DANNY LENNON: Hello and welcome to another episode of Sigma Nutrition Radio. Today, we are at episode 180 of the podcast and as always, I am your host Danny Lennon and today, I'm particularly interested about the topic we are going to be brining you because it's something that probably hasn't really been touch on in any of the previous episodes of this podcast. At least not directly or in depth in the manner that we are going to discuss it today. And we are going to be talking about the role of ethnicity in risk for cardio metabolic diseases. So, diabetes, heart disease and all the associated chronic illnesses we see that are related to heart health and metabolism. And so, I'm going to be talking to a researcher from University of Glasgow, Dr. Jason Gill, who is done a lot of research in this area. Comparing different ethnic groups and how different markers for say, BMI or physical activity can confer different disease risk to different groups. And therefore, maybe we need to reevaluate what recommendations we give. So I think this is particularly important discussion, not only from a public health message perspective but for any of you listening who are in fact, dietitians or nutritionists, or coaches or personal trainers, who are working with someone on their nutrition or n their exercise. Just having where to stuff this stuff, that there may

be different targets for some of this things, depending on the person ethnic origin. So it's really interesting discussion and Dr. Gill has done some – like I say, some fantastic work over this year on this, as well as some other different related topics within academia. So his group in Glasgow have done lots of stuff investigating the effects of exercise and diet on prevention of this metabolic diseases and that spans all the way from molecular work all the way to whole body level and onto the observational stuff so, lots of stuffs that we can dig in to, in today's show. And so, if you want to get the show notes this episode, they are going to be over at sigmanutrition.com/episode180, that's where you go there. I will link up to any of the relevant research papers that Dr. Gill published on this that we are going to talking about today. A bit more about his background, archive of all transcripts to podcast episodes, if you want to check those out. And anything else that is relevant to this discussion today. So that'll be at sigmanutrition.com/episode180. And then, the final thing to mention just before we do get into this week interview, is that for those of you interested in powerlifting, you may or not have seen the announcement over the past week or so, on social media and via email. That there is now a separate podcast that is just launching, the sigma powerlifting podcast, which should be out now, as we speak on iTunes, Stitcher and TuneIn and all the other podcast aps and a whole host of great interviews there. There will be a first batch of episodes, available for you to check up now. So if you are into powerlifting and strength training, then the sigma powerlifting podcast is now available, so you could just search that and it should come up in your podcast aps. And you can get interviews with the likes of Eric Helms, Mike Kosher, Matt Gary, Jen Thompson, etc. which should be available to you now. So, without further ado, let's jump back onto the nutrition train and join Dr. Jason Gill for this week interview.

Dr. Jason Gill welcome to Sigma Nutrition Radio, thank you so much for joining us today.

JASON GILL: Hello Danny, I'm delighted to be here.

DANNY LENNON: Yeah it's my absolute pleasure and we got plenty to discuss because I've been really intrigue and fascinated by a lot of the work that you've been part of over a number of years. And so, we are going to dig into a lot of that today. But maybe just to start us of, to give some of the listeners some context about you and your background, can you give us some insight into your career and academia up to this point, and what field of study that has led you to.

JASON GILL: Yeah so, I did my undergraduate degree, it was a joint honors degree in physics and sport science at University of Loughborough. I then stayed there and did an MSC in sport science. And then, I did my PhD looking at exercise and lipoprotein metabolism. And so, I'm trying to understand a little bit about how exercise influences the level of lipids in your blood. So I got my PhD in 1999. And then, I came up to the University of Glasgow where I work as a 0:06:05.8 researchers on a study looking at more than one saturated fats, olive oil type fats on a low density light protein cholesterol and basically trying to understand how increase in monounsaturated fats in your diet might reduce LDL cholesterol. So we did some kinetic studies where we injected people with traces substances which track the production and breakdown of this lipoproteins in the circulation. Then after about 3 years, I got my first permanent job but at Glasgow, I got my electorship and I've been there ever since. I've been in Glasgow for 17 and a half years. And since then, my research branch out. So I looked at, trying to really understand the mechanisms by which a physical activity and diet influence risk of diseases such as type II diabetes, cardiovascular disease and obesity. Look at the mechanism involve trying to look at some big epidemiological studies to look at the associations between this lifestyle factors and risk. And doing a randomize trials to work out how best to manipulate diet and physical activity to influence risk. And one of my big interest is how one size might not fit all for physical activities. So how some people might be able to get away if you like, with not being very active and still being at low risk, when to some people need to do more.

DANNY LENNON: Yeah and I think that's going to center around, a lot of our discussion today. And particularly, when we bring up the

topic of enthicity which definitely we want to get into later in the podcast. But maybe before we get there, it might be worth talking about cardio metabolic disease risk because that's one of the things I'm interested to look at. And look at that in more a general sense and why it's such an issue and I know that a few of the risk factors that you addressed in much of your work, Dr. Gill, things like physical activity, the fitness level of individual, sedentary behavior, those types of things. And I think, maybe many people listening might seem or might think of those as just different sides of the same claim rather than, distinct different things that we can look at. So maybe we can touch on how each of this things are actually assess from a research perspective. And then from, I kind of broad over review level right now, what sort of relationship do, things have to cardio metabolic health?

JASON GILL: Yeah, so that's a very good question. So for cardio metabolic disease, we mean diseases which are related to heart disease and metabolisms. The big disease there are; Cardiovascular disease or heart disease and type II diabetes and related conditions such as – I know some people don't like the term – but the metabolic syndrome. So, there are numbers of risk factors for this, the biggest one is age. As you get older, you risk of this diseases increases. So the number of none modifiable risk factors that we can't really change. So we are interested in modifiable risk factors. So these are things that you are in your control to change. So one of them is, physical activities that simply how much you move. So if you move around more at whatever intensity, we can break it down a little bit further, but that's physical activity. Sedentary behavior is related to physical activity. We can think of it as being right one end to the physical activity spectrum. So the definition of sedentary behavior is basically time spent sitting or reclining or lying while awake, where you spending less than 1.5 metabolic equivalences. It's very, very low energy expenditure sitting. That's sedentary behavior. And there is a body of evidence which suggest that time spent sitting might influence or be associated with risk of cardiovascular disease and diabetes and obesity, separate from how much time you spend doing moderate to vigorous intense physical activity. That's is all the physical activity you

think about when you are exercise. After that, there's been a recent paper by, which suggest that when people are very active, the people are doing more than 60-75 minutes of physical activity but they – the risk of sitting down too much appears to not really be that. So this seems to be – the risk of sitting too much seems evident in people who are maybe not doing very high levels of activity. So if you are an athlete, it might not matter how much you spend sit down, sitting down. But if you are regular person who is doing 30 minutes at the gym, how much time you spent sitting down might be important.

DANNY LENNON: Sure, so that super high level of activity can essentially mitigate a lot of the bad things we know that's happening with a prolong sitting or lying down for example. That kind of brings us onto like image one, the topics I'm really interested to hear, you discuss Jason is, around how this ties into then ethnicity potential differences in how we should just view this whole subject, because I know you've talked about this before. I know a lot your research paper are coming based on this idea of digging into this and going down a little deeper when we start thinking about recommendations for people for physical activity and disease risk. From a general point, how should we start thinking about this? Where do this tie into ethnicity and can you maybe mention some of the work that you have done that I look at this tie between ethnicity and then, how this things may affect disease risk?

JASON GILL: So one of the things is, we started off by doing a whole bunch of research looking at how physical activity and fitness are associated with risk of developing diseases like heart disease and diabetes. So from that, it's really, really clear data which shows that people who are highly physically active or highly fit, so being fit, in this instances related to your body's ability to do prolong work. It's related to concepts like 0:12:28.4 people with high level of fitness or people who are highly active appears to be at low risk of these diseases. Now, one of the issue is, almost all of this research has been done on people of white European ethnicity, and that's because a lot of the work been done in Europe, the United States, Canada, Australia, places where the dominant population is white

European. So people are studying the population that they have available to them. And 6 out of 7 people in the world are not white European and what we are doing to some extent, is extrapolating data based on one ethnic group who is a very much of a minority of ethnic groups around the world to the whole population. So we have some data suggest that maybe we shouldn't be doing that. So for example, we've got data which looking at obesity and risk of diabetes. So what you find with, your level of body mass index or your level of waist circumference or measure of how fat you are, if you increase that, your risk of diabetes goes up. Now conventionally, we talked about the body mass index of 30 KG per m2 to indicated obesity. If we look at that level of obesity and look at the proportion of people with diabetes with that level of white European population. And then, we look at other ethnic groups and we look at what level of body mass index gives an equivalent level of diabetes, what you find is, if you are of black origin, then you – you got BMI of about 24-26 will give an equivalent risk of diabetes compared to a European with the BMI of 30. But if you are South Asians, Indian, Pakistani, Bangladesh, Sri Lankan origin, you are looking at BMI for about 21 or 22, to give someone an equivalent risk of developing diabetes. So if we say that an obesity threshold of a BMI 30 is what we regard as unacceptable because risk of conditions such as diabetes, are acceptable high. What we are looking at in South Asians, is a much, much lower BMI of 21 or 22 which is low between the normal ranges. So what we need to do is while we are considering what is the optimal level of body weight is probably going to be lower in none white ethnic groups and ethnic group than white ethnic groups. And we have taken that further and looked at physical activity because what we can do is look at the risk profile for heart disease or diabetes at the level of physical activity that we currently recommend, that's about 150 minutes of moderate intense the physical activity per week. Now we've shown that for a South Asian to get to an equivalent risk profile, as a white European meeting current physical activities guidelines. They need to do 230 to 250 minutes of physical activity per week. So the guidelines for how much physical activity is appropriate, and also, what level of body weight is appropriate, probably differs between

different people. And if we interest in trying to minimize risk of developing diabetes and heart disease, we should maybe think about what level of body weight, what level of physical activity people should need to do, and it's probably isn't one sides all that.

DANNY LENNON: Yeah it really is, kind of fascinating and the highlight is a, I supposed a big issue when we try to decipher conclusion from research. And just to touch on, when we talk about this difference in disease risk for the given BMI and how that relates maybe diabetes incidents is one of the example you gave. Do we know is, is this increase disease risk simply a function of ethnicity alone? Or is it a fact of mismatch between the environment, not those population are now in versus maybe their evolutionary past or environment which what they typically would of grown up in and have come from, so is it a simply a matter, for example, of those South Asians having higher diabetes risk full stop? Or is it a case of South Asians once their placed in a westernize environment with a very different food environment then, then it causes the problems.

JASON GILL: Well that's a very interesting question. So if you – one of the obvious things is South Asians might have a different set of genes which predispose them to more diabetes risk and when those genes move into a westernize sort of obese genic environment that they develop more diabetes. So it turns out, when you look at the genes, there's nothing obvious. So there's no obvious increase in the number of diabetes associated genes in South Asians or the association between each gene and diabetes, the strength in association similar, there's nothing obvious in genes. There is perhaps some data which suggest that epigenetic changes. So changes in mutilation of genes might influence risk. There is some evidence that there might be differences there. And one of the really key things here, is to develop type II diabetes, you really need 2 things to happen. The 1st is an insulin resistance. So what that saying is that your – for a personal tissue mainly, mainly is skeletal muscle. A less responsive to the effect of insulin. So insulin binds the insulin receptor and this opens up channels to let glucose or sugar go into your muscle. And if you're insulin resistant, you got less of those

channels opening up, when the insulin binds the receptor. So that's one key feature which is related to diabetes risk insulin resistance. The other is that, when you're insulin resistant, what happen is, the beta cells and the pancreas need to keep secretes more and more insulin. And if they can keep producing more and more insulin, you manage to keep your blood glucose level normal because you are able to secretes. This still increase risk of heart disease that, when you are able to keep your blood glucose level within the normal range. So there is some evidence that South Asians might have less capacity in the beta cell to produce more and more insulin. So they get their beta cell failure in lower levels and some of the epigenetic changes seem to be related to genes which influence beta cell functions. We think that differences in beta cell function might be a factor. And this is pure speculation now but this might to relate to early origin types perfects where differences in utero in terms of the growth and maturation of the pancreas and other internal organs might be different and that might be related to nutritional status before someone born.

DANNY LENNON: Yeah that's fascinating to think that it goes beyond maybe the first layer of where we would initially think to – see the potentially physiological and then even, maybe even genic too. Maybe there's a lot of questions I think that are going to be really interesting to find an answer to. One of the things I wanted to as you about Jason, is something I remember reading in one of your research papers about, there being some data on not only the differences in disease risk, but potentially then in, not only in fitness levels, but even in all the way down to fat oxidation and how we see differences between ethnic groups in their ability to oxide fat at different levels. And then maybe, how that carries over into other areas in fitness for example, can you maybe touch on some of the data you've seen with that?

JASON GIL: Yes so, one of the things we did, in our early studies, is we basically got people on their treadmill, run them on a treadmill and measured their VO2 max, the amount of oxygen their body was able to use. And what we found is when you take a group of South Asian, these were young men and European young men of the same age and BMI. The

South Asians were less fit. Their level VO2 max is by about 20%. And we've done another study in older men and to a couple of hundred men age 40 to 70, and wee that South Asians have fitness levels that are about 20% low. And a couple of other group have shown the same things. We think this is a robust in a late finding that South Asians repeated to have a lower level of cardio respiratory fitness. And this doesn't seem to be fully explained by differences in physical activity, because one of the things we know is that, as you become more physically active, if you run more you get fit's up. And we saw that in both groups of people, we objectively measured physical activity using accelerometers. So we found that the people who did more physical activity were fitter. But what we found is for any given level of physical activity, the South Asians had lower level of fitness. And we also found that, if we could statistically adjust for this difference in fitness, between the South Asians and Europeans about 2/3 of the risk insulin resistance went away. So we thought that things that were going in fitness, which is related to the cardiovascular system but also related to skeletal muscle, might be something to do with, why South Asians are more insulin resistant. So one of the other things that we did, is we got the South Asians and Europeans to walk on a treadmill at different speed and we basically measured fat their body was burning during exercise and when you measure fat oxidation during exercise, you're essentially measuring muscle fat oxidation because all the increase in metabolic rate is pretty much in related to muscle. And we found that South Asians muscles working at the same rate were burning only about half as much fat as the Europeans muscles. And that seem to be strongly related to both on the level of insulin sensitivity of the whole body level. And we also do muscle biopsy and looked at different proteins within insulin signaling and found that there is an association there as well. So we think that an impairment in fitness which is probably closely related to an impairment in the ability of skeletal muscle to burn fat in South Asians, might be a key factor which is related to the increase insulin resistance and potentially increase diabetes risk.

DANNY LENNON: Sure and again, that kind of brings up another interesting question in that. We've so far seen that some of the data you talk about has shown that going by a BMI, may not be an accurate or the best way to give recommendations because we know between different ethnic groups that will confer different disease risk. We now see that the amount of physical activity someone does, doesn't have the same effect on fitness level and found oxidation there for disease risk as well in the long term depending on the ethnic group. So when it comes down to getting some recommendations, to be able to put out, particularly in a public health setting, where we have to give a wide message, how do you think is the best way that we need to start communicating to some of this information and how do we take this data and now be able to translate that into messages that people can receive that are actually going to be more useful that maybe what's currently there?

JASON GILL: Okay that's a very good point. One of the things with physical activity guidelines that I've been involve in writing physical activity guidelines, is that we have this hole on two sides. One is, with what people are prepared to do and people are able to understand, because you need to have a clear message. And the other, is trying to understand the intricacy of the biology, where there are individual differences. So, one of the issues of potentially going around this route of saying that, you got personalize medicine and you got different levels of activity for different people. The message becomes very complicated and it can be difficult for the individual to understand. So, one of the things that we could say going forward is talking about ethnicity and say, and posting a different number on the amount of physical activity for the South Asians needs to do and say that it needs to be say, 250 minutes per week or rather a 150 minutes per week. We're already there to some extent with body mass index. So the current WHO organizations, guidelines and in the UK, nice guidelines for body mass index, are putting lower thresholds for South Asians than European. So in terms of body weight, we're already getting to the point where that's not one size fits of. For physical activity that's probably a way to go. In one set of recommendation for physical activity that I was

involve with, which is in the British Association Board Sciences, what we said was that, all adults should do a 150 minutes of moderate intense physical activity or 75 minutes of vigorous intense physical activity per week. And then we put in a higher level, of saying 300 minutes per week of moderate intense physical activity or 150 minutes of vigorous intense physical activity would give you additional benefits. And then in the bottom, we said that certain groups of people and then in that group of people, you could say certain ethnic groups such as South Asians, would particularly benefit from going for the higher level of activity. So that way, you have a global guideline and additional guideline that people might want to do to get an additional benefit, and then highlight that certain groups of people might be particular wanting to do, those high levels of activity to maximize benefits. So that might be a reasonable compromise between trying to have a simple message is easier to understand and also, sign posting to particular groups of people so they may particularly benefits and doing more.

DANNY LENNON: Yeah sure, that sounds really intriguing and it kind of leads me on to, I supposed the next question that I was thinking of is, really where you see or you hope the future direction for this field goes because, as you kind of eluded to, there's a lot of really fascinating stuff emerging but it then also throws up some more interesting questions right, and just to, not only why we see this associations but how is this happening even at the kind of level or what is going on physiologically or genetically and all this things that throw up this questions when we think of , this association were seen between this groups. So when we start to think of, those relationships between some of the factors we discussed and then, cardio metabolic risk in different ethnic groups, and really anything, related to this field and your future work. What kind of research questions do you think remain an unanswered that you are hoping can be uncovered over the number of years?

JASON GILL: Okay so, one of the studies that we have this ongoing, we're just about to finish it, is the study trying to understand why the stiffness of the relationship between BMI and diabetes risk is greater in South Asians compare to Europeans. So if

you look at the – if you draw a line for BMI against diabetes risk, it is stiffer line in South Asians, so why is it when South Asians put on, say 5 kg of weight, they get a bigger adverse health consequence than a white European puts on that same weight. So what we're doing in the study which we called Glass Vegas, that's the glass go visceral and ectopic fat with weight gain South Asian study, is get a group of young South Asians and young Europeans and essentially get them to gain about 5 kg in weight and we are basically are giving them physipop and potato crisps. And also, things about to basically getting them to gain 5 kg in weight. And before and after that, we are making some measurements on them. The first thing we doing, is put them in an MRI scanner, and we're measuring where their fat is. We're measuring the fats under the skin which we called subcutaneous fat. We're measuring visceral fat, that's fat on the inside. And we're measuring fat inside the liver which we think is key, a key determinants of metabolic risk and fat within the muscle. We are taking fat biopsy. We are taking small samples of fat from under their tummy and we are also fitness and physical activity, and we are measuring metabolic responses to eating food. And then, make those measurements again after they have gain weight. And what we are prophesizing, is that South Asians may have less capacity to store fat safely under the skin. So subcutaneous fat, fats stored under the skin. We think is relatively safe. So if you gain fat and you stored fat under the skin, that's what it's there for and that's fine. The problem comes when those fat cells, fat stores to full, and then the fats start to spill over into places where it can cause harm. This is the visceral fat and we call that ectopic fat, the fat in the liver and muscle can cause more harm. So what we think is, South Asian have less capacity to store the fat safely under the skin. And so with the set amount of weight gain, they will potential store discretionally large amount of fats in the dangerous places. So we trying to test was the hypothesis is true. And the reason for that or what we are prophesizing, is that South Asians maybe less good at growing the fat cells. Because if you are able to basically convert more immature fat cells, we call them preadipocytes, into mature adipocytes, you are able to store a more and more fat safely under the skin. So you get fat but you can potentially stay healthy. And

the problem comes, if you can't do that, the fat cells you've got become too full and basically, the fat spills over to dangerous places. So one of the things we are going to be looking at is, genes which are responsible for maturation and growth of immature fat cells and making them into mature fat cells and seeing whether there's a difference between South Asians and European. And that's one thing that we are doing to trying understand what the mechanisms are. The other thing that I think we need to consider more is how we can use this information and practice to try and prevent diseases like diabetes. So South Asians are three to four times more likely to develop a type II diabetes than white Europeans. And so, we need to try and think about ways that we can better target people increase risk and offer them interventions which might reduce their risk. One of the things that we share recently, is South Asians have lower levels of strength, grip strength than Europeans and there seems to be a relationship between how strong you are and you're risk of diabetes and we done some modelling which suggest that, if we can make South Asians strong as the average European, we can just say a number of them, cases of diabetes. So what we need to do now, is do some trials to say well, if you try in not only increase physical activity and get weight loss but try to make South Asians a little bit stronger, is that affective at, helping prevent them from getting diabetes. So I see my work, going into two different directions. One is to understand exactly why a particular group of people, such as South Asians in increase risk and then, using that information to apply it, to try and prevent people getting disease.

DANNY LENNON: Yeah that's really fascinating. Particularly, when you mentioned the kind of fat stored patterns or the capacity for the different groups, maybe to store fat differently or a decrease ability to store a subcutaneous because, I think that brings up a really interesting point that maybe is often overlook by people, is that a lot of the problems that come with becoming overweight and obese, isn't necessarily just directly related to fat accumulation. And like you said, it's more in issue maybe of energy overload right, where there's either hyperglycemia because we can't effectively store that

somewhere or whether there is just too much energy going in and there's no more place for it be stored in, safely in subcutaneous fat and we have this large increase in viscera; fat. And so there kind of more interesting things to look at. And so, and I know there's probably not too much direct stuff on this now, and again, it might be a case of having to hypothesize in some of this. But if we're going on the hypothesis that there's maybe differences in how different groups respond to say, overfeeding, is there the possibility that we are going to see the exact same in response to underfeeding, as in different ethnic groups are going to respond to trying to lose weight or trying to diet down differently and so may have to approach at a different manner. Is there anything that suggest that could be the case?

JASON GILL: I'm not sure if there is. One of things we are doing in this study is, for ethical reasons right, we can't just get people to gain 5 kg and leave them there. So the part of this, I didn't talk about is getting back down again. So we're putting them on diet afterwards. And we're going to make some measurements again at the end of fact they've lost weight. So that's one of the things that we're going to look at to see whether the ability of people to lose weight might differ in different ethnic groups. I think there's something exactly different from what you are saying, what you talk about was the effect on weight gain, or weight loss. So if someone is in negative energy balance, they are consuming fewer calories and they're burning, they should lose weight. And if they're consuming more calories and burning, they will gain weight. What I'm interested in particularly, is not necessarily how much weight they gain, but how bad that affect that same weight gain might have. If two people gain exactly the same weight, 5 kg, one person might have a bigger adverse metabolic effect of gaining that same weight as to other person, and that a slightly different question from whether one person gains weight more easily than another person. So that's an interesting question but we are asking a slightly different question with the same amount of weight gain, why is the one person does more badly metabolically than another person?

DANNY LENNON: Yes sure and I supposed from a health perspective, the question you just framed is a much more important right? And that it's again, it is disconnect between the fat accumulation and the effect that can actually have on health, are this two slight different variations. And so, yeah, it's really interesting to see the distinction between different groups and how the set amount of body fat gain can confer various different disease risks, it's really, really fascinating. Jason, there's a number of people listening who are maybe nutritionist, dietician, personal trainers that are working with people, I know you mentioned the second aspect to what you hope to see going into the future of how do we get a stuff, to inform more practical application. So where we're we things right now in the emerging data and the stuff that you're even going to test into the future. What do you think is the best way for those types' people who are working with someone else on their nutrition and their physical activity and their exercise, is there anything now to take away that you think is even just something for them to have an awareness that would be a good take away message?

JASON GILL: Yes so I think, more and more I'm realizing that there's no one single silver bullets, and we need to do lots of things together. And I think the evidence suggest that if we want to maximize metabolic health, there are probably 4 things that we need to think about. One is our body weight, I don't think we can ignore the amount of weight and fat we are carrying and we need to make sure that it is in within the safe level for the individual, which differs between some individuals. Some people can carry quite a lot of fat and be metabolically quite healthy. Some people become metabolically unhealthy at different level of fats and the ethnicity arguments is one I illustrated. The other is, doing aerobic level, aerobic type physical activity. A lot of the big diabetes prevention trials show that increase in physical activity, to about 150 minutes per week, is effective at reducing risk of diabetes in people are high risk of diabetes. The other two things that are maybe a little bit newer, is one is, we got some nice data on cardio respiratory fitness, which suggest that, that's also a very important factor to consider and a separate factor from how physically active you are. So we got some data from a

very large population study of nearly 500, 000 people, which show 2 things. One is, the benefits of physical activity in terms of reducing risk of mortality seem to be greatest in the people who are naturally low levels of strength and low level of fitness. So people who are not very strong and the people who are not very fit, appear to benefit the most from increasing physical activity. Whereas the people who, naturally have a naturally have a high level of strength of fitness can to some extent, get away with being less physically active. Now if we thing about it, the people who are naturally fit and naturally strong, are probably the people who are more likely to be physically active because they find it easy and because they find it fun. So people who have low of fitness, the people are probably don't like doing sport because they find it hard. And are evidence suggest those are exactly the people who get the most benefit. And if we think about public health, what we need to do really is think about ways in engaging these people, they are probably fine running really hard, don't like lifting weights because they are probably good at it, to increase in their activity levels, because I think that's where a lot of the benefits will lie. So measurements of fitness and strength in targeting people who have low level of fitness and low level of strength, I think is where we need to go in terms of public health if we want to reduce the burden of heart disease and diabetes, which are the diseases, which are causing a huge burden on our health care system. 1 in 9 health care dollars worldwide is spent on type II diabetes and that project to double by 2035. So trying to think about ways to reduce that, and we need to target the most at risk peoples do that, is I think what we need to do going forward.

DANNY LENNON: Brilliant. Thanks for breaking that down, it's a great message to give and before we get to the final question Jason, where can anyone listening find out more about you and your work online and get access to your research papers or research or any that type of stuff, where's the place to track down more info about your work?

JASON GILL: Okay so if you Google, Dr. Jason Gill, I'm one of the first hits, some at the University of Glasgow, you can type the University of Glasgow website and look and type me in start

pages, and you'll find a profile of my research and the papers that I published and the research that are ongoing. That's probably the best place to have a look. I pop on a various places on the internet, so you'll be able to see various bits and pieces. I don't really use Twitter or Facebook. So that's probably the best way to find me.

DANNY LENNON: Perfect. I will link to that in the show notes for everyone listening and also to some of the research that we have mentioned in today's episode. So Jason that bring us to the final question and we 're going to end the show on, we're always on show on, it can be to do with anything even outside of today's discussion topic. And it simply, if you can advise people to do one thing each day that would have some positive benefit on any area of their life, what would that one thing be?

JASON GILL: Okay so, we've just published paper in the British Medical Journal a couple of weeks ago, on commuting to work and what we showed was the people who commute to work by cycle, have about 40% lower risk of dying from any course, a lower risk of heart disease and lower risk of cancer than people who go to work by none active means, that's public transport or driving. And so, in terms of population health, what we find is, you're lot of your listeners will be, people who are very active in entering nutrition and go to the gym and are very dedicated to that but what you find is, a larger portion of population aren't like that and a lot of people struggle to prioritize time to be physically active. Once you get busy, but if you are young kids or whatever then, then going to gym can be hard. And what the data suggest is that if you can multitask and build your activity into the day by building it into your commute, you can get a really substantial health benefits. And the advantage is, if you a busy and don't have time to go to the gym or go for a run, you'll always getting that activity and you are getting it every day, and it can be potentially sustainable. So it argue that if you are somebody that struggles to fit activity into your life, multitasking and getting it on the, on your commuting work can potentially substantial health gains.

DANNY LENON: Yeah that's a great message and I think even from the perspective of allowing to become more of a habit for someone by telling that something they already doing is always a great strategy to do that. So I really appreciate your insight on that Jason, and with that, I'm going to wrap up the show. First of all, I want to say thank you so much for taking the time to do this and then on top of that, for the great information you provided and of course, the great work that you continue to do, you are doing some very important work that I think it's going to be fascinating to see where it goes in the next couple of years, so be interesting to keep up with that. So thank you so much for your time today.

JASON GILL: Thanks Danny, I really enjoyed it.

DANNY LENNON: So that was Dr. Jason Gil from the University of Glasgow, as I mentioned you can get more information about his work, click through to some more of those research papers and get any relevant links or resources to this episode over the show notes page, sigmanutrition.com/episode180 and you'll also be able to get a transcript of this as soon as it's available, and that's the information there. Final things before I finish, I just want to say thank you to everyone who continue to support the show, and if you do want to do something to help the podcast, there's a number of ways that you can help. First of all, we got an official Patreon page, over at patreon.com/sigmanutrition, which I really, really thank everyone who's being supporting on that at any stage over the past number of months. If you can leave a rating and review on iTunes, that helps the podcast tremendously and it allow us to keep evidence based information on the top and get more people aware of it. So if you could post a review, I love reading them. I love seeing people that being able to support it through it on iTunes, rating and review. I read every single ones. So thank you if you continue to do that and it really, really does help the podcast. So if you be meaning to get around for it, I know it takes some time and to get over and people forget, that's completely cool but if you do remember, I really do appreciate if you could leave a review on iTunes. And then finally, for those who of you who continue to post about this and share a news of the podcast on social media, it means a lot. Anyone that's putting up in

Instagram story and tagging me in it, and talking about episodes or listening or telling other people about it, mentioning it on Facebook and Twitter and SnapChat. All this things really, really do help and it's great to see that it's bringing enough value that you feel you can share it with people, who are, your friends with and people who are following you. So thank you for everyone who does mention the podcast, anytime that you do it on social media, please keep doing that, it really does help. It really just, number 1, allows me to just feel better when I see people actually getting enough value from the show that they feel, that they want to post about it. So thank you so much for that. So that is our episode for this week, like I mention on the top of the show, if you are into powerlifting, then maybe checkout our brand new podcast to Sigma Powerlifting Podcast, I think for anyone that's interest in competitive lifting, and even in general interest in strength training, will probably derive tremendous value from that. So please do check that out. And I will talk to you, in next week episode, we got an interview coming with Jeff Nippard who is a tremendous natural body builder. If you don't know who Jeff is, check him out. His YouTube is pretty cool and we'll be coming out with that episode soon. So thank you so much for listening and I will talk to you in the next episode.

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