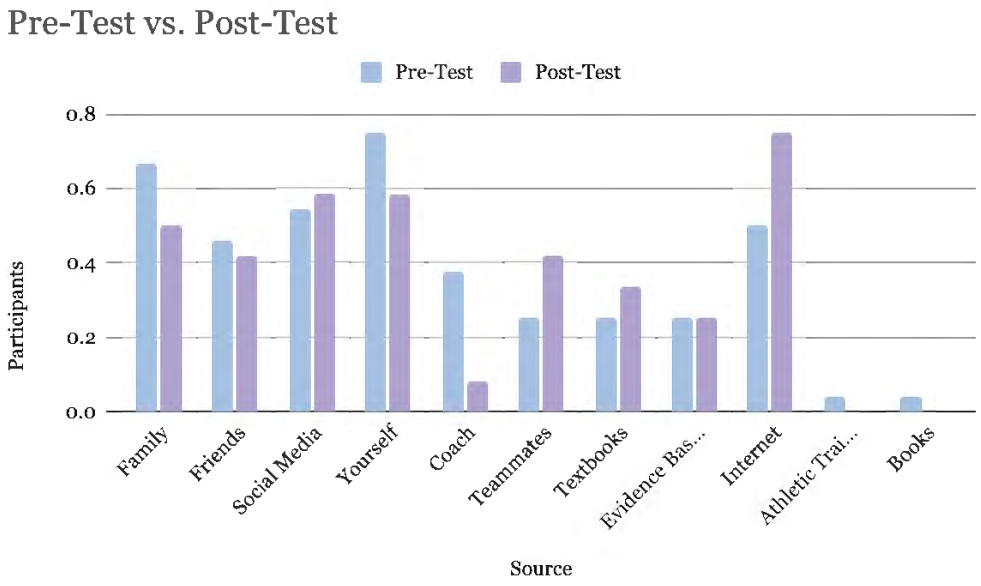


Figure 5: Results from Pre & Post-Test Surveys on Source of Nutrition Information

A few of the results on different questions were in favor of increased nutrition knowledge. When asked "what is the body's preferred fuel source?" 100% of the participants in the post-test answered correctly compared to only 87.5% of participants answered correctly in

the pre-test. When asked how many times the participants eat breakfast in a week, more participants in the post-test eat breakfast every day, versus less eating breakfast every day in the pre-test. Studies have shown that higher energy intake at breakfast is associated with lower fatigue and higher overall mood and alertness post-exercise. More participants in the post-test are also following more sports nutrition related content on social media compared to the participants of the pre-test, as well as following @obutigersfuel on Instagram.

Some results stayed similar between the pre and post-tests. Questions such as what nutrient is needed to restore muscle breakdown, what is the best post-race snack, which meal would be best to eat before a morning race, and nutrition knowledge ratings had similar results between both surveys. See Figure 6 to see nutrition knowledge ratings of the pre-test and post-test side by side.

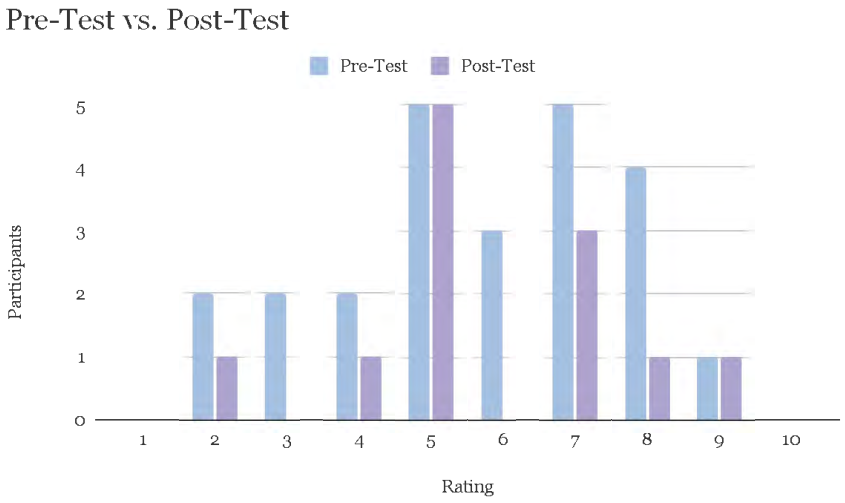


Figure 6: Comparison of Nutrition Knowledge Ratings

Some results lean less in favor of increased nutrition knowledge such as when asked what nutrient is needed to replace energy stores after a workout and signs of dehydration. Results from both of these questions decreased in correct answers. See Figure 7 for the results of replacing

energy stores, as well as Figure 8 to see results from the signs of dehydration.

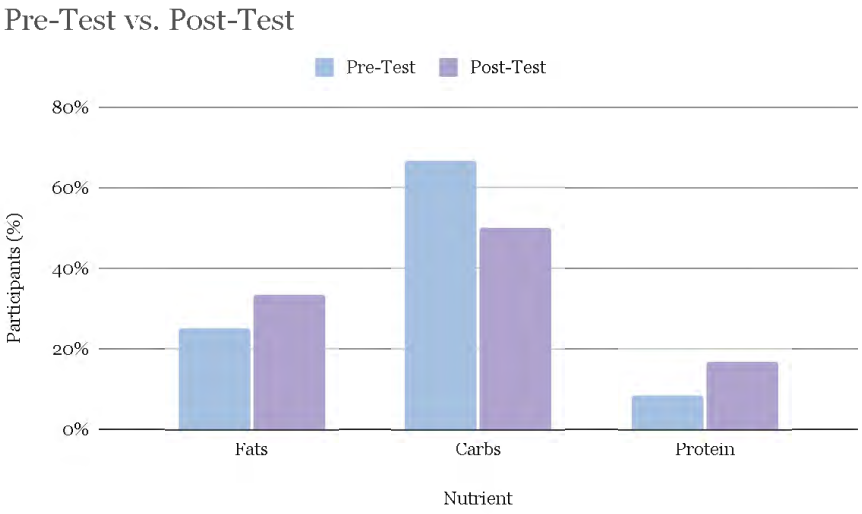


Figure 7: Comparison of Replacing Energy Stores Nutrient Question

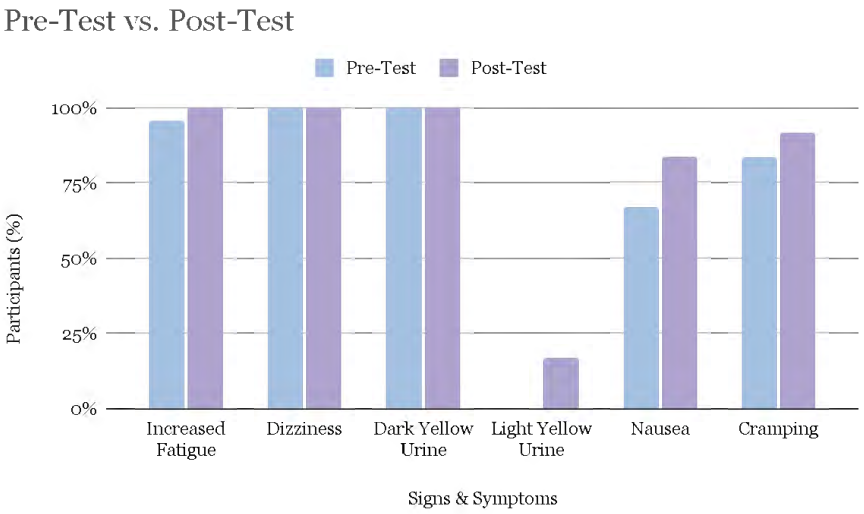


Figure 8: Comparison of Signs of Dehydration

Overall, there were many limitations to this research study that invites further research. One limitation was the drastic difference in the number of participants in the pre-test versus in the post-test. Only half of the participants in the pre-test took the post-test, resulting in

potentially skewed results. Once this became an issue, a suggestion for further research was created by assigning each participant a number and tracking whether the participant answered both the pre and post-test while staying anonymous. Because not only was the limitation on the number of participants between the pre and post-test, but there was also a limitation on deciphering whether or not it was the same participants taking both surveys without risking the anonymity that was guaranteed to the participants through the waiver each participant signed.

Another limitation that could be explored in further research is the Instagram and the entirety of @obutigersfuel. Due to limitations presented above, it is hard to know whether Instagram has been successful in increasing nutrition knowledge. @OBUTigersFuel could now start creating specific posts tailored to the knowledge deficits that are clear in the pre and post-tests, while also expanding into other areas of nutrition that are needed for Ouachita athletes to thrive.

Also, the fact that the Instagram had only been active for four months when the post-test was administered is a limitation and it is important to consider what the results would have shown if the Instagram was live for a longer amount of time before testing the runners for the second time.

Although this research has its limitations, it is significant to know the nutrition knowledge levels of athletes, especially at Ouachita when injury rates are high. Further research should also be conducted to test other sports teams such as the men's and women's soccer teams, as the injury rates were high for these teams as well. If this thesis proves anything, it proves the extreme need for a sports dietitian who has received their Master's degree in nutrition and dietetics, completed a dietetic internship and passed the national registered dietitian exam. This dietitian's main goal and job would be aiding athletes on campus with specific nutritional needs.

This sports dietitian should prioritize the overall health of the athlete that includes both physical and mental needs. A registered sports nutrition dietitian would benefit this campus greatly and it could be expected that the injury rates among athletes at Ouachita would decrease significantly and performance would increase. @obutigersfuel along with the class can only provide so many resources, but a dietitian could open Ouachita to many more accomplishments in the future as other universities have seen on their campuses.[18]

Conclusion

In conclusion, assessing the nutrition knowledge of athletes is particularly important in allowing and aiding the athletes to understand how to properly fuel, hydrate and protect their bodies. Athletes are at an elevated risk of injury when playing sports; coupled with poor nutrition knowledge, the injury rate only increases.

Testing the track and cross-country runners' nutrition knowledge was helpful in understanding where the nutrition knowledge deficits lie, and how to best educate these athletes in the future. The @obutigersfuel Instagram is a great avenue to supply this education and knowledge as seen by some results between the pre and post-test surveys. Overall, the best avenue to take is hiring a sports nutrition dietitian to bridge the gaps seen in nutrition knowledge, injuries, and help improve performance among the athletes on Ouachita's campus.

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References

1. National Athletic Trainers' Association's position statement: Fluid replacement for athletes. *Relias Media*. https://www.reliasmedia.com/articles/51114-national-athletic-trainers-8217-association-8217-s-position-statement-fluid-replacement-for-athletes. September 1, 2000. Accessed April 23, 2024.
2. Kaufman M, Nguyen C, Shetty M, Oppezzo M, Barrack M, Fredericson M. Popular dietary trends' impact on athletic performance: A critical analysis review. *Nutrients.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10460072/. August 9, 2023. Accessed April 23, 2024.
3. Valenta R. and Dorofeeva Yu.A. Sport nutrition: the role of macronutrients and minerals in endurance exercises. *Foods and Raw Materials*, 2018, vol. 6, no. 2. doi:10.21603/2308-4057-2018-2-403-412
4. Beck KL, Thomson JS, Swift RJ, von Hurst PR. Role of nutrition in performance enhancement and postexercise recovery. *Open Access J Sports Med*. 2015;6:259-267. . doi:10.2147/OAJSM.S33605
5. Lodge MT, Ward-Ritacco CL, Melanson KJ. Considerations of low carbohydrate availability (LCA) to relative energy deficiency in sport (RED-S) in female endurance athletes: A narrative review. *Nutrients*. 2023;15(20):4457. Published 2023 Oct 20. doi:10.3390/nu15204457
6. Tipton KD, Hamilton DL, Gallagher IJ. Assessing the role of muscle protein breakdown in response to nutrition and exercise in humans. *Sports Med.* 2018;48(Suppl 1):53-64. doi:10.1007/s40279-017-0845-5

7. Stanzione JR, Boullata JI, Bruneau ML Jr, Volpe SL. Association between protein intake and lean body mass in a group of Masters Athletes. *J Nutr Sci*. 2022;11:e30. doi:10.1017/jns.2022.10
8. Phillips SM, Van Loon LJ. Dietary protein for athletes: from requirements to optimum adaptation. *J Sports Sci.* 2011;29 Suppl 1:S29-S38. doi:10.1080/02640414.2011.619204
9. Callahan P, Leonard Me, Powell M. Glucose regulation and utilization in the body. *Nutrition Science and Everyday Application v 10.* https://openoregon.pressbooks.pub/nutritionscience/chapter/4d-glucose-regulation-utilization-body/#:~:text=Insulin%20binds%20to%20its%20receptors,be%20used%20in%20several%20ways. October 14, 2020. Accessed April 23, 2024.
10. Schoenfeld BJ, Aragon A, Wilborn C, Urbina SL, Hayward SE, Krieger J. Pre- versus post-exercise protein intake has similar effects on muscular adaptations. *Peer J.* 2017;5:e2825. . doi:10.7717/peerj.2825
11. Nutrition for athletes. https://boxing.nv.gov/uploadedFiles/boxingnvgov/content/HotTopics/Nutrition_for_Athletes.pdf. Accessed April 24, 2024.
12. Nack JD, Phillips RD. Shock absorption. *Clin Podiatr Med Surg*. 1990;7(2):391-397.
13. Magee PJ, Gallagher AM, McCormack JM. High prevalence of dehydration and inadequate nutritional knowledge among university and club level athletes. *Int J Sport Nutr Exerc Metab.* 2017;27(2):158-168. doi:10.1123/ijsnem.2016-0053
14. Barr SI. Effects of dehydration on exercise performance. *Can J Appl Physiol.* 1999;24(2):164-172. doi:10.1139/h99-014

15. Turnagöl HH, Koşar ŞN, Güzel Y, Aktitiz S, Atakan MM. Nutritional considerations for injury prevention and recovery in combat sports. *Nutrients.* 2021;14(1):53. . doi:10.3390/nu14010053
16. Research from Dr. Kluck
17. Veasey RC, Haskell-Ramsay CF, Kennedy DO, Tiplady B, Stevenson EJ. The effect of breakfast prior to morning exercise on cognitive performance, mood and appetite later in the day in habitually active women. *Nutrients.* 2015;7(7):5712-5732. P doi:10.3390/nu7075250
18. Hull MV, Neddo J, Jagim AR, Oliver JM, Greenwood M, Jones MT. Availability of a sports dietitian may lead to improved performance and recovery of NCAA division I baseball athletes. *J Int Soc Sports Nutr*. 2017;14:29. doi:10.1186/s12970-017-0187-6