Ask-a-Biologist Vol 049 (Guest: Gabriel Shaibi)

Oh No, Not Exercise!

It's that time of year when those that have not been exercising think about starting their new routine, but is all exercise the same? Do you need to run five miles every day to get in shape and be healthy? Dr. Biology has a chance to sit down after a workout session to talk about exercise and kids with metabolic biologist Gabriel Shaibi. What he and a group of researchers found might surprise you.

Transcript

Dr. Biology: This is Ask-A-Biologist, a program about the living world and I'm Dr. Biology. Now most mornings if you try to find me I'll be in the Student Recreation Center working out. Yeah, that means exercising.

What am I doing this for? It's not to become the best athlete or even an athlete, it's actually what I call stress management. But there's a lot more going on than just reducing stress and since it's the beginning of the year and a lot of people decide it's time to pick up that exercise routine that they haven't been doing, I thought it would be a great time to talk about it on the show.

Today's guest scientist should help me with any of the heavy lifting that comes along in the show.

Gabriel Shaibi is an assistant professor in the College of Nursing and Health Care Innovation at Arizona State University. He's also a researcher in the Center for Metabolic Biology.

Professor Shaibi has been studying the benefit of exercise not only in our basic health but also how it can help with diabetes and even better yet, he's been working with a young group of people that might not be getting out to exercise as often as they should. And why? Well, it sounds like too much work.

Welcome to the show, Dr. Shaibi. Or do you prefer if I call you Gabriel or Gabe?

Gabriel Shaibi: Gabe's fine or in terms of my grandma, it's Gaby but we'll stick with Gabe.

Dr. Biology: OK, we'll stay with Gabe. Before we get started on this topic today, which is really going to be a fun one, what is metabolic biology?

Gabe: Metabolic biology is kind of a fancy term that we like to use as scientists but basically describes how the body works from a perspective of energy. Energy is anything we put into our mouths, like food, and energy can be a process that is worked on when we do exercise or activity.

Dr. Biology: OK, so basically we eat food to get the energy to do work and work can be getting out of bed in the morning or actually bicycling to school or if you're an athlete could be you're out running.

Gabe: Yes, exactly.

Dr. Biology: It could even be while you're sleeping.

Gabe: Yes. Everything our body does cause us to use energy and we need that energy to maintain our breath, our thinking, our blinking and our hearing.

Dr. Biology: OK, we talked about the fact that we're going to be doing a show on exercise and since that's not the most popular topic and before anyone turns to another channel, we're not talking about going out and running five miles or becoming the next great bodybuilder, right?

Gabe: Correct. Exercise can be anything. It can be something like you running a relay race on your school's track team or it can be when you have to go home and walk your dog around the block. All those things constitute what we call exercise or consider activity.

Dr. Biology: OK, you're beginning to give us some clues about exercise. So what does a person need to do to be exercising or maybe let me put it this way: what is exercise?

Gabe: Great question! What is exercise? I want you to think of exercise in two different ways. Exercise can be a planned activity or exercise can be play. So the difference is, let's equate exercise with homework. If you have to read a chapter from your history book for homework, that's a planned amount of reading that you have to do. But if it's the weekend and you want to read a chapter in Harry Potter or three chapters in Harry Potter, you don't plan time to do that. You sit down on your lawn and you read Harry Potter.

That can be the difference between exercise, meaning the planned stuff you do, or activity meaning the stuff you do that's fun and anything that you would want to do otherwise besides having to set out some time for it.

Dr. Biology: So for me if I get up in the morning and you find me in the Student Recreation Center and I'm on an elliptical and then I'm lifting some weights, that's a planned activity. Meanwhile, when I go play racquetball, even though it's planned, I'd have to say that seems more fun because that's not competition, it's just playing with some friends.

Gabe: Right. So exercise is a way for us to get our heart rate up, get our sweat going, get us breathing hard. Now activity does that too but when you pick up the phone and call your buddies and say, hey, let's go play racquetball, now we're talking about a different form of exercise because it's activity. It's fun, you didn't plan to do that. It doesn't mean that all exercise is not activity or that all activity is not exercise. Sometimes they're one and the same. But you wake up every morning to go do your elliptical for 20 minutes and we would consider that exercise. Both things are incredibly healthy and both things are something that we need to be doing on a regular basis.

Dr. Biology: Getting up in the morning, if you talked to my kids and I said I'm going to make them go, and I use the word "make," exercise at six am in the morning I might as well tell them to go eat dirt.

Gabe: Or pound sand but, yes.

Dr. Biology: Right. Do we have to do that sort of thing, not even talking about the time. What is it we need to do that is exercise that's beneficial? Picking up the phone is not enough energy that's being used. What do I need to do?

Gabe: One of the things that we really need to consider is how much do we need to move to actually get some benefits for it. Our body always needs to move. Our body needs to move to get out of bed, our body needs to move to talk to school, but also our body needs to move in a way that elevates the energy that would otherwise not be burned. So the question is how much do we need to do, what is the minimum amount? Well, that's in debate but what we know is that at least an hour a day of moderate to vigorous exercise or activity needs to be done or should be done.

What does that mean? What is an hour a day of moderate to vigorous? Moderate to vigorous means basically things that you're doing that would increase your heart rate so your heart pumps blood.

What are the things that you do to get your heart pumping? Does changing the channel on the TV get your heart pumping? Probably not. But if you were to walk to catch the bus, your heart rate would increase because that energy and that blood needs to flow to those muscles that need to get you from point A to point B.

Mr. Biology: So walking your dog, for example, even though it may not seem like a real strenuous exercise, could very well be exercise and most likely will get your heart rate up.

Gabe: So that big term that you use, strenuous, equates to a term in exercise science that we use that's called vigorous. But we know that there's benefits for not just strenuous or vigorous exercise or activity but moderate as well. So what we tell people is moderate exercise equates to at least going to someplace with a purpose. What does that mean? It means your next class is starting and you're not late but you know you have to get from Class A to Class B in your four minute passing period and you don't doddle. That's at least moderate exercise.

Now, a light exercise is if you and your friends are at the mall and just kind of cruising around and watching, going from store to store and shopping. That we consider light exercise.

Now there's benefits to light exercise but we think that by doing at least moderate, that brisk walk or better, seems to have more health benefits than just doing a light exercise. So what we tell people is that you should probably get at least an hour of exercise or moderate activity every day of the week.

Dr. Biology: Do I have to do that one hour all at once?

Gabe: Scientists struggle with how do we give people the answers that they want, what's the minimum I need to do and how much time do I have to do that in? What we've actually found is that if you do exercise in 10 minute blocks over the course of your day, that can add up to the amount of exercise that we recommend people do to maintain their health. You can do 10 minutes in the morning, 10 minutes at lunch, 10 minutes afternoon, you've got 30 minutes compiled exercise or activity. Then if you go out and walk your dog for another half hour, you've got your full 60 minutes of moderate to vigorous activity, those benefits are the same as if you were to do 60 minutes all at one time.

Dr. Biology: If I talk about exercise, a lot of people will think about running laps or swimming laps or lifting weights. All of those are exercise but are they all the same or are some things better for you than others?

Gabe: They're not all the same and I don't want to say that some things are better for you than others because that would not be a true statement. All exercise is good but different types of exercise have different adaptations or changes in our body. For instance, if you are going to go out and walk around the block, that's called cardiovascular exercise. It gets the heart, which is the cardio. It gets your blood pumping, it gets your breath breathing harder and it gets your muscles working aerobically. Aerobically means with air.

Now, if I was to put you into a weight room and I say, let's lift this weight 10 times, we see that there's dramatically different changes in strength over time, which means if you continue to lift weights, you will get stronger.

That's called anaerobic exercise or exercise without oxygen. What is the difference about those two things, that's the big question, aerobic versus anaerobic exercise?

We have to breathe to do anything so is all exercise aerobic? Yes, but what you think about is can you sustain the exercise or activity over the course of that bout without breathing. That's a good way for you to think about it, meaning you can probably lift a weight 10 times and still hold your breath, right? And you'd still be able to lift that weight.

Now, if I were to tell you I want you to hold your breathe and run around your block, you'd probably make it three houses, five houses, 10 houses but I guarantee you're not making all the way around the block.

So we need to continue to breath in order for the energy that we talked about earlier to process and go into our muscles to help us continue to produce the energy necessary for us to run all the way around the block or walk all the way around the block. It's a really simple way of thinking about the difference between aerobic and anaerobic exercise.

Dr. Biology: The benefits you would say for either?

Gabe: OK, that's another good question. The benefits for aerobic exercise seems to be the protective exercise against obesity, diabetes, some forms of cancer, some of these long term consequences that are associated with a inactive lifestyle. So if you continue to do aerobic exercise, there's these changes in your body which seem to be protective of certain processes. Now, the benefits of anaerobic or strength training or resistance training, it builds much stronger bones, it builds stronger muscles, especially as you start thinking about what types of things you do in your daily life, getting up off the chair, getting up off the couch.

You need to be able to carry your backpack because your teachers give you way too much homework so you need to carry all those books, that 30 pounds of books home. Your muscles will get stronger by doing strength training.

There is some evidence that suggests that strength training is also a way to be protective of the long term consequences of being inactive such as diabetes and potentially cardiovascular or

what's called heart disease. But as scientists we're not quite sure yet. It's still an area that we need to look further into.

Dr. Biology: Well, speaking of research and you being a scientist, your research deals with a younger group of people and I thought it would be really good for us just to talk a little bit about this. Give us a little bit of the story.

Gabe: Sure. I work with a population of kids who are overweight and they're also what we call sedentary or kids who don't get enough or do enough activity.

Dr. Biology: Oh, I know what those are like. They're the ones that are sitting in front of the television or they love the computer games but they won't be doing much else.

Gabe: Exactly. So we looked at this population of kids who are not active and typically are the ones that don't want to do aerobic exercise. Although they may need it and their doctors and their families and their teachers and their PE coaches are telling them, you need to run, you need to run and these are kids who are overweight. So running for them is really, really hard. They're the kids who for the most part are the last when you do the mile run test in PE, may not be the first ones picked but also are probably not the second, third or fourth picked when it comes to playing basketball and sports that you really have to run around a lot because they have a lot of extra weight.

The neat thing about these kids is they are also extremely strong. They're stronger than kids who are not overweight, usually because they just have more fat mass but they also have more what's called lean tissue mass or muscle mass.

So when we were developing a program for kids we thought if we're going to reach a population of kids who otherwise don't want to run and we're going to come to them and say, you need to run, they're going to say, no, we're not going to do it.

But what we wanted to do is create a project to see if we take sedentary, overweight kids, put them in a weight room, allowed them to do an exercise or an activity that they're good at, meaning weight lifting, would they receive the same health benefits as kids who do aerobic exercise?

Dr. Biology: OK, so I'm curious. What did you find out?

Gabe: The best thing that we found out is that these kids love this kind of exercise. What does that mean that they loved it? Do we ask questions about do you love to exercise? No. We looked at how many sessions they showed up to. What was their attendance rate? More than 96% of these sessions were attended. That means that these kids came and when they came they exercised. That's a good indication of us that these kids enjoyed this type of exercise.

The reason for this project was really to find out if there's added health benefits to this population and what we found, which was surprising to us as well as to the scientific community, was that this form of exercise dramatically improved their diabetes risk factors or something we call insulin sensitivity.

That means that this group who is at high risk for developing obesity-related diseases in the future, reduced that by improving the way their body uses energy as a result directly of this program.

Dr. Biology: So if we're talking about obesity-related diseases, let's name some. You mentioned diabetes.

Gabe: Type II diabetes, cardiovascular disease, potentially some forms of cancer, although we're not sure about the cancer, what's called the "metabolic syndrome" which is a bunch of risk factors or this kind of strange entity which we think predicts who is going to develop long term complications related to obesity. So the reason for this project was to see if this form of exercise in a group that otherwise is sedentary or doesn't do exercise may actually prevent them from developing diabetes in the long term.

Dr. Biology: OK, diabetes, this is a disease that people here about. Let's talk a little bit about it. What is diabetes?

Gabe: Diabetes by definition is high sugar in your blood. If you go to the doctor and he pulls some blood from you, takes a blood sample. If your glucose or the sugar in your blood is above a certain point, you are said to have diabetes. There are two types of diabetes. What we're interested in is what's called Type II diabetes.

Dr. Biology: So what's the difference? We've got diabetes, we have Type I and Type II. All right, so the Type II, what is it?

Gabe: Type II diabetes is when your body does not produce enough insulin for the amount of insulin resistance that you have in your muscles.

Dr. Biology: OK, you brought up insulin. I love all these terms, this is why we do the show. Insulin is produced where?

Gabe: Insulin is a hormone that's produced in the pancreatic beta cells.

Dr. Biology: OK, so in our pancreas we have these cells that make insulin and insulin is a hormone and the hormone is what's controlling our glucose, our sugar levels in our body when it's working correctly.

Gabe: Excellent. That's exactly right.

Dr. Biology: OK, so what's going on with Type II?

Gabe: So our body doesn't produce enough insulin to keep our blood sugar levels down and those blood sugar levels have to go somewhere. They have to either go into your muscles as a form of energy that we talked about earlier or they have to go into your liver or into your fat. And when insulin is not working right, that glucose goes nowhere. It stays in your blood and it gets higher and higher and higher over time and what we talked about earlier, the definition of diabetes is when the sugar in your blood is too high.

Dr. Biology: And if it's too high, hey, if you've got a sweet tooth, it sounds like more sugar the better you are because we think about sugar and energy.

Gabe: That's a good point. The problem is, when your sugar gets too high, there's a lot of what are called complications such as blindness, cardiovascular disease, heart attacks and in really severe cases things like kidney failure, amputations and sores that never heal.

Dr. Biology: OK, that sounds pretty bad. So now let's get back to your research here. What did you find out?

Gabe: What we found is that by doing this form of exercise we actually improve the way insulin works in their body. What we say is we improved their insulin sensitivity and if we think back to what insulin does, that just means that insulin is now working better in their bodies. If insulin's working better, their blood sugar is not as high so we think for the long term, if we can get these kids to adopt this form of exercise for the rest of their life, they will reduce their risk of developing Type II diabetes.

Dr. Biology: All right. While we're on the subject, you mentioned Type II, what's Type I diabetes?

Gabe: Type I diabetes is when your body doesn't produce insulin almost at all and that's a different form of the disease. You actually have to go to get insulin put in with shots or some maybe have an insulin pump. Basically the body isn't producing any insulin and that's a really different type of disease that's not necessarily associated with obesity. It's more of a genetic disease.

Dr. Biology: So can you use exercise to control Type I and Type II diabetes?

Gabe: Yes and what people say is regardless of what type of diabetes you have you should still be doing exercise.

Dr. Biology: I love the idea that 96% kept coming to the class or working out. What else did we find from this research?

Gabe: We know in the kids who exercised their insulin worked better. We don't know exactly what that means for their long term health but we know that it was better than when they didn't exercise or when they started.

Dr. Biology: That's cool. Any other benefits?

Gabe: Yeah, these kids got stronger, which is not a surprise but one of the things that we really feel is important is that kids and adults, everybody, needs to see success and the nice part about lifting weights is week to week kids say, hey, my muscles feel stronger. Last week I was only lifting 40 pounds and now I've got 60 pounds on and these kids said, wow! I'm getting stronger and stronger and stronger. So for them it became a source of pride.

I have a great story. We bought a leg press, which is a machine you push with your legs. We bought it and put it in for this project. It took us about four and a half weeks to realize our leg

press machine was not enough. What does that mean? It means that these kids were able to do all of the weight on the whole entire leg press machine in a matter of four weeks.

What did we have to do? We had to go spend $5, 000 to buy another weight machine that had enough weight that these kids could actually continue to progress over time. This was a source of pride for our kids. Our kids came in and said, we broke your weight machine and now we need to buy another one. You don't have enough weight for us because we're too strong.

Dr. Biology: That is cool. So let's talk about some of your success stories here with your students.

Gabe: One of the best things about this research project is we got to know people. We got to know the kids in our study. Remember I told you that the kids in this project didn't do activity. Well, we introduced them to a type of activity that they were successful at, they enjoyed doing and the best part for me was that kids now experienced what's called this self-esteem building. We had kids who left our program, joined the football team and by their senior year in high school became captain of the football team.

So a kid who otherwise sat on the couch and played football on a video game now became captain of his high school football team. We're not going to say that our program is what created that but it developed a sense of pride or a sense of self esteem in this kid that we can't measure as scientists. But you know as a person that this kid feels better about his ability to do exercise and now is more willing to do things like go to a sports team.

We had kids who signed up for the swim team and now have joined the swim team after being part of our program. Well, you were lifting weights and now you're swimming. You went from anaerobic exercise to aerobic exercise. That's kind of weird.

No, we took a kid and we said, you can be successful in exercise and he said, well, yeah, I liked lifting weights but, guess what, I want to swim and now I'm going to join the swim team. He became successful at the swim team in doing the exercise that he most wanted to do.

Dr. Biology: Did you notice any lifestyle changes or did you get any scientists out of this?

Gabe: One of my favorite stories to tell about this program was we took a kid who finished our program and he came to us and said, I really love doing this but I want to do what you guys do. Well, you're 18, so what do we do? We went to a YMCA and said, hey, we have a kid here who's really interested in exercise, who really wants to do the things that we did in our program, can he be a trainer for you? He was added on as a YMCA trainer and now that's what he's doing. He's working the YMCA as a trainer.

Dr. Biology: We'll go back to you now. What exercise do you like to do?

Gabe: I have turned my exercise into playing. I love to play softball, so I play softball. Last night I had two softball games.

Dr. Biology: So you're not out running laps?

Gabe: I don't run laps.

Dr. Biology: OK. How often do you exercise?

Gabe: I try and exercise at least five days a week. Some of those exercise days are playing softball, some of those exercise days are lifting weights and sometimes it's an exercise where I walk with my wife.

Dr. Biology: I have to ask you, how do you get started and more importantly how do you get started in a way that you can stick with it? What I see, a lot of people show up at the gym January and then February there's less of them and March even less. They disappear and I think it's because their expectations are too high. Give us the method that you would recommend, especially for one of these overweight students possibly.

Gabe: My suggestion is find something that you like to do and find a partner who you like to do it with. That can be anything from walking your dog. If your partner is your dog, guess what, the benefits are not only for you but for your dog. If it's for your friend down the street and you both like to ride bikes, I would recommend that those would be an activity and an exercise that you should do with a friend. If you want to work on the team setting, you can go out for a sports team. The most important thing is to find something that you enjoy doing because if you don't enjoy doing it, I guarantee you're not going to maintain it over the course of time.

Dr. Biology: One of the things I do, I have an iPod and I find that music is really motivating to me. I have these play lists that I create that have different tempos to them so it starts out a little bit slower and it gets really, really fast and then it slows back down. It's about a 30 minute stretch. I can actually see that I'm faster on the elliptical or I'm faster pedaling on the bike when that music is faster and it goes slower when the music is slower.

Gabe: There's a research study that looked at how long kids can exercise with or without music. So they made an exercise test where kids would walk on a treadmill and they give half the kids music to exercise to and the other half got nothing. What they found is kids who exercise with music went longer on the treadmill than kids who didn't have music when they were on this test.

Dr. Biology: Do you think we could maybe create some suggested workout routines and/or "paper coaches" that we could put on Ask-A-Biologist?

Gabe: I think that's definitely a great idea. We can come up with a way to allow people to document what they do or put an exercise journal together.

Dr. Biology: That's what we'll do. When this goes up, we'll have the links to an area where you can have the exercise journal and how to track and keep with your exercise. Now I'm going to exercise your brain a little bit. I ask three questions on the show. The first one is, when did you first know you wanted to be a biologist or scientist?

Gabe: It was when I was probably in fourth or fifth grade. I had a biological science class as an extracurricular activity and it was related to marine biology and we dissected frogs. To me, I hated looking at the insides of frogs but I wanted to understand how frogs worked. How come their muscles looked the way that they did and how come they could jump the way that they did? So I was just fascinated with understanding how frog legs work. From there it went, let's understand how people work and how our bodies work.

Dr. Biology: What if I took it all away from you? You can't be a scientist. What are you going to do, what are you going to be?

Gabe: A race car driver.

Dr. Biology: Really, a race car driver.

Gabe: Race car drier.

Dr. Biology: All right. That doesn't sound like a lot of exercise.

Gabe: You'd be surprised at how much race car drivers actually exercise, not only for their physical health because they've got to be extremely strong in the cockpit of the car but also for their mental health. It keeps them tuned in to what's going on in front of you.

Dr. Biology: Maybe we'll get a race car driver on here and we'll be able to talk to them one of these days. All right. What advice would you have for young scientists or someone who just wants to shift? Hey, there could a body builder out there decides they want to be a biologist.

Gabe: I would say that the best thing you can do is seek the guidance of a mentor. When I was seven or eight years old, I was in a research study and I asked the scientist who recruited me into this research study, what is it that you do and how do you do the things that you do? It just so happened that 20 some odd years later that scientist was on my dissertation committee when I was becoming a scientist. He was a mentor for me all the way through from age seven all the way up until now. So my number one piece of advice would be seek the mentorship of somebody who's doing the things that you think interest you.

Dr. Biology: Before I let you go, we talked about metabolic biology but we didn't talk about the Center for Metabolic Biology. What's the Center up to?

Gabe: The Center for Metabolic Biology is a center of researchers wanting to understand health related to obesity and diabetes in people as well as in animals and in cells. We work across those three spectrum to help us better understand how we can improve the health of people who are overweight or obese or prevent them from getting diabetes.

Dr. Biology: Any other studies by chance going on in there?

Gabe: There are also studies related to cardiovascular disease in addition to obesity and diabetes.

Dr. Biology: Well, Professor Shaibi, I really appreciate you sitting down with us on Ask-a-Biologist and actually taking time out of your exercise routine.

Gabe: My pleasure, Dr. Biology. It's been fun.

Dr. Biology: Now tomorrow morning when I'm exercising, I will be thinking a little bit about this, what's going on inside my body. All right, you've been listening to Ask-A-Biologist and my guest has been Gabriel Shaibi, Assistant Professor in the College of Nursing and Health Care Innovation at Arizona State University.

He's also a researcher in the Center for Metabolic Biology. The Ask-a-Biologist podcast is produced on the campus of Arizona State University and is recorded in a Grassroots Studio housed in the School of Life Sciences which is a division of the College of Liberal Arts and Sciences.

Remember, even though our program is not broadcast live, you can send us your questions about biology using our companion website. The address is askabiologist.asu.edu or you can just Google the words ask a biologist. I'm Dr. Biology.