Sports Nutrition

Recorded July 29th, 2020

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

PhysicalTherapy.com Course #3787

- [Calista] Well, once again today's course is titled Sports Nutrition and it is my pleasure to welcome back Dr. Carol Mack to physicaltherapy.com. Carol is the owner of Cleveland Sports PT & Performance in Cleveland, Ohio. She graduated from Duquesne University's Doctor of Physical Therapy program in 2006 after playing four years of varsity soccer. She is a Board Certified Specialist in Sports Physical Therapy specializing in end-stage rehabilitation of soccer athletes, female athletes, and runners. Carol is also a Certified Strength & Conditioning Specialist and a Precision Nutrition Level 1 Certified Coach. She currently serves as Chair of the Female Athlete Special Interest Group through the American Physical Therapy Association. She is also a member of the U.S. Olympic Committee's Volunteer Medical Staff. Carol was previously a Physical Therapist at Cleveland Clinic's Sports Health Center where she was Chair of Cleveland Clinic's "Match Fit" soccer performance enhancement and injury risk reduction program as well as co-director of Cleveland Clinic's Sports Physical Therapy Residency. Carol now serves as a Physical Therapist for Beaumont School Athletics, Distance Coach for Fleet Feet Sports Cleveland and a consultant to a local yoga studio. Well, thank you so much for being with us here today. And after reading your bio I'm wondering how you have any time Carol, but we are so pleased to have you with us today and I'm gonna go ahead and turn the microphone over to you.

- [Carol] Thanks Calista, I appreciate it. I appreciate the introduction and having me back here. I always love doing these webinars. So, hopefully you guys can all hear me. Actually I'm gonna, maybe that's better. There's some static at a fan going behind me but hopefully that's better there. So anyway, I've given this talk before to different like local groups of people. This is my first time giving it to PTs and rehab professionals, I'm pretty excited about that. That being said, I always wanna make it as interactive as possible. So, you know, nutrition is such a broad topic and people have so many different questions on it or things that may interest you. So, by all means a chat box is there, I'm happy to stop kind of, you know, even if I'm in the middle of a slide and just

answer questions that you guys may have. I really, like I said, we'd like to make it as interactive as possible and just answer things that may be more important to your practice or things that you can use in terms of your practice. So, a little bit of my background. Also, I've received an honorarium. I've have no relationships to disclose about this other than and actually this is not a financial relationship. I am a precision nutrition certified coach for nutrition, but there's nothing financial kind of going on there other than I may refer to their program a few times because I like it. I'm not getting any money from them although I feel like it really benefited me and my practice to learn more about nutrition. I don't know if any of you had in PT school any coursework on nutrition.

I didn't other than basic, like, you should drink some water and carbs are good, protein is good. I love my PT program and I think I learned a lot about a lot of other things. But just in general, I personally with my practice and in terms of sports performance and PT, I think I've learned about nutrition, maybe almost a little too late. I guess better late than never but hopefully I can share some things with you all too. So, I'm gonna go back here learning outcomes as I didn't mean to skip over those.

After this course, you all will be able to identify at least three strategies of when and how to refer or collaborate with a licensed nutrition professional, we're gonna talk about that next. We're gonna describe at least two scientific principles behind macro, micro nutrients and hydration and then identify at least three principles on how nutrition can affect injury recovery, training and health because I think it is a really big link between what we all do in the rehab world and in the training world and really getting our patients and clients better. So, yeah, a couple people that yes, good, I agree. Debora there's been other comments that yeah, I didn't get very much either. So good, I'm glad you're all here. And hopefully we can all kind of learn a little bit more together. So first thing collaboration. I'm not a dietitian, I'm not a nutritionist. We need to collaborate with them. They're not rehab professionals but there is room for, I think a lot

of us when we go through PT school, we shadow surgeons and we learn about surgeries. And when I worked in a hospital system, I spent every Friday morning at 6:30 in the morning at physician fellows conference where we would sit in a room and listen to the physician fellows present on a surgical technique and learn the newest research. We don't tend to do that as much in the nutrition spectrum and I think that's so important even though, if I wasn't a surgeon, I still learned about surgery because at benefit of my patients. I'm not a dietician but I think I really need to know about nutrition, so, where is that kind of fine line or where our scope of practice versus their. So the APTA has actually put a lot of resources out on this very recently and so I urge if any of you are APTA members, take advantage of your membership and go to their resources on the APTA website. If you're not a member, then that might be a reason to join. I'm not trying to plug APTA but they're good guidelines.

To what they have said is that nutrition is part of our scope of practice but you just need to check with your state practice act. Same with other things that we're doing in PT, direct access, dry needling, all those things. So, some states don't allow anyone to give nutrition advice other than a registered dietitian. Other states will allow people to give nutrition advice but you can't bill insurance for it. So check where you're practicing and just understand your guidelines. This is just for your reference, I'm from Cleveland, Ohio as Calista mentioned, state of Ohio laws and rules for dietetics. Basically saying that only a licensed dietitian can provide nutrition care. So things that we would do in the rehab setting, that's what dietitians are doing in their setting which makes sense, you know, assessment, goal setting, counseling advice, so, just having to understand where their scope of practices and then where our scope of practices as well. If we look at then there's a center for nutrition advocacy and these scenarios are actually on the APTA website. There's a link to this website. And this is just for your reference but this is it just obviously in general scenarios where healthcare professionals can use some of these tools in practice. And like I mentioned, these are wordy. I'm not gonna read all these, it's here for you. But they are here if you wanna

use this as a reference here. Also, back to the APTA website, the House of Delegates. This is from there, the full position statement is here, it's linked up. It is within the professional scope of a physical therapist practice screen for and to provide info on diet and nutrition issues. And it makes sense because as we're gonna learn, some of these things really affect how somebody's going to recover from an injury. It's funny, I was listening to a podcast earlier this morning. If anybody's a soccer player and you know, if you've heard of Kelly O'Hara, she was on the Women's World Cup team. She's new podcast out, she was interviewing Alex Morgan who's a star soccer player also on the Women's team.

And they were talking about drinking and last summer after they won the World Cup, they had some nagging injuries and Kelly had mentioned that she was going to stop drinking to let her ankle injury heal. And it's athletes at the higher levels kind of understand the role of diet in terms of recovery. And I'm not sure that everyone in the community knows. I certainly didn't grow up in college soccer and even like beyond that, so, it is a great way for us to provide that education and that information to our clients and the people in the community that we work with. So again, this is just that quote again, here the physical therapy scope of practice, that it is per APTA, it is within our scope to at least screen for and give general information.

We do not and we cannot provide regardless of what state you're in, provide what is called medical nutrition therapy. This is something important, I think it may be showing up later on your quiz, but just we cannot. So there is a fine line of that person has an injury. And if we're giving specific diet plans for that injury or very, very specific advice, that is outside of our scope, they will need to see a dietitian for anything like that. Anything that's in terms of how to specifically breakdown calories, protein, grams, etc, like that. Like I said, specific conditions, diabetes, metabolic conditions, all of those things, we can be general and we can give them guidelines. A lot of times I will have clients that... I have one that does see a nutritionist regularly, she has a lot of other

health issues going on. And that nutrition is just sorting things out. However, she will see the nutritionist for her session once every couple weeks, I see her twice a week. So a lot of times she goes to see, gets that diet advice and then is coming to me to say how the heck do I implement this? Like now I have to, you know, I have kind of a big thing I need to change, I need to make to my diet this week and it's really gonna benefit me but I need help putting that into practice.

So sometimes things that we do are trying to sort out the practicalities of that, do we go all, you know, just any kind of logistics, I think rehab professionals spend a lot of time with their patients and I think we're good at having to do those things just by the amount of time we have with people, I think we have a luxury versus some of the other professions. So there is a link right there eatright.org, that is a link to find a registered dietician nutritionist, that's from the Academy of Nutrition and Dietetics. That's a referral service. So that's a great link to save them, bookmark and just find people in your area and just start to build up a professional relationship if you don't have one already. All right, we're gonna move on to metabolism and energy balance. I'm gonna go through the slides pretty quickly because I have a lot of other info on macronutrients, micronutrients, all kinds of other good stuff.

So like I said, if anyone has questions about this, just flag me and I'll slow down with it. But first off, we've learned about all this stuff in school but I don't know that we've learned about it from this perspective. We don't really produce energy. If you remember the law of thermodynamics, energy isn't created or destroyed. When we eat food, what we're doing is we're converting that energy stored in the food. So that's when we talk about calories or energy, you're feeling your workout or feeling your recovery, all those things. When we have this energy, it's a transfer of energy. So we break down the food, release energy and that fuels those processes that form ATP. As everyone, I'm sure love learning about as much as I did in biology class in high school and college. So, briefly, ATP is the body's energy currency. We need a constant supply, we need it for every

action in the body. Obviously, it's moving our muscles, it's fueling our workout, it's producing enzymes and carrying molecules across cell membranes for healing and recovery and all those things. We need a constant stream of it. So we get that stream from either nutrients, things that we've eaten or broken down and passing through the liver, things that are stored. We do store nutrients and energy supply in our liver, our muscle and our fat cells. We carry some in the bloodstream for immediate use. It's not enough in our bloodstream to keep us going for very long, but we do carry some for short-term. If you guys remember, two most important raw materials that make ATP. We have triglycerides which is a storage form of fatty acids and then glycogen, which is the storage form of carbs. So just to put it in a food perspective versus a bio perspective. Let's say you're eating guac, some guacamole with beans, good old snack.

Maybe on some nachos or, you know, whatever burrito, whatever you want. Beans are complex carbs so you think of those as a polysaccharide, we're gonna go into carbs in a second. But the complex carbs in those beans are broken down into simple sugars, glucose which are gonna be used for energy. And those would go to your liver and they're packaged and stored there in the liver as glycogen. There's fiber and those beans and the fiber will go to your GI bacteria that can help eat that and convert that into some short chain fatty acids.

Again, we're not gonna go into a ton of detail about these mechanisms. But I just want you to think about like, when we eat and what we put into our body, how it kind of breaks down and can go into a bunch of different places and can serve a bunch of different functions. To beans, also a protein. So a little bit of that protein is going to be broken down into amino acid and we're gonna talk about that in a second. And then the guacamole is obviously fat or a healthy veggies, you may hear in different places. And that also will go through the liver and it's converted into triglycerides which would be an ATP source. So when we talk about things like complex carbs and healthy fat

and protein and why they're important, that's just an example. I think we all learned about ATP in a different way, at least I did, but just looking at it from that different perspective. So again, ATP needed for everything in the body. When we break down that ATP that's where we release energy. So we talk about the energy transfer, that's when we kind of release it and the body uses, the body only stores enough ATP for like a few seconds of intense extra effort. What the body needs is about 75% of your body weight. So it's easier for the body to store extra and then make what it needs as it goes along. So, if we look very, very quickly and if anybody's listened to any of my other talks that go into more detail about these systems, I'm not going to today but like I said, these slides are your reference just let me know if you have a question. The phosphagen system.

That's first system them to kick in when we're exercising so it's at short bursts. I always think of like trying to swing for a home run baseball or things like weightlifting, doing a power clean or throwing a shot put, that kind of thing, it's short-term, it's less than 10 seconds and this is why the creatine system and creatinine kinase is being used to make ATP. The more creatine in the muscles the more of the system is available for high intensity short bursts contractions and therefore, you will have more energy and possibly more force that you're able to exert when you're lifting weights or doing those power movements and better performance.

So we only have a certain amount of this ATP and creatine stored in our bodies. As I mentioned earlier, so there's really only a certain amount of the system we can use then after that glycolysis takes over. So glycolytic pathway takes over. So thinking about like, these are things like for a 400 meter sprint, it's about six to 30 seconds of activity and you're breaking down that immediately available blood glucose, the store muscle glycogen and then the glycerol backbone from triglycerides and it makes for ATP. Remember all this and it costs too. So we really only get to ATP, that stuff used to make my head spin. I'm not gonna go over a ton of detail, just moving on to more

bigger picture things. When we talk about muscle fatigue from this. I do wanna touch on this because I think it's a misconception and it's something that I used to have you misinformed about as well. On the glycolysis, that muscle burn that you feel kind of towards the end of it. So like the glycolytic pathway, releases hydrogen ions, that's what fatigues muscles. What ends up happening is NAD which we still learn about, again, during this whole cycle, picks up hydrogen and pyruvate and that's what creates lactic acid. Lactic acid is not what is the fatigue and muscle burning. So we say all the lactic acids building up in our legs. Lactic acid it's actually trying to buffer those hydrogen ions and carry them out of the cell. So metabolic acidosis, as we think about that muscle burn, it's actually from that proton that's released when we break down ATP and then that just regenerates and accumulates. Actually, after about 90 seconds of intense exercise that's when the aerobic system takes over after this. So, last one of these systems, the aerobic system, we learned about the Krebs cycle before in school, we learned about electron transport.

Of interest in terms of nutrition. When we think about the H+ in this system, it's actually the coenzymes that help to do the Krebs cycle are derived from vitamins B3 and vitamins B2, that's niacin and riboflavin. Basically, you just have to know B vitamins. Interestingly enough, those vitamins are used to help energy transfer and ATP regeneration. So sometimes this is a reason why people that are deficient in B vitamins can feel very sluggish and tired because we don't have enough of them or they aren't working as efficiently in that pathway. So just something of interest in terms of physiology applied to nutrition here. Just so you guys can see here, these are the different pathways. So when you know, that first maximum intensity, then working into the glycolytic pathway and then into aerobic, anything really over three minutes there. When we think about nutrient metabolism, I'm gonna again briefly talk about these. You've probably seen in school, different things were breaking down carbs, different pathways to break down carbs here. And then I'm gonna keep going through here, then glycogenesis. I've never been able to see at all in college and even now I'm

talking to all of you. But just when we were talking about the conversion of glucose to stored glycogen here, then glycogen to glucose, just different kinds of pathways here and then making glucose from non carb. So just other forms and ways for our body to produce carbohydrates. We also have different pathways for fat metabolism, ketone formation and cholesterol synthesis. Cholesterol synthesis we probably don't hear enough about but there are a lot of other great things that our body needs from good cholesterol. Cholesterol helps cell membrane function, it helps to absorb dietary fat, it's the basis, the building block of a steroid hormone, it also helps us synthesize bile salts. So there are some various central body functions that we do need cholesterol for and I'm gonna talk about that a little bit later about good cholesterol, bad cholesterol and kind of what the breakdown is from that.

Lastly, we have protein metabolism. The building blocks of protein that I haven't mentioned yet are amino acids. Those function to give our body the structure and the strength. They really are, talking about the building blocks, of almost everything. They make hormones, they make enzymes, they help with the immune system and they make transport proteins to carry out any kind of bodily task. So when we think about the energy value of food, we've all learned about calories, we all see those nutrition facts on the on the back of all the food that we have. The food that we eat contains potential energy.

And I mentioned that earlier when we talk about energy is transferred from when we eat it into our body and then our body uses it to fuel. So technically, a gram of fat has about nine and a half calories on it. That's great and we study that in a bomb, like bomb killer murgee in a lab. And I don't know if anybody has ever had to do that in a lab or work on those kinds of things. Basically, what you're doing is you're looking at the amount of energy in food and how many degrees it heats water up by and that's how they measure that from. Humans don't have function like that. We function similar to that but our bodies are so unique and there's so many unique processes with our

body that it's not as clear cut as that. Even if we know how many calories are going into our body, we don't know how many we are actually going to be using. There is some that we've lost through the actual process of digestion because it takes energy to digest our food. The status of our gut sometimes can determine how much energy we absorb versus how much we use. Calories are sometimes a great guideline but they're approximations. Other reasons that can be affecting how many calories. So if you buy a box of food and you see that food nutrition facts, those calories on it, those are approximations, those were obviously made in the lab that is producing the food, but they are approximation. So, things that can affect the calorie count. And that label that you're reading on there some are the analytical methods, they may be a little off one day or another. Also the product variety, there may be subtle variations in that product even if it was mass produced in the food production is a standard as possible. There may be subtle variations.

Some of that is to you know, the soil or growing conditions of anything that went into that food. If we look at like, like an apple, for example and the nutrition facts of an apple, you can probably Google and see. The ripeness at the time at harvest or the growing conditions that that was grown in, those will affect. So that calorie count that you may get, generic on Google really may be different. Maybe you're eating a huge apple, maybe you're eating small apple, maybe it's a lot more ripe and it's a lot sweeter and the sugar contents a little different. In terms of meat or chicken or poultry, you know, really any kind of meat product, that animal's diet will affect a calorie count. The length of storage, I don't know if anybody has ever had like fresh potatoes that are fresh harvested versus ones that have been stored for a little while and then the sugar content changes in that. Now, also the preparation and the method and the cooking that you are doing to prepare that food can actually change the calorie count. Really you can have around you know, as much as 25% more or less than what that package is claiming. So just understanding that calories are a good thing to pay attention to. And sometimes it's good to help keep your portions in check but at the same time,

they aren't the end all be all. Other things to understand when we think about calories and energy and metabolism, you all may have heard of some of these things; basal metabolic rate, the resting metabolic rate, the thermic effect of feeding. So just to go over some of these, your basal metabolic rate is the minimum level of energy that we need to maintain vital functions. So it's literally like, I mean, this isn't talking activity level, this isn't talking anything else, it's what do we need to be able to keep our heart beating, to keep our brain working, to keep our digestion and all of our vital functions going. It's about 70% of the energy and the oxygen that we consume it each day, so food and then also our oxygen intake.

So a huge amount of our energy intake goes to just like keeping us working and functioning. Then we have our resting metabolic rate and this is measured during rest. It is a little bit different than the basal metabolic rate. It's slightly higher but it's no more than like 10% higher, just a little bit different measures. From there we have the thermic effect of feeding. So what this is is digestion, absorption, assimilation of what we're eating and I mentioned that earlier, that actually just digesting our food takes energy. How much energy that takes depends on what we're eating. So protein takes the most amount of energy to break down. Fat is the lowest.

And I think there are different and you may have seen different like diets or fat things or different things to eat off of that like you wanna eat something that takes your body more energy to break it down, so you're actually burning calories while you're eating. All of those things have sometimes been in the news or trendy to do. Then we have exercise activity. This is the one that I think we all probably know about and understand. You know, it can range from 10 to 15% more than your daily energy demand to even 30% or even more if you've got you know, marathon runners or high level endurance athletes or athletes at multiple soccer games in a day or different activities. And then the last thing is non-exercise activity thermogenesis. This is basically all the daily life stuff that's not your exercise. It's important for weight loss or

weight gain or just understanding your activity. So if you just have a generally active euros, people that never really sits down and is always kind of burning energy versus somebody who is a lot more sedentary and that's just understanding those things there. When we have to estimate how much energy somebody needs when we're working with an athlete or working with an injured person or whoever our client is. Really just understanding two main things. One is that their oxygen consumption will go up as your energy demand goes up. And I think we all kind of have a decent understanding of this. If not a visual for you is I mean, if I'm gonna go for a run, I'm gonna start to get out of breath because my body needs more oxygen, so I'm gonna start to breathe heavily to kind of balance that energy demand.

So that is understanding those two things and then that all of our bodies differ in energy needs. So that depends on our genetics, it depends on our body weight, it depends on our age, it depends on our sex. As we need and use more oxygen, we need to use more energy and we need to get that from our food. When we think about a balanced set of energy, there's different factors that go into it. So we talked about, you know, calories may be a little imprecise. There are, you know, other things that go into that with what's that person's individual environment? What are their genetics and how are they expressed?

Their hormones, what they can digest or absorb? For instance, you may have people that have a food intolerance or gluten intolerance or different things. My husband is, we found out in the past three years that he is gluten intolerant and most of his family is too. It's interesting to see how that has the pattern of what they can all tolerate and digest in different levels, different times of each of them kind of finding that out through different physician appointments and different tests and different diet, dietary changes. But what he can absorb it's really interesting, certain things that he can absorb differently or certain things that he can tolerate in terms of gluten but also in terms of hydration when he does take in gluten or other nutrients, when he is not taking gluten

and it's fascinating how his body physiologically it has an intolerance to that, but then sometimes it will grab on to other kinds of calories or other kinds of nutrients just because they think it needs something, it's not able to tolerate the gluten but whatever else is within his food his body is trying to use. So all of those things can affect energy balance. The other thing is physiological and psychological stressors. I'm sure all heard about things like cortisol or stress responses to different activities or different life stressors. And all of those have an effect on energy balance. A lot of that is outside of our scope of practice but just understanding that it does affect that. So somebody during a pandemic, that is having a lot of issues in terms of stress or somebody with an injury that has a lot of issues in terms of stress of their injury in the recovery.

Those all have something to do with it. If we're trying to gain weight, obviously, we need to take in more energy than we put out and we have to start somewhere. So we can gain weight as fat which would be restoring triglycerides. We can gain weight as lean mass. So where you're storing carbs and protein and muscle gain. When we're losing weight we are taking in less energy when we're trying to lose weight, that's our goal. So, a general thing, I would recommend this is where a dietitian or a nutritionist needs to come into play and help with calorie counts and all the exact you know, understanding the exact effects of hormones and digestion and stress and all those things on their diet.

But in general, things that we can tell people, if we're trying to lose weight, we're working on reducing the number of portions. So an easy thing to do is just to start by, removing maybe one or two handfuls of carbs, you can kind of use your hands as a guide for portion control. So if you think about a serving of carbs, being like a cup of your hand and cupped handful. There removing one or two of those handfuls per day or if you think about fat, measuring a fat serving is the size of your thumb. Removing one or two thumbs of fats from your daily intake or generally just trying to eat with smaller dishes or different things that you can work on with portion control on just a

general tip might be good when people are asking you questions about how to do these things, how to lose weight, how to gain weight. You know, obviously gaining weight would be the opposite of adding in one or two handfuls of carbs or protein and then adding in like one handful or one thumb for a healthy fat. Like an exercise, this is kind of our bread and butter but, type of training affects the use of your energy. So if you're working with an athlete, that's high intensity, short duration. You're cross fitters, you're you know, people that are sprinters, weightlifters, those kinds of things your body does prefer to use carbs for this. That's why we just went through all that boring talk on glycolysis and the ATP PCR system. During exercise, you need that short carb kind of burst energy. Afterward, after some of those intense exercises, you kind of do have this after burn effect and that will last for about hours, a few hours after activity and they will need to refuel from those activities afterward.

That you can start to have a little bit, you will need to refuel a protein, you will need to refuel with fat. Activities that are low intensity, long duration, those aerobic activities, long distance running, cycling, hiking, that's a new sport, hiking. More energy is obviously burned during that, it's long duration. So your body is using that aerobic energy and then innate there's some fat burning going on during that. As time goes by, you end up depleting from that muscle glycogen and then the body will switch to use more muscle triglycerides and free fatty acids too because those are available next. And then after they're done with that activity, the body's working to get back to baseline so needing to refuel those calories.

And the fluid loss which we'll talk about it as well is very important. People have questions about what is going to be the most effective, a general person trying to lose weight, both of those forms of exercise, help control balance. So I think sometimes you may see in the media different things like oh, it should be aerobic exercise only, like just fat loss, like let's go towards that, you know, fat calorie burn. But really, both of those are important. So trying to help people mix in those high intensity short duration

activities can also be very effective mixed in with those low intensity long duration. In terms of an athlete that is highly trained, they're obviously very trained into exercising and using certain body systems. So, for example, a long time efficient distance runner, they have a very well developed circulatory system. They have plenty of enzymes available to transfer work transferring energy, their heart pumps more every beat, so they're getting more blood flow and more efficient. But that person that's training as we all know, maybe sometimes when we are trying to train and have training gains, we may want to get them outside of that efficiency stage, we may want to try to train the body to work harder. So just understanding that we need to kind of challenge some of those workouts and training and again, I think I'm preaching to the choir here but that has an effect for training effects for a muscle adaptation for a strength for whatever training gain you're going for, a rehab goal, but then also that can have an effect on their metabolism and nutrition and energy consumption as well.

Other things that are very important when we think about there's you know, nutrition, fueling exercise and weight loss, weight gain, all those things but we forget about some of these things that are also very, very, very important in terms of nutrition. One is reproductive function. I don't know if anybody has experience with patients or clients that have had an issue with energy availability, it used to be called female athlete triad or relative energy deficiency is a couple different names and there's some controversy on what to call it but basically just understanding that when our energy is low, when our body doesn't have enough fuel it's going to cut down on the production of sex hormones because it sees that as a non essential.

If you have to pick between keeping your heart beating and keeping your brain working or reproductive function, it's going to pick the keeping your heart beating and keeping your brain working. So what ends up happening is you cut down this production of sex hormones in male or female, it could be testosterone or it could be estrogen and progesterone for women. And then men end up having impotence and lower energy,

women end up having a loss of a menstrual cycle and they will not get a period. We've got a question here. Good question Christine. "Is it possible to help athletes gain weight "while heavy training?" Yes, it is and I do think speaking with a dietitian is helpful to really nail down exactly, but yes, it is possible. And it's a matter of making sure that they are first feeling enough for that heavy training, but then also that they have excess fuel. So taking in more energy than with their training needs. So adding in an extra portion of carbs and adding an extra portion of protein per day and making sure that you fuel it at the right time. You know, right after exercise, we're gonna talk about that in a little bit. But that will help. And it is important for us to make sure that athlete is, if that's their goal or if they need to gain weight for a certain reason that we are able to assist them with that or route them to somebody who can and work with that person. That's a good question.

Yep, you guys keep the questions coming with this. Again, as I was mentioning, back to the body functions, in terms of reproduction, the body will cut down on those things and it really can be a major issue in terms of reproductive function and in just terms of bodily functions. There's also a link with that and stress fractures and some other things that are outside of the scope of this talk. But just understand that it is very, very important. If you're working with an athlete and they are mentioning that they are having any alterations in any kind of sexual function, it is really, really important to refer them on.

Other bodily functions, cognitive function, I'm sure you all, if you're really, really hungry, the brain fog you feel when you feel like you can't even think, that is a very real thing. That's your body's not getting that glucose, your brain is not getting the glucose and the energy that it needs. So it's very important. Metabolic function, your heart, your kidneys, your other organs need energy to maintain and we talked about metabolic rates, your resting metabolic rate will adjust itself. And the body's that amazing adapter to keep itself alive but sometimes it's not adapting for optimal function. So when the

energy intake goes down, your resting metabolic rate will go down and then that affects other things that affects your thyroid hormones, it affects just really almost every function in your body from there. And then the last thing is repair and restoration. And we're gonna go into this a little bit more detail later, your recovery needs energy for it. Your body needs that energy, whether it's recovering from a workout or recovering from an injury or recovering from an illness. All of those things are very, very important. And like I said, we're gonna talk about that a little bit later. Moving on to macronutrients. So these are foods that your body needs in large amounts. So it's carbs, fat, proteins, those are macronutrients. You're required in large amounts of the diet. We're gonna break down each of those and why they're important. But macros can affect your ability to digest food and absorb nutrients, it can affect hormone production, it can affect the immune system, they can affect really everything, your metabolic function, your body composition and down to the cellular function. So let's talk about carbs first, so, different forms of carbs.

So monosaccharides that is your simplest form. That's where you have one sugar group, that's where we talk about glucose, fructose. We're gonna talk a little bit about fructose and all the controversy with that shortly. But also galactose, mannose, ribose, if anybody's heard of those things, so that's a monosaccharide, that's the simplest form. Then we have shorter chain carbs, oligosaccharides and then polysaccharides which are your starches, your glycogen, your fiber, those longer chains of carbs linked together there. I'm gonna keep going and we'll talk about that a little more detail but basically when we are digesting carbs, the goal of our body is to break those longer chains down into monosaccharides and then they go into the bloodstream as glucose. From there, we store them in your muscles and liver. So if we have more muscle, then we have more space to store glucose. Any excess once we filled our stores, as much as we need to, we stocked everything that our body needs and the excess is converted into fat, into triglycerides. So, like I said, the more muscle you have, the more you potentially you have to store carbs as glycogen instead of triglycerides. So

the other thing that's really important for this is, we talked about like weight training and exercise. It's very important for managing blood sugar because the lower... So I'm gonna just repeat all this again. The more muscle you have, the more carbs that can be stored as glycogen instead of being converted to fat and then at that point, your blood sugar will also be lower because it will be taken up by those triglycerides. So when we talk about weight training and exercise and we talk about things like diabetes or just managing blood sugar in general, weight training is very important because the more muscle we have the more ability we can store that excess glycogen and then the less need to turn it into fat.

So it's getting it out of the bloodstream and getting it into our muscles and not having need to be in the bloodstream and need to be eventually converted into fat. So when we talk about things that are important in weight training and intensive weight training to make a training gain, that there is that link there between nutrition and the things that we do in terms of strengthening people and in helping them to train and make gains that way. One other thing I wanna mention is I mentioned briefly on the other side, fructose and we always hear about high fructose corn syrup and all those things. The natural form, the non processed form of fructose, that is a monosaccharide. So it's that you know, there's glucose and then there's fructose is another version of it.

That is naturally found in fruit. It's also in honey, it's also in tables sugar, a highly processed version of it is in high fructose corn syrup. Sometimes you hear things like fruit gets a bad rap because it's high in sugar and it's high in fructose. That is a different form of fructose than the process version that is chemically added to different things that high fructose corn syrup. Your body can process the natural fructose. It's found in fruit and honey, a lot better than it can the process form. And so when you hear people say things like fruit is bad or I shouldn't eat a whole lot of fruit, fruit does have a lot of micronutrients, a lot of vitamins, a lot of vitamin C are things that we need for healing and to help our body. So that is kind of false. Most people should get no

more than 50 grams of added fructose per day. In terms of eating whole foods, sources of fruits or different things like that. Fruit doesn't seem to really contribute to that issue. So if we would eat 50 grams of table sugar, 50 grams of high fructose corn syrup or something like that just straight sugar, we're taking that into our body, it's a lot more processed. So there's a lot of other issues with that. And then it also doesn't have fiber, it doesn't have the water that like a piece of fruit would have. It doesn't have all those extra nutrients there. If you're eating an apple or an orange or that kind of thing, you're taking in natural fructose and you're taking in all those other good things for your body. So we talked about you shouldn't have any more than 50 grams of added fructose per day, so what is that in real life? So a 30 to 32 ounces of soda is about 50 grams.

A bag of Skittles is 24 grams, a Starbucks grinding Frappuccino light is 39 grams. So it's almost your full day even though it's a light version, 11 apples. So you would need to eat 11 apples to get to the amount of fructose that can have all the other sugar content of other things. So, really, the bottom line is yes, you should watch your sugar or your sweeteners and if it makes up more than like, if excess sweeteners make up more than like 10% of your diet, that is not good. But having a piece of fruit a day or having you know, getting that intake is actually very good and it is important. We got a question here. Let me show this.

Does the recommended quantity of sugar intake depend on your weight or size? Great question. It does. So five to 10% is a general guideline. But yes, if you are smaller than you should, you will be taking in less just calories in general. So your sugar but also your protein, your fat, is all going to be a little bit less. If you're a little bit bigger than you will be taking a little bit more. The easiest thing and the most general thing to have people do, you know, before you get to the stage where you're sending them to a dietitian for that exact calorie counting is use your hand or have the person you're working with use their hand to measure portion size because the cool thing is hands, one hands are portable, they're coming with you when you're eating, if you have you

know, hand function. Or the other thing is a bigger person is going to have a bigger size hand. So what we would say is for in terms of carbs, a serving of carbs could be one cupped handful, a serving of protein should be the size of your palm and then a serving of fat should be the size of your thumb. So, that can kind of help without having to go into all that calculation of your weight times your activity level and getting into all those caloric details there. But that's where we can kind of generally had people and then at every meal, the goal is to get a serving of carbs, a serving of fat, a serving of protein and then some vegetables. So you would want at every meal, a cup of your hand and a serving of you know, rice or pasta or whatever your carb is. A palm sized serving of whatever protein you're having, a thumb sized serving of fat and then vegetables the size of your fist. The vegetables you can kind of do more because they're nutrient content.

So awesome question. We're gonna go into, we're talking about carbs, something called the glycemic index because this sometimes gets some precedent, is it is important. Basically, it's how quickly can your food raise your blood sugar. When foods are less processed and they're higher fiber so more whole food sources. Things like legumes, whole grains, vegetables, I talked about beans having some carbon, some protein, that's a complex carb. Those have a lower glycemic index because your body has to break those down they're more of a complex carb and so it's not going to spike your blood sugar versus me downing a bag of Skittles and it's already pretty simple. A simple carb and it can go right into my bloodstream and in sugar and insulin response. A low glycemic diet, you hear about that and you want you know, it's touted as that's very healthy and it is but sometimes it doesn't tell the whole story. You need a mix of you know, protein, fat and fiber and those can all have an influence on the glycemic index. The other things that can affect how quickly a food is converted into glucose and get in your blood, raising your blood sugar is the time of day that we're eating, the activity level. And everyone has individual variation. So we just mentioned body size's one, just your own metabolism and those kinds of things. There are other ways to

measure this, you may have heard of like the glycemic load, that's where you take the glycemic index and you take serving size into account. That gives us a better picture but again, it doesn't take into account protein and fat and fiber and all those things. There's something called an insulin index, that's basically the amount of insulin that your body produces in response to a food. Sometimes it doesn't always match the glycemic index because high protein, high fat foods can kind of stimulate an insulin response as well, a higher insulin response. So really, the bottom line is, in general and this is an easy thing that you can counsel people on. Regardless of any of these indexes or any measures. A minimally processed carb and a more complex carb will have a slower digestive response. Highly processed foods are gonna spike your blood sugar. So the more whole foods and the more variety of foods that you're eating, the better off you're going to be.

Glucose transport, I'm just gonna go through this quickly. Basically, you know, insulin stimulates glucose uptake in muscle and fat and exercise, when we talk about like weight training but exercise, again, it's more important. That increased muscle is an increased ability to store the glycogen and not be converted into fat. When we think about carbs in the diet, I mentioned that our brain needs a certain amount of glucose, our body needs a certain amount of glucose, that intake depends on again, how big or small somebody is.

That was an awesome question earlier about that, activity level. How much lean mass or body fat that person has, what's their age, metabolism does slow as we get older. Sadly, I wish it didn't but it does. Genetics or foods that people can tolerate or prefer to eat. Something that is very cool and I think we lose sight of with modern technology or you know, humans evolved eating a varied seasonal diet. So seasonal meaning that I live in Cleveland, things get cold, I don't have citrus fruits growing out, I wish I did, growing out my back door all the time. You know my food changes. We have winter squashes, we have different things. Our body, my body in this climate, I was born here,

does best eating seasonally, our bodies tend to do that and varied and seasonal diets. Carbohydrates and really any food, protein, fat that are found naturally in different foods, that's what we work best on. We work best on a mix, that's the best way that we can assure that we're getting all of the vitamins and minerals and nutrients that we need for our body. So you know, sticking to that, in general, is really the best way. And sometimes it's the easiest way because, you know, we get so many mixed messages in the media about eat this, not that or you know, whatever or whatever it is. Just understand that if we have less processed foods, more whole foods and we're eating according to seasons and what's around us, our bodies are going to thrive on that. Most often we want slow digesting high fiber carbs, so carbs and have a good fiber content. The less processed food is, the more fiber content it has. And if we choose different whole foods, we can get these pretty easily.

Again, there's beans, legumes, whole grains, fruits, root vegetables, all those things. Occasionally, we want those faster digesting lower fiber carbs. If I'm running a marathon and I need a gel for quick, you know, sugar burst, that's where we're gonna need that to get into our bloodstream right away. But in general, we want those complex carbs. Again, just to reiterate what I just said, not all carbs are created equal, not all carbs are bad. I remember that, I don't know if it's still a popular book but like the eat this not that. I think before and in part of why I went into doing nutrition, like learning more about nutrition is I think there's so much you know, worrying about like, that's a bad food, like, I can't eat a bagel that's bad or I shouldn't eat this, that's bad. Not all carbs are bad.

There are things that are better, food is a continuum. And really, we should be telling people that. There is a continuum, there are choices that are a little bit better given the situation that you're in and what your body needs. And that's really the art is learning that and trying to constantly work towards that versus beating ourselves up over eating a doughnut or eating bread or that kind of thing. Couple questions coming in. Are there

any vegetables or fruit that can actually lower the blood sugar? I think there's different theories on that and it's a great question and I've seen things about that. Out in the world, the theory is that the vegetables and the fruit that had the highest fiber content can work against that that blood sugar spike. So things that have higher fiber content. So in terms of vegetables, things like celery or things that your body has to work very hard to break down. The more raw food is, that's the case, fruits with higher fiber content. I'm blanking so all I can think of is like oranges and pineapples and things that are of a higher water content. Those are a little bit higher on the blood sugar spectrum and spike but squashes, I don't know if that's considered technically a fruit or a vegetable, things like that that have a higher fiber content in with the carbs. Those can kind of help to work against that blood sugar. In terms of actually, like lowering it, I don't know of any but there's there's kind of like a mitigation of that spike of blood sugar for down. But that's an awesome question.

One more, how important is aging regaining muscle mass? It's very important. We tend to lose muscle mass as we age. I can't remember the exact ages, at 25 or 30, way too early in my opinion. I'm 30 so I've passed that a little while ago. So it is very, very important to be working against that. That being said, you can put on I mean, there are people that are past that age that are putting on more muscle mass than they may have had in because maybe their habits are a lot healthier and they're doing heavier weight training and we see that I think with like the CrossFit fads and not it's not a fad, but like the CrossFit craze, you know, people have it started to take up that sport a little bit more.

A lot more people are getting into Olympic weightlifting, a lot more people are understanding the importance of putting on that muscle mass and training intensely, which is a great thing. I do CrossFit myself, I'm not knocking it. And so age is important but I think we can kind of work against that and the older you get, I personally think that it's even more important to try to work against those losses. So just having people

understand that it is never too late and you can rebuild those, you just have to work harder as the years go by to do it but I personally think it's worth doing. So thanks guys. Like I said, keep the questions coming. I'm happy to answer them. The bottom line we're gonna kind of wrap up carbs here. The bottom line is a carb amount is important. So we talked about using your hand is the easiest. One serving is one cupped handful. Again, that's, you know, fruits, whole grains, beans, root vegetables, potatoes, you can have a list or there's different... Precision Nutrition actually has a lot of good free content out there. And I believe that there is a blog post that they have. So it's a nice printable thing you can give to your clients or patients that have different sources of carbs.

And it's just like, you know, a good thing to jog people's memory like, oh, I can eat that or I can, you know, that's another idea for my carb. So they're not getting in a rut with what they're eating. Sensitivity does matter. So active people need or use carbs more effectively. So activity is important. That's something that we have a great role with what we do in encouraging that. And then carb timing matters. So high level athletes who follow a good diet and they're looking for an edge for training you're competing, that timing of those carbs will give them the edge and that fuel that they need. Last carb slide here, fiber. When we talk about fiber, there's soluble and then there's insoluble.

So plant cell walls, I know we just talked about. Foods and their effect on blood sugars to the plant cell walls, I always think of like a celery or like, you know, root vegetables or dark green leafy vegetables. What insoluble fiber does is it adds bulk to the stool and it helps to keep your bowel movements regular. So you want things to keep moving along in the body. And then there's soluble which are things like oats and dried beans and flax seeds and I've listed some of them there. What that does is that soluble fiber helps decrease your cholesterol levels just because it helps with the recycling of bile acids and I won't go into that whole pathway but soluble fiber is important for

decreasing cholesterol. And at minimum you want 25 grams a day. But again, caution with when you have people that have inflammatory bowel disease. Again, this is where you would refer to, you know, have somebody make sure that they're getting an amount that is beneficial to their body versus something that could cause harm. The benefits of fiber, you want a combination of all those kinds, soluble and insoluble. It helps you feel full. So I think people that are on like juice diets or different things, you're juicing your fruit but you're losing and your vegetables, but you're losing that fiber content. You're losing that feeling of fullness.

And I've never done one of those but I can only imagine that you're gonna be hungry pretty soon shortly after that. Decreases your cholesterol, I mentioned that. Also by keeping things moving along with that insoluble fiber, it decreases your colon cancer risk and it increases your gut health. So very, very important to make sure that you're getting fiber. A couple more questions coming in. In regards to carb timing, would it be before and after training? Yes, it would. And I will, actually, we're gonna get to that shortly. So it's an awesome question and we'll talk about that. It would be before and after. The closer you get to the time when you're training, you want a quick carb source, you want your carb to be less complex because you don't wanna get sick, you want your body to digest it.

After training, you want the more complex carb to help refuel and then you want a protein source as well with it. And then teens. Yeah, I'm glad you asked that. It's really important and I think it's overlooked a lot. I work at a high school and I think everyone has different varying levels of, you know, nutrition influence for what they're reading, for what they're learning, all those things. But in teens, they're spending a lot of energy especially if you've got a team that's like just very active. And so that carb timing is really, really important. One for performance, but also it's a growing developing body and you wanna make sure that they're getting the energy that they need for the bodily functions that they need. Then one more, fiber gram content for teens lower than an

adult at 18. That's an awesome question. I don't know the exact gram content, it would be lower than an adult at 18. It depends on body size. So I'm saying lower only because just based on body mass, but I'm not exactly sure. They need to get adequate fiber, I wouldn't cut them back on fiber per se but if we're basing it on body mass and they have a lower body mass than in adults, then yeah, they would need it a little bit lower. So I'm going to move over to fat. When I was going over this talk this morning I realized how many donut pictures I put on here. This is from a place in Cleveland called Brunettes. And those donuts are, they're amazing, I'm gonna be honest. I must have been craving them. Because of the quarantine and everything being space, six feet apart, every time I drive by this donut shop, there's a line out the door and I haven't had one since like February.

And apparently I was really thinking about them when I put this talk together, so anyway, fat. Fat is, it's an organic molecule. Is made of carbon and hydrogen and they're joined into what we call hydrocarbons. We've all probably learned these at a certain point. The arrangement of that chain determines the fat type. So we think about unsaturated fat versus saturated fat. So there's this long chain here and when all of the bonds are filled with a hydrogen atom, that's a saturated fat. A saturated fat is solid or semi-solid at room temperature.

If only some are bonded, that's unsaturated fat and that where it's liquid at room temperature. So, obviously like, along those lines, the less saturated fat the more fluid. Then we had things that like unsaturated fats, you may have heard of things like monounsaturated fatty acid, that's where you have one carb, carbon unsaturated. That's something like almonds, almond butter, avocado, cashews, olives and olive oil pressed out of those olives, peanut butter. And then polyunsaturated fats, that's more than one carbon unsaturated and those are your omega three and omega six fatty acids. Omega three fatty acids are found in fish, seafood and basically it because it is a little more fluid. What ends up it's basically with fish that are living in cold weather, it

acts as a natural antifreeze. That's why salmon is a good source of omega three fatty acids, just to get about where that salmon lives, a little bit further North. Just kind of an interesting reason why that is a good source for us then. Other polyunsaturated fatty acids are things like chia seeds, flax seeds, sesame seeds, walnuts. When we digest fat, we break it down into fatty acids and glycerol and then it enters the blood several hours after eating. So it does not dissolve in water. It can't travel, anyone who's tried to mix oil and water understands that. It can't travel and it does not dissolve. So it can't travel in the blood on its own, it's carried by a lipoprotein.

So just an example of how proteins kind of work in all of our bodily functions, they help to transport fat. In terms of lipoproteins, if anybody has heard of some of these one is HDL which is a high density lipoprotein and what that does is its job is to bring fat and cholesterol from the body cells back to the liver. So it's in terms of cholesterol transport. And then there are also things like low density lipoproteins, your LDL, which many of us who have had labs done, I have to go to the doctor tomorrow and actually I'll be having these labs on as well.

Your LDL, it's job to carry cholesterol to all the cells of the body. You have very large like buoyant kind of, I always think of like these fluffy floaty LDL particles, the more you have of those, that indicates good health, the smaller and more dense of those you have that indicates poor health. And then you have your very low density lipoproteins, VLDL and those carry the newly made triglycerides from the liver into your fat tissues. So when we think about lipoproteins, when our physicians order labs, they would like to know they are, you know, dieticians or even when we're looking at labs for our patients, we're looking at the number of LDL particles and HDL. So if we think about, in analogy is number of cars on the road. So if you think about, like, your bloodstream like a highway, you think about the number of LDL particles as like the number of cars on the road and then HDLs the number of ambulances trying to pick up and transport things back and fourth in the blood. Most blood work generally shows your total

cholesterol so which is just the number of things kind of riding in the bloodstream, but then in terms of things that are transporting it in the type. That's also very important to just because it's linked to different bodily functions and different things in terms of heart disease and I think we all kind of know about the effects on metabolism and heart disease and just general kind of health and other diseases. So what we would really wanna know is the total cholesterol to HDL. So when we talk about cholesterol, we need to be clear on what we mean.

Most of the time, we end up talking about the cholesterol content but not the size or the number of them and both are important. So we're looking at the total cholesterol to the HDL, helper cholesterol. The goal for males is five to one or fewer. And then for females, it's a four to one, that's a typo, it should be four to one, not 4.4 to one. So, again, looking at the triglycerides, your HDL cholesterol, that has been recently been determined as being a good predictor of risk of diseases among commonly available blood lipid tests. So, again, those are just reference goals there for you. In this highway analogy that I just referenced earlier, when we think about LDLs those are the cars that are carrying cholesterol and fat in the bloodstream.

The ambulances are the HDL and the cholesterol fat are the passengers and then the guardrails on the highway are your blood vessel lining. So if you've too many cars, if you too much LDL cholesterol, you likely have more crashes into the guardrails or the blood vessel lining. When that crash happens into the blood vessel lining, it initiates plaque formation. If you think about the HDL, it's the ambulance at the scene of the crash and what it does is it takes passengers back to the hospital which is your liver. The bottom line is it's not the all the passengers, is not your total cholesterol, it's the number of cars on the road. So it's that HDL there. And again, you want the number of your HDL to kind of help with those, those crashes and then that plaque formation. When we think about fat in the diet, fat gets a bad rap but really it has a lot of major roles. So, energy, it makes and balances hormones, it forms cell membranes, your

brain and your nervous system rely on it and it also transports fat soluble vitamins. So, vitamin A, vitamin D, we've been hearing so much about vitamin D especially now with the pandemic. We need fat to transport that in our body. And then vitamin E and vitamin K. It also gives us two, there's omega three and omega six fatty acids. We can't make those on our own so we need them from our diet. And both, we need a mixable saturated and saturated fat. I'm gonna talk in a second about saturated fat. It obviously gets a bad rap and everybody says don't eat saturated fat. There's certain saturated fats so we don't wanna eat. We do need some saturated fats. We don't want a diet that eliminates one or the other that in terms of our health and our body function, that's doing more harm than good. So, saturated fats.

As I mentioned, they're saturated with hydrogen that's found in beef, pork, lamb. It does not necessarily cause heart disease. So the theory was before, that if we eat saturated fat, it would raise our cholesterol levels and that foods high in saturated fat are usually rich in cholesterol too. Then if we eat cholesterol, we're gonna raise our cholesterol levels and that's gonna cause cholesterol levels be more deposited in arteries and I just went into that whole spiel, I'm not gonna get into that again. Human physiology is more complicated than this.

Our liver makes most of the cholesterol that we need and the liver, our liver controls that relationship between what we eat and what we make. We need cholesterol for important jobs in our body. Our steroid hormones are made from cholesterol. So that includes sex hormones, that includes glucocorticoids. So we need cholesterol to live. And artificially decreasing this, like cutting back on how much our body can make will cause dangerous side effects. And so in the whole low fat craze, we didn't get healthier or slimmer or fitter, we got fatter. Everyone around the world continues to eat fats and they're fine in the right portions, let me say, let me not make a sweeping as a generalization as I just said, in the right portions. People were able to eat saturated fats, maybe not so much, you know, beef, pork and lamb but there's also saturated

fats and eggs and full fat dairy in coconut, in cacao, those are all saturated fats. Why did the low fat craze not work for us? Well, a couple of reasons. One is people were eating more processed food. So we traded whole food sources for things that were low fat. And as you take it out, you need to process it with sugar or other additives to make it actually palatable. People were focused on the badness of foods. So talking about like food is bad eat this not that versus eating a high quality food, it had this label slapped on it that something was bad. People felt less satisfied because they ate less fat and they ate more overall. Eating fat helps release hormones to tell your body that it's satisfied, that it's full, it signals something. Has anyone ever like overdone something that's low fat, you don't ever feel full and you can just keep eating and eating and eating?

I can definitely tell you that I have. Versus it's almost better to just eat a little bit of you know, full fat ranch dressing and eating a thumb sized portion. You feel a heck of a lot more satisfied than smothering a salad with low fat ranch. It's because your body, it wants more, there's a piece of that. Your body is smart, it's senses that there's that macro nutrient missing. Again, people, we ate more processed sugar and salt to make up for the missing fat. And we just got all whacked out on one nutrient versus considering your whole diet and the whole spectrum of the long term, whole big picture of our diet. So again, what we do know about saturated fats is that if you eat a lot of them and you combine them with a lot of sugar and a lot of processed and refined foods, that is very unhealthy. But eating whole sources of saturated fats in the right portion may not be. And we can get into a whole plant based versus, you know, animal based and that's a whole nother topic on itself but you know, generally eating things like plant sources, coconut fat, cacao those things that are saturated in the right portions are not that bad. They should be balanced with other fats. So we talked about monounsaturated, polyunsaturated fats. So again, I'm not telling you to eat all bacon all the time, we need to understand the fats are energy dense. So you know, I talk about a thumb sized portion of the fat, a thumb is a lot smaller than the palm sized

portion of a protein source that I'm gonna eat or a handful of carbs or a fist of vegetables. So just understanding that you need them in the right context. There's a lot more energy packed into that serving of fat, but we can't say that you know, saturated fats are all bad. Most dietary sources are some combination of saturated, unsaturated, monosaturated fats. Like I said, we want a variety. So that is best for our hormones, that's best for inflammation. I'm gonna talk about that a little bit in a second, it helps support immune function. So thinking about things like like eggs are rich in saturated fat but they do have some monounsaturated fat in them as well.

Butter is mostly saturated but there's also some mono and polyunsaturated fat. Things that people tend to be low on are things like the omega three and omega six fatty acids and so if you need to, supplementation of those is where people you know, may struggle with getting them in their diet and they may need to look into supplementation. That being said, there is a fat, I don't like to say things that are like, bad or good but we need to talk about trans fat may not be the best for us. Trans fat is something that with, when we process fat, what they do is they take an unsaturated fat that's often liquid at room temperature and they pump hydrogen ions into it to make it, so it's hydrogenation.

You may see labels like hydrogenated blah, blah, blah, that's what a trans fat is happening there, so, basically, what it does is it gives products a longer shelf life. So like those baked goods that you can get at the gas station, probably been sitting there for like, five years or whatever they've been pumped with, hydrogen to lengthen the life of the product, not necessarily to lengthen your life, your own life. Basically they don't go into our cell membranes very well. They kind of can bog down in there and they also change the fattest process. So they have an effect, a negative effect on HDL that helps our ambulance helper with the cholesterol that transports it. They compete with the essential fats that you need. So they kind of crowd out those essential fats. So it can worsen you if you eat a lot of these, they crowd out the good fats that you need and

then you can be more deficient in those essential fatty acids. And they are linked to a higher risk of chronic disease. So even one meal with a high trans fat content can have a negative effect on your blood vessel function and elasticity. I don't know how temporary those effects are but there are studies that show that, you know, one meal at least in the immediate afterward can have a negative effect on that. The FDA in 2015, it had a position statement conclusion that artificial trans fats are not generally recognized as safe. Partially hydrogenated oils had been recommended to be phased out of all food products, so, omega threes and omega sixes, some good fats for you. Let's get back to those, omega three. There's three parts that make up that. There's ALA, there's DHA and there's EPA. So the ALA are your flex sources, your plant sources, those come from plants.

The DHA and the EPA are from more marine sources. So when we think of the ALA, that's flax seeds and chia seeds. And then the others come from algae and then the fish that eat the algae is passed on to them and if we eat fish it gets passed on to us. Omega three fats keep cell membranes fluid. So they're good for brain health because if your brain cell memories are fluid, the messages from your neuro chemicals can be transmitted better.

Getting EPA and DHA early in life has been shown to help with brain development. Later in life there's been shown to be a link between the prevention or slowing of neurodegenerative disorders. Fluid cell membranes help with insulin sensitivity. There's a role in the cardiovascular system, there's a role in the nervous system, there's a big role in immune health for omega threes. So obviously, all very, very important. Omega sixes are pro inflammatory, omega threes are considered anti inflammatory. So omega sixes are shown to be pro inflammatory in terms of constricting blood vessels, blood clotting, they may increase pain. Your first thought may be that that's bad and then omega threes are anti inflammatory, so that's good. Obviously anti inflammatory is good but we think about your body does use omega sixes too, when you think about

constricting blood vessels if you've had an injury and it's trying to slow the onslaught of blood flow to an area where there's swelling and effusion, your body's trying to in that healing process. So there are times that you know, we want our blood to clot at certain points when we have a major cut or a major issue. So we do need some omega sixes. The issue is we need both three and six. And early humans had more of a balance, so maybe two to one, you know, in favor of omega six, more of a serving size. Right now our ratio due to processed foods and refined oils and things, our ratio is more like 10 to one or 20 to one. So the goal is to improve that ratio. You are always going to have more six and three but we need to have a better balance of it. Ways to improve that are one, eating fewer processed foods, refined foods. I'm a bit of a broken record saying that but really more whole food sources are better in that. Eating more very plant and animal foods.

So fatty fish, wild game, flax seeds, chia seeds, those kinds of things. And then if you are not able to still have that balance in those two steps, you wanna consider supplementing omega three. And you can do that by having fish oil. I will caution people you have to make sure that your fish oil is of a good source. So, sometimes there are, if the fish oil is not from a great source or it's been processed or there's questions about how stable or maybe expired or those kinds of things, you just have to make sure that you have something that is a good quality source of a supplement. The other option is you can get algae sources of DHA and EPA.

That's personally what I do just because sometimes I'd rather just go to the algae source that it's from, those are a little bit harder to find too and sometimes I will tell you from experience that the label on them may say DHA and EPA and then, you know, ordered off of Amazon or not read the labels clearly as I should at the store and then I'll get at home and realize that it is a fish source. I'm not vegetarian or vegan, but I just like I said, like to go more of the plant based on that. So like I said, just read it. If you're working with somebody who is vegetarian or vegan or plant based or you yourself are,

just make sure you read what you're taking beforehand. All right, protein. Amino acids, moving on to this. Again, amino acids when they're joined together. So protein's made of amino acids when they're joined together, do you guys remember peptides or peptide chains? And that's a primary peptide structure. So when we take in, if we take in 100 grams of amino acids, 80 grams go to the liver for making protein. And then 20 grams go in the systemic circulation, it's called the amino acid pool. And I always think of this like pool, like everybody in the pool, like this pool party. It's the storage and it's in your systemic circulation and that's where we have, sorry, I keep bumping my headphones here, that's where the building blocks of proteins are. And that's where our bodies have them for different bodily functions.

However, we don't store proteins the way that we do carbs and fat. So that's part of the issue of needing to get protein in your diet. Why that's so important is because our body is always breaking them down and building new protein. And we need it for so many functions, as I mentioned but we can't store it. So again, we need a range of protein sources but we need to make sure that we're getting protein. Almost all foods contain some protein. I know there's a big worry about people that are on plant based diets like where are you getting your protein? There's protein in certain things. It's just what foods are more protein dense and not and making sure that you're getting the right portion in there.

So when you think about a palm sized serving at each meal, sometimes it can be very easy to not get that much. There's three categories of amino acids. There's non essential. There's 14 amino acids, there's 12 of them, we can make in the body. Essential amino acids, we can't make them and we have to get them from food. I apologize, there's 20 amino acids. Then there's conditionally essential amino acids that we can make if we have to but we don't always do it very efficiently, effectively and we need extra conditionally essential amino acids of certain times and we need them more when we're under physical stress or for heavy training or if we're sick, we need those.

Move to the next slide here. So the average person and this is the bare minimum would need 0.8 grams of protein per kilogram of body mass. Basically you would convert if you're using pounds, you convert that to kilograms and calculate 0.8 grams of protein provided, that is the bare minimum, that is literally just for like, body function. So any more activity than that we're going to need a little more protein. So this is here for reference. I'm not gonna read this for time sake but endurance athletes are going to need a little bit more. And that's kind of a fallacy. Sometimes that people think that endurance athletes just need more carbs and less protein, that they'll get bulky if they have protein. No, they absolutely need protein.

Their bodies are breaking down after long bouts of exercise and they need to rebuild that strength, power athletes need a little bit more. I think there was a question earlier about needing more intake of at least carbs for heavy training but protein in here too. Mix sports, again you need more protein. You don't need any more than 2.2 grams per kilogram per day though. So, you know, the people that are filling up a plate of just steak and eggs and protein, any more than that will overload your liver. Also you wanna consume it throughout the day.

So we're talking every three to four hours you're not overloading to make up for not having a lot of protein at breakfast, you don't wanna have it all at dinner. So it's 20 to 30 grams per meal. And like I said, that's general use, you know, calculate more exactly for your body weight above or those references for you. And then you want one palm generally per meal. So again, needs go up. Anything that's gonna be a stressor, if you're injured, if you're sick, if your post recovery, if you're training really hard, if you are under a lot of stress or if you're losing protein for another reason, if you have digestion issues, those kinds of things. Your needs go down if you have a liver disease, if you have gastric issues again, these are all reasons to refer because we cannot give medical nutrition therapy. Protein needs is a duplicate slide, we're gonna go back to a plant based diets here. Plant based diets can have a lot of great benefits and people

may be on them for very different, you know, reasons, ethical or just feeling better health wise, those kinds of things. You wanna make sure you're eating enough to meet your energy needs. That's just in general calories but also making sure protein is in there. You wanna make sure that you're getting as much of a variety. And then the other big thing is you wanna make sure that you're eating at least one cup of cooked beans or legumes per day. So legumes are a good source of lysine, that's an amino acid that is typically low in people with plant based diets. So you need, we all need 30 to 45 milligrams per kilogram of lysine per day. So it's about like, for a person it's 150 pounds, that's two to three grams of lysine per day.

One cup usually has one gram of lysine. So at least you can get at least one cup and then hope to fill that in with the rest of your day and your diet. Other things you want to avoid is don't build your diet or on cereal grain processed foods, it is very easy to do that. Like I said, I am not totally plant based but I personally don't eat a lot of, you know, I try to get a certain number of meals per week and per day that are more plant based but it is an easy trap to fall into a plate of pasta, or you know, cereals or grains or that kind of thing and just not getting that protein source. So you do have to work harder, be a little more creative in planning your meals.

You know, in a lot of times it is worth it but you just have to be conscious of that. If you are having trouble getting that protein in, there are plant based protein supplements, there's plant based protein powder, there's different things that you can do to supplement that. So a couple questions. Does gymnastics fall into the mixed category? You know what? It would, gymnastics is such a tough sport and the hours of training. So, gymnastics would be mixed and you think about the hours of training though, so, it is mixed but then you may have you know, gymnast going into bouts of like three to four hours a day of training. So, they will need more protein but they will also need, you know, more calories in general to fuel that. And then protein needs for the teen athlete. You can calculate based off of the body weight. I'm gonna flip back to the slide here. In

terms of body weight here and you can take so the teen, whatever they're weighing and then going through here with, you know, matching that to their sport. But absolutely, you can use that as a guideline. I was working with a group of high school health students over the summer and we actually did a project where a lot of them played various different sports at a high school and calculating their protein needs for their sport for like a crew athlete versus tennis player and a runner and that kind of thing. And actually, and Ricardo you can use in terms of gymnastics. So these protein needs are your baseline but I'm gonna talk a little bit about per hour of training, you know what you need to do in terms of hydration and then supplementing with protein. So just stay tuned, you'll be able to get a little more exact on that in a second. When trying to gain weight, is it okay to base protein off of the weight goal or can it still overload?

Great question because I think that's a very easy thing to do. Yes, when you're trying to gain weight you can base protein off the weight go up to 2.2 grams per kilogram. So really, when you're trying to gain weight, it's a mix of carbs and protein. You know, you've got the excess protein servings but then you will also have excess carbs servings too and that's how you can kind of take in that extra energy without overloading the liver. So when we think about supplementation and really any supplementation so this goes for protein but this goes for everything, real food first. So if needed, then you can supplement.

There's whey, casein, there's milk, protein blenders, egg whites, and there's plant based proteins, pea, hemp, rice, all of those things. Just very, very important. To make sure that you're getting in with anything, just get what you need from real food and then you can supplement afterward. Things to look for, you guys can just take this as a reference, just things to look for basically, things that aren't additive, additives, tolerable ingredients. People may not tolerate some of the whey protein, it depends. Everybody has different tolerances and just making sure that you've repeatable

company. This also goes for the omega three and omega six, you wanna make sure that there's third party testing NSF certified for sport or informed choice certified, those companies had tested to verify what is actually in the product is actually in the product, that it's not mislabeled, they also verify that there's no other contaminants or illegal additives. So a lot of protein powders and a lot of other supplements may not actually have what is stated on the label which is so sad but NSF informed choice certified do. All right, micros. So micros, why is it a micro? We need less quantity than macro. So basically these are your vitamins and minerals and you need this quantity. If you don't get enough, you're not functioning properly, if you're getting too much, you may also get sick. Vitamins participate in all metabolic processes, we can't make them ourselves.

And it's important, we need them. There's fat soluble and water soluble and it's just based on how they're, I talked about fat earlier and why we need that to transport certain vitamins. If you're not eating enough fat, you're not gonna get those key vitamins. Water soluble are the B's and the C's. We don't store a lot of these because and we're always taking in and excreting water so it's important to make sure that we're continuing to get those in our diet. Cooking matters. And it's fascinating and this is a lot bigger scope than this talk but some are best absorbed when they're raw, some are best absorbed when they're cooked and some are best absorbed when things are cut or crushed or that kind of thing.

So like when spinach is cooked, you can best absorb the iron and the calcium. When it's raw you can absorb it's vitamin C. When we talk about eating a variety of foods you can also include a variety of preparation mechanisms to make sure you're getting in what you need to get in. Water soluble vitamins; so foods that are high end B or C, those vitamins can be lost in water because they travel in water. So if you're like boiling them, they can kinda boil out. So foods high in B and C should be cooked in a method that has minimum water loss. Fat soluble vitamins are more stable in cooking and

things that you add in so, like leafy greens are good sources of vitamin A and vitamin K. If you add olive oil because it's a fat that will help get the maximum that you're getting from your diet. So these are again great ways to console. If you have somebody that's low in a certain diet, you can generally understand what people need to supplement with. But then this is a great kind of collaboration source with a dietician or nutritionist. Things that I find fascinating actually that you can change how your body processes or uses different things by how you prepare them or what you eat them with. But really, instead of getting all bogged down with the details, just understand that if you eat a wide range of whole less processed plant, animal foods, you're gonna be fine. A couple things to talk about quickly, special scenarios here. Iron deficiency, quality sources of animal protein.

So again, we're not able to give nutrition therapy but it's important to know these things. Quality sources of animal protein are good sources of iron but then also vitamin C helps to absorb them. So adding things like pineapple and citrus fruit can help with iron. Cook spinach is also important, is a good source. Too much iron could be dangerous for some people. So just understanding that a lot of people are low in iron but at the same time, some people could have interruptions. So just understanding iron is important and especially with athletes, a lot of people are iron deficient, so, those are sources.

When we think about calcium and things like osteoporosis. Sources of calcium. Things that we may not think about tahini, tofu, almonds, kale, so which is interesting and then we think about bone health and osteoporosis and different things like that. I'm gonna skip to the next slide and talk about stress fractures here. Also, along with bone health, there's four nutrition related factors that increase your risk of developing a stress fracture. One is low dietary calcium intake. Adequate calcium which is in women under 50 it's 1,000 milligrams. Older women over 50 it's 1,200 milligrams and males it's 1,000 milligrams, that's what is considered adequate calcium, so, consuming that amount

can decrease your stress fracture risk. The other thing is low vitamin D. That can also increase your risk. Vitamin D supplementation does improve that risk. 30 to 50% of the U.S. is deficient and likely more like I don't see the sun from November to April. So when you're up North, where I'm at, more of us are deficient in vitamin D. Again, this is something that you can have levels tested, which is important. Also low body weight. When we talk about low body weight or low energy availability and I talked earlier about like the miles triad or relative energy deficiency that is linked to stress fractures. A BMI under 19 is the strongest independent risk factor for a stress fracture in young women.

And then low energy availability like I just mentioned. If you're not feeling your workouts, you can absolutely put yourself at risk. So ways to decrease risk of stress fractures. One is getting calcium rich foods, enough of them. I just mentioned a couple sources there. Think about having your vitamin D levels tested or supplemented and then they can ensure you're at appropriate weight and eating enough to fuel your workouts. Plant based diets, I just talked about that, we're gonna keep going through here.

Other supplements in micronutrients to consider with plant based diets, omega threes and the plant based source of that. So ALA, which is the part of omega three source that are flax seeds, chia seeds, all those and then the combined DHA and EPA. Also making sure that you're getting enough calcium and magnesium and zinc. Vitamin D sometimes can be low in everybody but also in people plant based diets and then B12. So we don't make B12 ourselves, we need to get it from animal products, so, ways to just understand that if you need to take a supplement of that or on there's something called nutritional yeast that you can put in your food, that is a source of plant based source of vitamin B12. Other special scenarios in terms of micronutrients, medications can interfere with micronutrient absorption, good to talk to a pharmacist or dietitian or physician about this. And then just any other issues that would be restricting your

eating or changing how your body is digesting food. Moving on to things that have to do with workout recovery. Beet juice and in terms of micronutrients, this is high in nitrates. And it's been shown to dilate blood vessels, it can help with muscle efficiency here. There's a lot of research out there on this which is interesting. And basically it decreases the oxygen that's needed to kind of do the work in your body. So you basically become more efficient, you can work harder on the same amount of oxygen and you can work longer before exhaustion sets in. There's been some studies on endurance athletes on this.

One was in cyclists, when they took and then one in the male triathletes, where they took 12, so not a huge sample on this one but well trained male triathletes and they were in a double blind crossover study and then they were receiving beet juice and then they had an endurance test about three hours after they took a beat supplement. And basically, a lot of these reviews, a lot of the studies, one systematic review showed that it can't be, this is the quote from the study. "It cannot be stated that the combination of beetroot juice "with other supplements has a positive or negative effect. "But it is possible that the effects of the supplementation "can be undermined by interaction "with other supplements such as caffeine." When you take it and the amount that you take is important. If you know of anybody that's doing this or working with it yourself.

Peak blood concentration of nitrates that the beet juice is high in occurs about two to three hours after ingesting. But you need to be taking it for like six days before in a bed if you wanna see improvements. So in that study with the triathletes, they only gave them one supplement, three hours later and one test so they didn't have huge results to some of the other studies have shown. But what the research is saying is about six days before an event you will see an improvement. And then how much would you take research usually uses like 500 milliliters which is like two ish cups of beet juice or two ounces of beet concentrate or about 10 grams of powder in there. So, we've got a

question. How cooked is kale or spinach had to be? Can it be lightly steamed? Yes. And I think there's, yes, exactly. Lightly steamed should be fine 'cause overcooking, it can change the effects of that and then change option there. And then also too, if you're somebody like me who's done things like roasted kale or kale chips or something like that, then unfortunately, that's kind of really like burning a lot of the nutrient content out of them. Other things about workout recovery, you guys may have seen tart cherry juice. This is high in antioxidants and high end anti inflammation, nutrients so it's kind of a good thing to battle like stress and inflammation and muscle damage from exercise.

Research has shown that tart cherries can be used to, you know, less than muscle damage after heart efforts. It can reduce pain after exercise, it can improve your recovery, it can also improve your sleep duration and then there's some immune system effects. So, some studies on that, I'm happy to answer questions on that. But just for time, I'm gonna kind of skip through those but just I do have references here if anybody's interested. Research uses about 50 tart cherries like one or two times a day. So that's like eight ounces of juice, two tablespoons of a concentrate. And how often would you wanna use this?

It depends on the desired outcome. So if you're looking to decrease soreness after an event, it's about five days before, maybe three days after that event. If you have a condition again, we cannot offer medical nutrition advice but what some of the research is showing that daily for conditions like arthritic knee pain, it can help with some of that. So just something interesting there. Other considerations for workout recovery is related to micronutrients. Again, we've talked about omega threes, but then vitamin D and how that's associated with sub optimal or I'm sorry, how decreased vitamin D is associated with stress fractures, injuries, poor performance, that kind of thing. Vitamin D, we've talked about that. And I'm gonna skip over to collagen which is also another interesting topic and something that kind of goes in with what we're

doing. So collagen and then taken with vitamin C has been shown to increase synthesis of cartilage, tendons and ligaments. Research suggests that taking vitamin C with it because it's a co-factor in collagen synthesis, so, it has been shown to improve collagen synthesis which can be linked to tendon function, prevention of injury, speeding of healing. So just the timing of this is important. If somebody is taking a collagen supplement in vitamin C, it needs to be 30 to 60 minutes before exercise. And in terms of that segues into nutrient timing, so when we think about, when we plan and eat food and dietary supplements and the timing and types of food we can have an effect on how our recovery and how our tissue repair is, how muscle protein is and even mood. The key points is, so we're exercising really hard. A high volume of exercise depletes glycogen stores.

So just some references there, more than an hour. You're going through about 30 to 60 grams of carbs per hour. So, you want to replace with an electrolyte solution, you looking for every 10 to 15 minutes or replacing some of that. In terms of resistance exercise, we need to replace carbs or carbs and protein. So, that's because we need to improve the muscle glycogen stores, kind of mitigate the muscle damage and then helping to facilitate those training adaptations. So, post exercise. Protein either immediately after exercise or up to two hours, people may have heard of the two hour window, that can stimulate muscle protein synthesis.

So meeting that total daily intake of protein is preferably evenly spaced. Talk about not overloading it. Should be a really important emphasis for people that are exercising. However, the quality of that is important. So you know if you're eating like a very processed source of protein afterward, that's really not doing a whole lot of good after your workout. Or if you skip breakfast, you ate a crummy lunch then you're eating a protein source, it needs to be good quality. Got a question here, when's the best time for a high school athlete to take their vitamin D supplement? After a meal. Yes, it's really the time that they will be most consistent with it. So in terms of vitamin D, it can

be with food. I'm not aware of any other interactions. I've not heard of any, if anybody does, please chime in 'cause I don't wanna misinform people but yeah, I mean it can be then taken with food after a meal or supper and also in high school athletes just getting testing if you're concerned about a deficiency is important too 'cause varying levels of them depending on you know, if they're working out, doing a lot of work out in the sun, whatever their climate is, time of year, that kind of thing. I am going to quickly go over probiotics and then we'll finish with water and injury. Probiotics, we hear about these a lot. These are live microorganisms. They're linked to gut and immune health. So they are important.

They have an effect on the immune system. So there is especially in athletes who are traveling and coming into contact with other athletes and maybe traveling right now they're not but you know, maybe at higher risk for and heavy training, maybe a higher risk for respiratory tract infection. So probiotics can be important to help with mitigates or can decrease the risk of that. Or if you are sick kind of helping to help in the body to fight that. All right, water and fluid balance. We are a lot of water. The 50 to 60%, we need to make sure that we keep that up for our functions and fluid balance and everything.

Problem is the body is really good at regulating hunger and thirst but there's a lag time between loss of fluid and thirst. So we may be working out and exercising and we may not realize that we're thirsty until it's too late. There are studies on athletes that arrive at their workouts thinking they're hydrated, and they're really not. We don't replace what we should. So most adults need about 12 cups of fluid each day. Some of that comes from our food and some of that comes from food intake. So about eight cups of taking it, of drinking and then maybe about four cups from food, more or less depending on what you're eating. There's more water needed for body size exercise, environmental loss, if you're sick, all those things. You can calculate this and estimate your needs by body weight. As you can see here, even just a little bit, so half a

percentage of body water loss can strain your heart up to 10 to 20%, can be very critical. So this is really, really important to make sure that we're not losing water more so than they need. Dehydration symptoms. Like I said, there's a lag. So we typically don't notice that we need more water until we've lost one to 2%. Beyond that symptoms, headache, fatigue, low blood pressure, dizziness, fainting, nausea, rapid heart rate flushing, those are all signs of dehydration. We can't train to become better at dehydrated. We don't adapt to it, we just have to replace lost fluids. We can train our muscles, we can train everything else, we can't train that and that's really, really important. On the other side, we have something called hyponatremia. That's when we're taking in too much water relative to our sodium losses. There's three ways we can do this, one is our blood volume goes down.

So let's say you're vomiting, diarrhea, something that you're losing a lot of blood volume just generally and it's messing with the balance of sodium and water where you're having low sodium and too much water versus dehydration where you're having too much sodium and too little water. There's also where your total blood volume and total water can go way up but your sodium isn't just rising to the rate the water is. And then there's also normal blood volume but you're just drinking too much water so that people that are way too overloading water and not taking electrolytes with it can be at risk for this.

The symptoms are right there for you. Athletes are risk when they're rehydrating without electrolytes. So the bottom line is fluid replacement is crucial but don't over drink. So if you're just normal person, normal conditions, short bout of exercise plain water's fine. When you're exercising in hot, dry climate, when you're exercising for a long time, when you're a pro athlete, when you have more, like you know, two practices, at those points you need to replenish using a sports drink. So you wanna match the plan to an athlete. And just understanding that there's different examples endurance athlete, I'm not gonna go through these but they're here as a reference for

you guys, you can download these as... The slides are here for you. And I'll, you know, I'm gonna kind of go through these quickly just so we can get to injuries. There's ways you can calculate your sweat rate where you weigh in without closing you workout and then you weigh out again and just use that to calculate how much fluid you need to replace. But then there's also people that have different sweat rates or sweat, you know, they may sweat testing sometimes is a very important thing that you know, you can kind of dial in on. Some people may be very salty sweaters and just losing more sodium than the average person and they need to know that they can replace it. There's different plans for moderately intense or high intensity. I can't remember somebody asked question about, like gymnastics or people and I have mentioned people that are training for very long periods of time, these are references for you and you can download these.

You know, and just kind of general tips here. Food behaviors, again, I'm gonna kind of use this as a reference and I wanna get to injury recovery here. The bottom line with food behaviors and coaching is something I think we do in the rehab realm very well. And I think you need to do that, sometimes we had people walk in and talk to us about like, well, the doctor just said, I have to lose weight. Well, how? And we can't just say like, just go on a diet. I think we need to, you know, we progress somebody through rehab very stepwise and with intention and when we're coaching somebody, you're giving them nutrition tips, we need to do the same. We can't just expect that they're just gonna, like cut out all the donuts right away. Maybe we need to talk about, you know, why are they eating them or when are they eating them or, you know, stop labeling, the food is bad, maybe we can make better choices. So there's an art to it. And like I said, those slides are there for your reference. All right, homestretch here, injury recovery. Good nutrition can help to manage the inflammation, good nutrition can support your immune function and that repair and rebuilding again, we're not giving medical nutrition therapy here but general tips. People are gonna ask you about them and you wanna be able to answer them. We know how injury recovery goes from a

physiological standpoint. General tips; eat enough total food. So people may think that they're not training and they don't need the calories that they would be with training. Maybe they don't need all those extra calories but adequate nutrients are critical and your metabolic rate can go up during this time 'cause the body is working so hard to heal itself. Anti inflammatory fats are very important. So things like omega threes I've talked about that earlier and monounsaturated fats like avocado, olive oil, nuts, those can also have a positive effect. You wanna minimize as much processed carbs, added sugars because those can increase inflammation. And alcohol also can increase inflammation. So I'm just understanding that those things you know, no more than one serving per day of processed foods.

Foods rich in vitamins that can help, vitamin C. These again, this is a reference here for you. Vitamin A, zinc, copper, those can also, you know, so generally saying you know, one to two fists of vegetables at each meal, one to two handfuls of fruit at most meals is important. Again supplementation if they need it, check with because they may be on medications for their injury or illness. Check with a pharmacist or doctor, then check with a dietitian. But certain supplements can be helpful. Again, we talked about fish oil or algae oil. Multivitamin, Vitamin A has a role, Vitamin C has a role. Helps the immune system. Again, these are here for your reference.

Copper, zinc, protein, making sure you're getting your protein so your body has building blocks to rebuild. Turmeric is a kind of a popular one now, anti inflammatory and wound healing. And then other things like garlic, bromelain which is the main ingredient in pineapples, which is kind of interesting. That as I just said properties and anti inflammatory and then boswellia. So, I just flew through those and I apologize. I wanted to leave a couple minutes for questions and we already have one here, but if anybody else has any, like I said, those values and everything are all references for you and you can download those but yeah, let me know if you guys have any questions. My son, 10 year old boy into competitive gymnastics, picky eater. I'm gonna just, for

some reason is not letting me see. See if I can view, here we go. Now I'll give you all the rest of, picky eater here. Does not seem to build muscle mass visually. Coach says progressing slow in training but slow nutrition though. I'm just in trouble maximizing this box for some reason. Ricardo I am, promise for some reason I'm having trouble viewing the rest of your question. Oh, thoughts, okay, now I got it, sorry. Thoughts before, during or after training? Yeah, I mean, even in this happens, especially with young people but even there's older people too. There's adults that I work with that tend to be pickier eaters and I get it. You know, we want to make sure that they can take in what they need. Thoughts before, during and after training. Really if you just kind of break it down into before training that they're getting a complex carb, a protein that they want or they can tolerate, they can enjoy eating, getting those maybe two to three hours before training.

Or as it gets closer to training if they need a short burst, a quick like a smoothie or something that's easy, digestible carb is important. And then afterward, replacing that protein, that carbs. So the key is just finding what they like. And maybe they're not going to get as much variety as somebody else but at least it's better than nothing and just they're getting the nutrients that they need. Yeah, Ricardo, you're welcome to contact me and email me with any other questions. All of you are welcome as well. Question, smoothies is good or bad? You know what? Smoothies can be a great thing. Smoothies where you're blending it up versus juicing out all the fiber, smoothies are a great way to add. Protein smoothies are a great way of adding different nutrients into your meal and they're convenient. A lot of people do really well in smoothies. I personally and I think people fall into one of two camps. One, maybe the food prep with the smoothie is harder to all the chopping and the cleaning of the blender. But then there's other people that it's a, you know, you can prep it, and you can grab and go and you could have it in the car on a long commute or you can take it to work with you. So smoothies absolutely can be a great thing, you can add protein powder to it. Yeah, great question. Does high protein diet affect kidney function, is there any

evidence? There's evidence that beyond that 2.2, it can have adverse effects on the kidneys. It's just overloading them. So whether it's like long term damage, I don't know of any evidence that has that. But it's just beyond of how much is too much and overloading and not effective because your body's trying to process it from other sources. Any specific nutrition recommendations for, that just... For an AIIS avulsion fracture. This is a great question. Soccer player football kicker. Yeah, in avulsion fractures. I mean, that's an interesting one because it's a bone issue, but it's also a tendon issue too, so, getting nutrients in terms of specific nutrition supplementation, one would be just to manage the general inflammation. So thinking about supplements for that in terms of omega threes, in terms of vitamin C, turmeric, all of those things can have a good effect.

Protein, vitamin C, protein, and collagen also in terms of tendon health are also important too. So in terms of that avulsion fracture, you've got obviously combination of tendon and bone injury there. But just making sure that you have both of those and then soccer player football kicker. So somebody that has to, you know, be both a power, like a power sport and an endurance sport. Does heavy training affect a person's immune system? Absolutely. And it's something really important for us to realize. I'm glad you asked that question.

Yes, it does. So in terms of immune supplementation or immune eating to support your immune system but then also eating enough to support and fuel that training session and not completely depleting. You don't want somebody to be so depleted with nutrients that they can't recover and then they'd be more susceptible to illnesses. So yes, it really does. Where to find my email? I can post it. Oh, thank you. Thank you. I appreciate Calista Kelly posted that for me. Any nutrients must haves when a child is going through a growth spurt, different aches and pains daily? Yeah, making sure that they're getting adequate protein and adequate fat and just getting an adequate vegetables and fruits. So you're getting the vitamins and minerals that can help

support that growth but then getting that mix of all of the food groups is very important. They're also going to have increased energy needs. So making sure that those energy needs are gonna keep increasing as they're, you know, needing to grow. So keeping up with that is difficult but very important. And sometimes you can use hunger as a cue for that. You know, if you have something that's like ravaging and hungry, making sure that they're getting that fuel when they need it, but then also that it's complex carbs that you know, if they're hungry and they're not eating junk. That it's, you know, a complex carbs, a good whole food protein source, that kind of thing. Is creating for muscle growth state. If it's a supplement that, that NSF for sport, if it's a good supplement with not a bunch of other additives, it has been shown to be safe, but it also needs to be in the right proportions too.

So I think it's easy when it's a supplement that people can kind of overload and overdose on it. But it can and has been shown to be effective with muscle growth and especially for if you're looking to grow muscle and support those processes of like high power sports. High School runners, yeah. Specific diet recommendations. Getting enough protein, fat and carbs. Carbs to fuel the run and then protein and fat as a recovery. So one of those slides has a reference when you talk about, like their runs are probably going to last more than an hour.

So if you look at the reference slide, back here, there's probably too far back to find it but there will be one for suggesting how they supplement before, during and after activity with protein and carbs and fluid. Missing deficient enzyme, CAH, cholesterol cannot be... That's a good, that's a great question. And that's one that where a dietitian can absolutely. That I'm not sure of. But that's something that with working with a dietitian, with enzyme reactions and interactions and things like that would be a great, great thing to collaborate with them on. Well, thank you guys. Thank you Olivia, thank you Mary, I appreciate that. Thanks for tuning in. I think there was someone else that wrote thank you too and it somehow it popped off here but I appreciate that, thank

you. You know, when can you start incorporating amino acid powder in teens? You know, if they're deficient, a protein supplement that's like, you know, even like a plant based just kind of good, it doesn't necessarily have to be like a free amino acid, just a general protein supplement. You can do that in teens, it's when they're deficient. So if they're not getting it in their meals and you've tried different ways to have them incorporate it into their meals, adding like a protein powder to a smoothie is okay. It's, you know, that real food first but then you want them still to get some nutrients. So, thank you guys. I appreciate that, thank you. And thanks for sticking it out for two hours with me this afternoon. I really appreciate it.

- [Calista] All right, well, thank you so much Carol for once again, sharing your expertise with us today. And thank you everyone for attending. And we have another webinar on Friday with Dr. Mack as well. So if you're interested, please join us for that one as well. Thanks again Carol.

- [Carol] Oh, thanks Calista, thanks everyone. Have a good rest of your day.