DANNY LENNON: So without further ado let's get Dr. Herman Pontzer on the line. Dr. Herman Pontzer welcome to the podcast. Thank you so much for joining me today.

HERMAN PONTZER: Great to be here.

DANNY LENNON: It's a real pleasure to talk to you especially given much of the research that you have produced that I've read and been fascinated by and really ties into a larger area of when we're looking at just what's possible in terms of human energy expenditure and the implications of that for people who are trying to maybe increase that via different modalities which I'm sure we'll get through. But before we get to some specific pieces of your research can you maybe just fill the listeners in on a bit around your background? What area your research has led you to and what your current focus is most predominantly on?

HERMAN PONTZER: Sure so I'm an evolutionary biologist who happens to be focused on humans on our species. And you know what I want to understand in my research is how evolution has shaped the human body and how it works. And also particularly how to be able to know the evolutionary history that we all share sort of affects the ways that we interact with the world today

which of course is very different than the world which we evolved. And so that's my training as an evolutionary biologist. I'm not a public health expert. I'm not a doctor or anything like that. But I've come into this area of human energy expenditure and metabolism. Just as someone interested in how again just how the body works from a kind of basic research point of view and the reason that I was trained you know and I was interested in energy expenditure is that if you want to know anything about a species you've got to understand how it spends its energy right because you know like life is a game of green energy and kids as I like to tell my students. And we actually expect that evolution is kind of tuned, our different traits or behaviors and our physiological traits in our anatomy to maximize the fitness return on every calorie we spend. So not just us any lineage should be like that. Right. So if we want to understand any species at all. Ours included then we've got to understand first how they're spending their energy and that's how I got into this question about human energy expenditure in my research. So I came into it from sort of a different angle than most public health do but we ended up in some similar places

DANNY LENNON: Awesome and I'm sure we're going to dive quite deep into some of that evolutionary biology and try to answer that question of why we might have evolved certain adaptations that we're going to discuss. But as a starting point maybe a good place to jump in here is to talk about this constrain total energy expenditure model which you've written about on a number of occasions and I suppose stemming from something that maybe from at least the outside people looking in seems quite this paradox when you come across it of in certain studies at least we see that these more active populations may not necessarily have higher total energy expenditure with which to some degree seems like a contradiction. So as a starting point can you maybe first explain this model of what we're talking about when we say the term constrained total

energy expenditure model and how that maybe differs to that typical or more conventional or oversimplified model that people may have previously came across.

HERMAN PONTZER: Sure. So the model and I guess I can get later on I can talk about how we sort of developed this idea. But just to give people who are listening a quick overview of what the model looks like. The idea is this that your body adapts to your level of physical activity so that the calories you burn every day the total number of calories you burn every day doesn't change much as you get more and more active. And so you know if you start an exercise program today sure for a couple of weeks you burn more energy as your body sort of adjusts to that higher level of activity. But after a couple of months you'd find that your daily energy expenditure that the 2500 calories a day or so that your brain before you start the program hasn't changed much. And after a couple of months of this training program even though you're more active you're still getting the same number of calories you were before. And when we see very clearly is when we look across populations and across individuals within a population that are either more or less active. So active populations are on the same number of calories per day as less active populations or active people within a population seem to burn the same number of calories as less active people in the population. And that was a real surprise because of course that the usual model that we think about with energy expenditure and activity is sort of you know a sort of dose dependent relationship, the more active we are the more calories will burn, such sort of on an incremental dial there as you dial up your activity level. You're dialing up your calorie expenditure.

That's what I was trained. You know when I came up through graduate school and all that. It's what a lot of literature assumes even today. That is what we sort of thought we would expect that you know it's what we expected to see when we began this work working with hunters and gatherers and different very active

populations. But it just isn't what we see. So instead this constrained model suggests that the calories you burn everyday instead of just being sort of very flexible lay by result that you are that your body wants to burn the same number of calories a day regardless of how active you get and that calories burned per day, it's something more like body temperature or blood glucose levels or something like that that your body is trying to keep in check trying to keep it in a narrow range.

DANNY LENNON: Very interesting and there's so many questions that are popping up as you through some of that stuff and I'll definitely get to those and maybe some that may play devil's advocate on as well but I think before that I think it's interesting to try and piece how you came up kind of crossed this idea because as you say it's not something that at least from the outset before looking at some of your work is a something that would jump out as obvious and in fact it seems quite counter-intuitive. So how did you come across this idea? And what work really started off that I suppose hypothesis generation that you then started investigating more.

HERMAN PONTZER: Yeah well so you know the way it worked for us so it was, again as an evolutionary biologist very interested in how humans spend calories and when I looked around at what data was available about ten years ago now trying to sort of piece together the human metabolic evolutionary story as well as I could and test some research ideas there. It became obvious very clear that nobody had actually measured energy expenditure, daily energy expenditure and in hunter gatherer populations. Now humans evolved about 200,000 years ago maybe 300,000 years ago in Africa. Our Genus the Genus Homo is even older about 2 million years old and for the last two million years we've been hunting and gathering. So humans were hunting gathering even before we were Homo sapiens. It's a deep evolutionary lineage for us, at least evolutionary history for us.

And so hunting and gathering means you don't have any domesticated crops, no farming, no domesticated animals, no machines, no vehicles anything like that but instead you wake up every morning and with very basic tools that you can make and use by hand you go off and you gather wild plant foods and try to get wild animals for you know as game to eat maybe Caldwell honey. That kind of thing. And those are the conditions that we that our species evolved in. In fact that our genus has evolved and that's our deep evolutionary history. So we think that those conditions have had a big impact on the way our bodies were and so you know when I was looking around about 10 years ago trying to understand our evolutionary history from a metabolic point of view. And when I saw that nobody actually measured calorie expenditure in any of these hunter gatherer populations, that seemed like a huge omission of a big opening in the in the scientific literature and nobody had gone and done it. Now people have always assumed that there's lots of work sort of assuming or modeling what those energy expenditures were hunter gatherers would be like. But in fact nobody actually measured it.

People only assumed, sort of assumed or modelling what energy expenditure for hunters and gatherers would be like and in fact even imagine it. So Dave Rankling who was at University of Arizona and Brian Wood who is now at UCLA he used to be at Harvard working at graduate school with me. We put a grant in to the National Science Foundation to go and measure daily energy expenditure using the best technique available which is called the doubly labeled water technique which is a physiological measure of energy expenditure and a big sample of adult hunter gatherers in this population called the Hadza in northern Tanzania and so about 2009 we got the funding to do this. And I can tell you know in the rabbit hole let me read what we said was look we know that these really active populations that we all

came from that we all know it's our shared history and some of these populations still have elements of their cultures like this, that still hunt together and we know that they spend a lot more calories than we do in the US and Europe and other industrialized countries. We just have to find out how much more that was sort of the premise of the grant the premise of the project was we know that these guys are super active, we know they're going to spend a lot more calories than we do. Let's just go and find out what that deficit is.

And we got the money to do it and we went did the work and we have the data back. And I should say that we worked with a guy named Bill Wong at Baylor one of the best doubly labeled water labs in the country in the world actually to do the analysis, the benchwarmer. And we were really shocked because even though the Hadza which again you know it's a hunting and gathering lifestyle, are super physically active even though they have that really active lifestyle. They don't burn any more calories each day than you and I do. In fact you know when you correct for body size you have to do because there's you know there they tend to be a little bit smaller stature than the average U.S. or European. You track for body size there is statistically no difference whatsoever between the calories they're burning every day and the calories that you and I are burning every day. So it's a huge shock. And that had us kind of back to the drawing board and trying to think about how that could be true. And in this case the constraints total energy expenditure idea kind of grew out of that initial observation.

DANNY LENNON: Yes super interesting so I'm just interested like you say obviously this is going to be a huge shock on first seeing that data and the fact that it's done in such a well-controlled method as using doubly labeled water would kind of indicate to you guys at this is not just some sort of measurement error. This is like this data is going to be as true as we're probably going to collect. So with that initial shock or maybe this

counter-intuitive result what were the first few kind of hypotheses that you came up with to maybe explain that and then how has that change to what you maybe currently have in place yourself of this is how I would explain this right now or here's my current best understanding of it, has that kind of shifted from that time point of seeing that data to the work you've done since then. And so where are you kind of with that right now to explain these changes.

HERMAN PONTZER: Yeah so when we first saw the data there were a couple of possibilities that jumped out first of all we thought well maybe there maybe we are sort of biased in our perceptions. Maybe they are not quite as physically active as they seem to be. So we went back and you know we had it on our to-do list as to measure as carefully as we could daily physical activity and really understand that well. Another possibility that was raised by someone who reached out to us, his name is Jerry Siegel at UCLA. He's a researcher in Sleep physiology. He reached out and said well maybe these guys maybe the Hadza are sleeping a lot more than you think because of course they don't have any electricity.

They don't have any electric lights. You know it's dark at 6:00 p.m. and its all night again until 6:00 a.m. and maybe they're sleeping 10 or 12 hours a day and maybe that's how they sort of are able to save calories there. We thought well maybe this is a very peculiar point in time. Maybe we just were unlucky or lucky or you want to think about it. And we seem to have just caught a very strange period of time with the holiday and maybe they were not burning many calories that time. No but maybe some other parts a year they do. Then of course what we also thought was well maybe this really is real and the body is doing something interesting physiologically to keep energy expenditures in check. So that was the most exciting last possibilities the most exciting of course to me. And we wanted to check everything else too. So we went, we checked daily activity levels using

accelerometers. And we just published that data last year. Sure enough just as you'd expect or we perceive when you're out there, there are about five to ten times more active every day in your typical American or European. So they are really physically active this not just our perception. The sleep study ended up being really interesting. It turns out the Hadza don't sleep any more than you and I do. Even though there's a lot more time with the lights off there because they have no lights. They are still only sleeping about seven and a half or eight hours a day or night I should say which I thought was another one surprise but eliminated that possibility to explain the data.

We've gone out and got more Hadza data sense and we haven't published much of this yet but I can tell you it's the same as we saw before so it isn't just that we caught some peculiar moment in time with them. And then you know what seems to be left is this you know there's a real possibility that the body really is adjusting physiologically to what's going on. And so we've been kind of chasing that idea down more and more and I think we've got our hands around it better than we did initially about what the possibilities are. But you know if it really is a true physiological phenomenon the body is adjusting the activity level to keep everything in check. Well it shouldn't just be humans because humans are very similar to other primates, are very similar to other mammals for that matter other vertebrates metabolic physiology is a very sort of you know a shared thing across the vertebrates so you'd expect to see it everywhere. And sure if you do so you know when you look at mice that have to work harder and harder for their food in a lab even though even though they're working harder and harder they don't burn more and more calories. If you look at a primate. So we did this this work in 2014. We looked at energy expenditures in primates as many as we could measure primates' populations that live in zoos versus populations that live in the wild. Same calories per day. So you know I think I would say that

initially when we saw the Hadza data and were able to kind of digest it a bit we were really excited about this possibility that there's a real physiological phenomenon here that we haven't appreciated before. And I don't think that's really changed. We're still excited about that hypothesis but what we have done since is we sort of chased down all the other the other ones that we can think of certain explanations that would have helped explain the data without requiring some new physiology.

DANNY LENNON: Yeah its super interesting so just to make sure that I'm going to have it clear if we're thinking if we're seeing that this increased level of physical activity is out there that this multiple fold increase in physical activity over more Western cultures. But at the same time we're seeing a pretty stable total energy expenditure. Then if we kind of drill into that when we're looking at what total energy expenditure is made up of we don't have that physical activity component. We then have a resting metabolic rate, thermic effect of feeding and then maybe one of the big components that we might discuss is non exercise activity thermogenesis. So with that kind of makeup of total energy expenditure, is the currently if we're going to say that we're not really seeing a change or difference between these groups based on physical activity in total energy expenditure that once physical activity is increased by a certain amount the body's is just adapting to it by turning energy expenditure from one of these other areas down so they are turning down our metabolic rate or it's changing levels or so on that kind of thing, would that be a fair summary?

HERMAN PONTZER: Yeah that's right that's exactly right. So if you increase the physical activity component without increasing the size of the whole budget and you've got to be turning other things down

DANNY LENNON: Right. And again just from previous work that I'm sure regular listeners of podcasts will have heard and that we've looked at particularly much done by James

Levine who's kind of published a seminal work in relation to NEAT is that that seems to be at least in relation to say overfeeding or underfeeding which again is a slightly different thing but at least in relation to those things seems to be the most modifiable or NEAT seems to be the component that changes the most. Do you put would you say that most of these metabolic adaptation or are we seeing increased physical activity is largely dependent just on neat changes like could that potentially explain it that we're just decreasing non exercise activity thermogenesis by a large enough degree to cancel out that extra activity added in. Would that be a viable explanation?

HERMAN PONTZER: No is my short answer to that and I say that advisedly because I know that people assume that it must be NEAT that's changing and I'm not going to say that it can't contribute that a change in NEAT can't contribute here. But the reason I say no is two reasons. One is the amount of adaptation that we're talking about sort of maybe three or four or even 500 calories a day even in the most generous estimates of how much NEAT there is. You couldn't say that much there's not there's not enough NEAT out there to save you know 400 calories a day, it's just isn't possible. The second thing is that you know when Joe Levine came up with the NEAT hypothesis which I think is fantastic and I think it's certainly playing a role I don't want to downplay that that that work. I think it's great.

But when he came up with that you have to remember that's before we had good accelerometer measures of daily physical activity. So in the early 2000s before it was common to have you know hip or accelerometers and commonly done the way that is done now and so you know it's he's talking about non exercise activity thermogenesis or things like walking around your house or cleaning your house or you know walk into a store or walking to work. In his release in his early models those were all considered NEAT, now when

you have somebody where the Hibbett accelerometer all those get measured all of those are getting picked up. So. So that in that case if we have this really high level these really high levels of accelerometer measured activity and that is including a lot of what we might typically consider to be neat. Then we have to sort of to repartition right and think okay, NEAT can be a piece of this but the parts of NEAT that are usually are thought to be really like walking around your house and you don't usually think about and don't usually measure well when picking it up with accelerometers that can no longer be part of the NEAT and because we have that activity measure, right. Now things like standing versus sitting or fidgeting. Sure absolutely. Those can be a piece of it and they might even be you know sizable pieces of it. And that makes it even less likely that you're going to get to three or 400 calories a day of education that we're seeing doesn't it because you're taking away much of what we typically consider to be NEAT because we actually measure it in our accelerometer measurement.

DANNY LENNON: Brilliant. Yeah this makes it just so much more fascinating and to see that we can explain it away with this one particular component. This again just lights up so many more follow on questions. One thing that I had thought of as you were speaking earlier that may be not relevant at all but just popped up is thinking about then if it's not explained away by NEAT there's obviously some sort of well that's an adaptation or something happening in terms of how people are using energy. Could it be down to a similar way we see if someone starts exercising in the previous to being sedentary they get quite a large calorie burn and expend a lot of energy doing a set type of exercise. But as they get more and well-trained particularly in that specific exercise modality the body becomes more efficient and they actually don't get the same expenditure even from a greater degree of exercise using that modality. Could it be something like that because just how physically active these highly active

populations are there are just more efficient with it. Or I mean just maybe that has nothing to do with it all. Is there anything else that your work is kind of pointed to?

HERMAN PONTZER: So the short answer there is I don't think that can explain a whole lot of it because when you look at activities that are commonly done across populations for example walking, walking costs, we've measured it we put masks on adults and had them walk around a level track that we laid out in camp. So you know we took that we took a briefcase, a portable cosmic barometer out with us to a camp and we did this study, we had 10 or 12 of them adults walking around you know for a few minutes at a time. More than that but a half hour of time measuring energy costs of walking. It's the same as you and me. Right. So even though they walk a lot more than you and I do I'm guessing I don't know I don't know your daily life but I know they have more of them than I do sort of 12 kilometers a day or something like that.

You know they work a lot more than the typical Westerner. They are burning fewer calories doing it so they haven't sort of found some magic way to walk that's incredibly efficient. You know or they're more efficient doing the kind of very specific tasks that they spend a lifetime learning to do that I don't you know so chopping down trees or you know harvesting different berries and tubers and that kind of stuff that the women did. Yeah they probably are way more efficient than I would be just because they bottle a lot more practice but their muscles aren't inherently more efficient for example.

But I think there is some efficiency going on here. And I think what's happening is that other active you know other sort of metabolic processes are getting reduced. So if we look at we don't have great biomarker data for the Hadza for this because of the sort of logistics of working there. But if you look at other studies that have looked at other traditional populations, steroid

hormone levels are lower. So a great study by Peter Olson's group at Harvard looking at testosterone levels in men. And if you look at men in Boston versus men in Nepal and some other friendly populations versus men in a hunter gatherer population in South America called the chain you know the more active you get the lower the testosterone levels are in these men. Which is a little bit counterintuitive you think well you're exercising so much and you're really lean and you're fat and you're active every day you're going to have higher testosterone levels that might be true within a population. But when you look across populations we don't see that. And so that suggests to us among other things that you know organ systems that were not really able to visibly see very easily could be helping to adjust to make room for a higher activity levels.

DANNY LENNON: Yeah certainly super interesting so with that in mind when you look at this area within that it's trying to be uncovered over the next let's say five to ten years in research. What are the big unanswered questions that you are hopeful that research might uncover or examine over that next decade that I think would be critical pieces to answering some of the stuff that's still yet to be answered.

HERMAN PONTZER: Yeah so I think this issue of a physiological mechanism is a really big one right now at least. I mean you know we look at metabolic adjustments to activity and I'm certain we're not the first lab to show it. If you look at any links work from before, if you look at other you know some Rowen work before lots of groups have been showing it. And I think you know for whatever reason it's kind of been highlighted more and is being discussed more. But we see this metabolic adjustment to activity levels across species across populations across individuals.

We still don't have a good mechanism for how that's happening and I think that's a key place to look and you know you're asking well is it NEAT or is it the

efficiency of the muscles or is it what is it. Yeah I mean those are all the obvious places to start looking. But what we need to do I think is kind of have an open mind here and say you know do we really understand what components make up total energy expenditure and can we then start breaking down which ones might be adjusting in the face of activity level changes to kind of keep energy levels in check. So in my mind that's a really big question. I think that again to do that we have to sort of again keep in mind so you are saying well we think that the total energy expenditure is, you know the metabolic rate and thermic effect of food and NEAT and sort of a structured exercise. That's fair that's a fair first assessment but I think that that's a kind of that's a model right. We don't know that that's how well that really works. And on some level if we define that has to work rights on some level if we say look I want to fix miniature and I'm going to take all calories there and I'm going to put them into one of four buckets and finally have four buckets. And it's true. And there are only four buckets to let anything go into right. On the other hand if we get a little more of an open mind about that we think about well what is resting metabolic rate, resting metabolic rate is the energy expenditure that all my non musculoskeletal systems are spending over the course of the day.

Well okay we mentioned that at 5:00 a.m. typically you know the standard way to measure basal metabolic rates anyway is to get somebody at 5:00 a.m. right up when they've woken up them for 20 minutes or half hour and assume right. Assume that that level of energy and interest is constant throughout the whole day. That anything right on top of that has to be musculoskeletal or has to be effective digestion or has to be NEAT. Well that's an enormous assumption isn't it? Because we know that all the, you know every system in your body has a circadian rhythm. And the idea that it has to be fixed and can't change metabolic rates towards the day is just silly.

We know that there must be changes in metabolic rates of these different systems over the course of the day. So one thing I'm excited about and this is just hypothesis at this point. But one thing I'm excited about is this possibility that these organ systems and the circadian rhythms of a metabolic rate might be adjusted and maybe, maybe there that's where a lot of this adjustment is happening.

DANNY LENNON: Yes. It's so fascinating. I must tell you it's so refreshing and one of the big things that hit me not only from listening to your last answer but also from reading through all the work that you've put out is that with critical thinking mindset and essentially questioning that current model of what makes up total energy expenditure that certainly is something that got me thinking and I find it so refreshing to see that critical thinking so it's so great to hear you talk through some of those ideas particularly as you mentioned the circadian rhythms which is one area which I'm also fascinated by which could be a whole other podcast. To keep in with some of the things that popped up there was we're still trying to work out the exact kind of mechanisms behind some of this. Just the fact that we have or at least it strongly seems that there's this constraint to how much energy we're going to expend in normal free living conditions. What is the best hypothesis right now for why humans actually evolved this way?

HERMAN PONTZER: Yeah well first of all I'd say it's not just humans it's basically every vertebrate species that we've looked at birds, mammals has been looked at, except in reptiles or fish because you might expect them to be different because they're cold blooded they're very different ideologies. But you know in two big warm blooded groups both mammals and birds we see this happening. So it's not just humans. But so you know the reason I think that it's such a common evolutionary mechanism is this. Species you would expect would be shaped by evolution to maximize whatever was available in their environment in terms

of energy resources and make use of all that they can but not ever go over or at least not go over that energy limit for too long. Right.

So you want to if you can imagine what the average amount of energy resources in environment you want to be using as close to that maximum as you can all the time because the more energy that you put into your body the more energy you have for life's basic essential tasks, right. Reproduction, growth, maintenance. But if you run a deficit for too long, if you're using too many calories more than is available for too long then you starve to death and die. And that's not good either. And so we would expect then that species should be evolved to cue in to that level of energy available in their habitat and to try to keep energy expenditure levels right around that level all the time no matter what else was going on. You know and so I think that's why we see this constancy in energy expenditure is that you're trying to match what is a relatively relative you know constancy of energy availability in your environment.

Of course some species have evolved in habitats and environments that have huge fluctuations in energy availability. And we see really drastic responses to that so species that have evolved to hibernate for example or to go into torpor you know that's basically an adaptation to long term changes and drastic changes in energy availability in your environment. But humans aren't like that, humans are one of those special species that hibernate. So I think you know for us and for most species that are just typical your typical species that are awakened and alive and active every day you'd expect you know you'd expect mechanisms to evolve that would keep that constant energy expenditure and at a certain sustainable level all the time.

DANNY LENNON: Given your expertise in evolution biology there's a thought that I'd love to hear your particular thoughts on. When you think about again some of these energy

expenditures we're seeing in hunter gatherer tribes like the Hadza and therefore being able to relate that back to the essential energy requirements for foraging and persistence ending in say early human species. I've talked to Brent Ruby before whose done work up in Montana. And they've looked at some really cool stuff where they've tracked say like iron men doing races where they have expenditures as high as 10000 calories or I think there's even a 100 mile ultra-marathon where the 26 hour race.

HERMAN PONTZER: I love Brent's stuff, it's really cool stuff.

DANNY LENNON: Yeah. So I mean huge energy expenditures are seeing people racking up, I think the highest they saw there was like 19000 calories. So bearing that in mind seeing that for the needs of even these really active hunter gatherer tribes and the energy that they expend on what's required for them to survive, the kind of large gap between that and then what we're seeing. Human beings have this capability of expending over a timeframe. What do you think it's going to have or how should we think that through a fair question to think that therefore this metabolic range that we're capable of in terms of energy expenditure must be some sort of more modern human characteristic given that there doesn't seem to at least from an evolution perspective the need to go much beyond this kind of constrained energy expenditure we're seeing in these hunter gatherers yet we're capable of so much more of how much we actually expend. If that makes sense.

HERMAN PONTZER: Yeah. So this is another area that we're really hot on right now and we're trying to sort of piece together. And you're absolutely right that if you look at these Western states make ultra-marathon runners or you know people who are on the Tour de France for example classic study by cost mustered terminate he's measuring their energy expenditures. You know people can at least for some period of time can check their metabolic rates up enormously, immensely. And

you know one of the things that I love about Brent Ruby's work is that what he shows is that it isn't just you know the peculiar no weirdos that are able to do this and that anybody can do this if they train for it. So it isn't just sort of a one off thing that isn't available to the rest of us. Everybody can get their metabolic rate up that high for these events and be trained for it. And so that's I think you're absolutely right.

That's something we've got to contend with an answer if we're going to know that as we try to take this constrained model further and test it and see when it works and when it doesn't. What I can say is I really strongly think that if you look at the amount of energy expenditure that people are able to muster for a short versus long periods of time that there's a real sort of time duration element there. You know you can you can keep your metabolic rate up immensely for a sprint. Right. You can get pretty darn high for a marathon. You can get up a little. Not quite as high but still quite high for ultramarathon right. And then down the road very high but not quite as high for Tour de France you know expenditures and to put some numbers on it. I think Brent was showing the power level the ratio of total energy expenditure to body to body basal metabolic rate.

You know the power levels in these ultra-marathon runners are something like around 10. And it's a pretty short race that's a 26 hour race. If you look at cyclists in the Tour de France which is a month long race you know their power levels are something like four and a half and down the line. Right. So I think that my guess is right now is that there's a really strong relationship here between how long you can manage to keep up those levels and how high you can get. And so what I think is when we look at the daily energy expenditures of someone for example your typical adult in the Hadza population but for that matter you or me. I think you and I are at the at the very long duration sort of limits of what's sustainable truly sustainable over months and months and years

and years. And so our power levels are pretty modest compared to these ultra-marathon runners. But we all share this physiology and that if we were to attract these ultra-marathon runners for a year we'd see that if you average their power levels over some weeks or years or months or years comes down as well. And so I think that makes sense but I think that's sort of this sustainable level that we see when we when we measure and when we go out to a population and say what's typical for these guys. Sustainable typical week all week month on month year on year level that we are measuring or we capture what we think is sort of a typical day for these guys. Is the sort of extreme duration and physiology that we're all capable of from a shorter times if we need to sprint for a day or run for a month.

DANNY LENNON: Now it makes total sense of viewing things through this longer time course where we can get a true average that's more representative of what's likely going on in the long run. I mean people can probably relate this back to if we think about overall energy balance. Right. And looking at one particular meal and the calorie allotment that doesn't tell you all that much. It's looking at over a number of weeks or months or longer. The net tradeoff in energy balance I suppose it's a similar issue here. Sure you can rack up a huge expenditure in one day but over give it a long enough time course and you probably see a lot of that balance as you say. So yeah it's interesting.

HERMAN PONTZER: Fine by me, you know the other thing that we see with this is when I talk about this work, people will come up to me afterwards to say well you know you know how can it be because the hunter gatherers that we all came from they all used to run a marathon a day you know and there's a sort of this caricature that's come up through the literature. And I don't know if people you know either misreading what's out there or maybe hooking up poor descriptions of what's out there in the blogosphere I don't know, doesn't matter. But there's this idea that I think it's pretty common out

there that that in our hunter gatherer past we were running miles and miles a day and super active every day and you know if that's true then these ultra-marathon runners that Brent Ruby is measuring are pretty good model of what day to day life would be like for these guys. But it's not true and actually you know the odds are very active but they're still not nearly as active as someone who's actually training for or running you know the Kona triathlon or the Western states ultramarathon I mean those are those really are extreme things that you know we in the western world now have the luxury of sort of deciding to go do. But that really isn't. We shouldn't think of those extreme events and the people who are at elite level of endurance look at that as sort of a model for what hunting and gathering was like. Hunting and gathering is way more active than typical Western life in the US and Europe or other industrialized places. But it's not nearly as active as it's you know it's not anywhere near what we see with these racers.

DANNY LENNON: And I suppose maybe one final point to think about is would it be fair then to conclude that obviously when we're looking at the Hadza, one of the reasons why a lot of people tend to point back to their lifestyles and just generally where we would have evolved from in a classically thinking of these groups are much more healthy than maybe a typical westernized population and obviously there's a tons of moving parts here we can talk about sleep and dark cycles and so on but when it comes to the activity component does it maybe throw up this idea that that at least we're probably clear on this from other areas of research that the value of this extra physical activity is still imparting a very important overall health benefit to such people who have higher levels of physical activity regardless of the energy expenditure or the calorie burn you're getting from that activity

HERMAN PONTZER: Absolutely. And actually you know I wish I heard brought this up earlier in the interview because I think it's so important to make this point. You still

have to exercise but none of this work, with constrained energy expenditure suggests that exercise isn't important or anything like that. And we know from the Hadza work and other traditional groups that, that high levels of physical activity is what's protecting them against all the diseases that are going to kill you and me, right. You and I, Danny are at risk of heart disease and diabetes and all the rest of the ills that the Western world is now facing. And you know your listeners probably are in the same boat and the Hadza aren't going to get sick from any of those things and that's because they're really active. And so the physical activity levels are protecting them against these Western diseases. That's absolutely true.

The evidence there is really strong. But the activity levels aren't increasing their metabolic rates like we thought they were. And that suggests that it's you know when we get to things like obesity well their activity levels might not be as protective, it might be that diet is more of a tool to manage your weight but that activity exercise is the tool to manage everything else and so you know what I like to say is that we have to stop thinking about diet and exercise as these interchangeable things right. Well diet exercise is important for health so if you know you want to be lazy about your diet you just exercise more or if you don't want exercise you just watch your diet. I think that's I don't think that's a great message. I think the better messages and the more accurate messages based on the science is that diet and exercise are two different tools that have two different jobs.

And I think you know our work and other people's work looking at metabolic adaptation suggests that diet is going to be more effective for managing weight but exercise is going to be more effective for managing heart health and immune system health and healthy ageing and protection from kidney issues and diabetes. And so we really have to I think clarify that message and I say this with enormous caveat I'm not a doctor I'm not a public health professional I'm just

looking at the data and what I see is these are two different tools and have two different jobs and we should be clear about that when we talk about it

DANNY LENNON: Such an important point and just as you were saying that it kind of leads often to some of these other maybe indirect effects that we know. Physical activity can have and if we're thinking about diet I think one of the least areas I think Hopkins and others have published on is looking at how higher levels of just general activity affects our appetite regulation and people that tend to have higher levels of physical activity can regulate that better where we see some sort of essentially deregulation or lack of true homeostatic regulation of our appetite when we have people that are completely sedentary. So it may be one thing going into the next. So yeah it's an interesting area for sure but we're coming up on time here Dr. Pontzer so I don't want to take too much more before I get to the very final question for people who are interested in reading more about your own work your publications finding any more information about you and your work online. Where's the best place for them to check some of that stuff out.

HERMAN PONTZER: Well you know the good thing about having a strange name like Herman Pontzer is that if you Google me you are likely to find what you're looking for. I have a piece out this last year in Scientific American that summarizes a lot of this called the exercise paradox that people want to pick up a lot of the work that we've done is in the scientific literature is open access. So the initial publication on Hadza energetics 2012 and plus 1 is open access, anybody can access that. A lot of the other work is open access as well so the usual channels get you there. We keep the lab website that people can google and find you can look at my name that has summaries of the latest research and we try to keep that up to date. So I guess those are the usual and most easy ways for people to get a better sense of what we're working on.

DANNY LENNON: Perfect and for everyone listening I will link up to all that stuff as well as some relevant papers in the show notes to this episode. So with that we get to the final question that we always end the podcast on and this can be to do with anything completely outside of what we've discussed today. And while a quite open generic question hopefully we can put something to it. It's simply if you could advise people to do one thing each day that would benefit their life in any area, what would that one thing be?

HERMAN PONTZER: Give yourself a daily sabbatical, give yourself an hour a day more if you can to really do what's healthy for you. And if that's getting out for a walk or going into the gym or getting into the woods and having a bit of time just sort of recalibrate. You know mental health leads to physical health, physical health leads to mental health, these things are all intertwined and interrelated and I think that maybe this is me speaking as a New Yorker who always feels rushed and crushed on the subways and everything. I think if we would take more time to be just a little bit more aware and slow down and take time for yourself to eat well and exercise well it doesn't have to be you know half the day it can be pieces of the day and that can be enough to sort of track you well. I just say that that's just how I try to keep myself in check. And that seems to work for me so and I think that's my suggestion for anybody else that's listening.

DANNY LENNON: Brilliant. And a great way to round off this episode with that Dr. Pontzer I want to say thank you so much for taking the time to do this and for the fascinating work that you've produced to this point and will no doubt continue to produce. That has been something I've found extremely interesting and fascinating to read through and it's been an honor to talk to you today.

HERMAN PONTZER: Well it was a real pleasure. Thanks so much.