

Designed to Move: The Science-Backed Program to Fight Sitting Disease and Enjoy Lifelong Health: A Special Interview With Dr. Joan Vernikos

By Dr. Joseph Mercola

JM: Dr. Joseph Mercola

JV: Dr. Joan Vernikos

JM: Movement in your life: one of the most profoundly powerful interventions to stay healthy, but how do you do it? Hi, this is Dr. Mercola, helping you take control of your health. Today we have a guest who we've interviewed five years ago, Dr. Joan Vernikos, who is a true pioneer and really one of the first professionals to understand the value and the importance of regular movement in preventing disease.

I mean it's become quite popular now. "Sitting is the new smoking" is a real popular meme that's been around for a while. People understand it. This is not new information, but she was one of the leaders. She has a lot of interesting information and details on why it's so important.

Why should we trust her? Well, she has a PhD. She was hired by The National Aeronautics and Space Administration (NASA) in 1964, five years before Neil Armstrong landed on the moon. She's written over 200 scientific papers. She was the director of the Space Life Sciences at NASA from '93 until 2000. She just has loads of information.

She hasn't been with NASA for a while now, so she's had this time to reflect. Because a big part of her position was administrative, so she had time to reflect and think on everything that was going on. She's come up with some really interesting theories.

She's written a book and put some of them in there. It's called *Designed to Move: The Science-Backed Program to Fight Sitting Disease and Enjoy Lifelong Health*, which is an update from a previous book, which I believe is *Sitting Kills, Moving Heals: How Everyday Movement Will Prevent Pain, Illness and Early Death – and Exercise Alone Won't*. Welcome and thank you for joining us today, Dr. Vernikos.

JV: Thank you very much for having me on again – for a sequel.

JM: Yes. For an update, because it is such an important strategy for optimizing your health. I'm just going to give a little personal history before we go into the details and expand on it. Because when I last interviewed you, I've had a significant amount of incapacitating back pain. I have implemented your recommendations of standing up a few times an hour and doing some exercise, but that wasn't sufficient to relieve the back pain. For me, I had to stand up completely.

As I'm doing this interview, I'm standing up. I have been for pretty much the last three or four years. I'm not sure that it has the specific health benefits of standing instead of sitting, but for me, it was a postural thing. It just had an influence on my muscles. Once I started standing up, the back pain disappeared. You have a different perspective on that because of the change in business that's

been so crucial, but I will get into that in a bit. Now, I believe you dedicated this book to John Glenn, is that correct?

JV: Correct. Yes.

JM: Yeah. Of course he was the first astronaut who did an orbital flight from the United States. Obviously the Russians did that previously. He was a senator. He died, actually, late last year in December 2016, but he returned to space at the age of 77. I believe he was the oldest astronaut.

JV: Yes.

JM: Why don't you tell us about your relationship with Senator John Glenn?

JV: Well, I was instrumental in, I think, helping him get back into space. Because when he first came up with this suggestion, everyone thought, "You can't send an old man up in space. What if something happens to him, then how do we explain it?"

JM: Sure. It's a risk.

JV: It's a risk. The oldest person at that point was 52, Musgrave, who is not a spring chicken exactly. Fifty-two. Glenn wanted to fly again because John F. Kennedy had prevented him from going to the moon, because he was a national hero and it wouldn't be politically pleasant if something happened to him. He was forbidden from flying again. He tried to be a politician, almost president.

Then as senator, he arrived at NASA. My administrator said, "Well, Joan, what do you think? Should we let John fly again?" which was a heck of a question. I said, "Arbitrarily, why not? But let's do some homework with the National Institutes on Aging." We started asking around questions [to] experts. The answer came back. Well, there is no reason to exclude him, as long as he is healthy and fit, okay? Of course there are lots of tests.

He continued to be a senator right up to the day he flew. He was doing all his homework for the shuttle flight, on his flight back and forth. He was extraordinary. My concern was not that anything would happen to him during the flight, but how would he recover or would he recover.

JM: How long was he up there for?

JV: Eight or nine days only.

JM: Okay. That was longer than his first flight.

JV: Longer. That's for sure. That was my big worry. He came back, of course. He walked off like everybody else. We had a session at the National Institutes of Health on the results, which are all double-blind and revealed that evening. His chart was put up with all the clustered data.

[There was] one outlier. I thought, “Well, of course that’s got to be John Glenn, who is different from all the others who were in their 30s. It was a good try.” As it turned out, John Glenn was among the cluster, and the one outlier was 35 years old. So, that message came across loud and clear. Of course he recovered very fast. I escorted him on many rounds we did to explain to people what had happened and what we’ve learned.

The message came back loud and clear: If you are healthy, you are fit, and you take care of yourself – take care yourself, which is a very important premise – there’s no reason you can’t do anything that anyone else can do.

JM: That’s a good message.

JV: That was his belief right up to the day he died.

JM: How old was he when he passed?

JV: Ninety-five.

JM: Wow. That’s pretty good.

JV: Yeah.

CUT DUE TO AUDIO FEEDBACK [06:55 to 07:05]

JM: Okay. That was interesting because it provides us with some lessons about microgravity. When he was up there, you were still in NASA, right?

JV: Oh, yes. I was still the director of Life Sciences.

JM: Alright. You were the director there. I guess the concern is – Obviously, it’s a lot more than a few hours and nine days, but there are people up there who have been up there for over a year now. There are definitely some downsides.

Interestingly, I don’t know if I shared this in the last one, but like many kids, I remember clearly watching Neil Armstrong land on the moon and was inspired. I wanted to be an astronaut. I really pursued it until late high school. I was committed to following this path to lead me to be an astronaut, but then I had some encounters with the government and I realized I do not want to do anything with the United States Government. I’m out of here.

I’m so glad I did, because I later learned of some of the dangers, like the ionizing radiation and gamma rays, and of course, the lack of gravity, which you’re a specialist in. Why don’t you start expanding on some of the concerns you have? Because this was really why you’re one of the pioneers in this area, because this lack of gravity is very similar to inactivity down on Earth where we have gravity.

JV: It is very similar to inactivity on Earth, but that's not the only feature of getting away from gravity. The acknowledgment of the participants in the program that there is something possibly wrong with "The Right Stuff," which is the astronauts' favorite –

JM: The movie.

JV: The script. How could anything happen to them that is not very pleasant? Well, it does. We can't deny it anymore. We cannot deny not only what has been now shown, that changes occur in the microgravity of space that are very reminiscent of those of aging on Earth, except they happen 10 times faster. If you're going to lose bone at 1 percent a year here on Earth as from age 20 on, you're losing 5 percent – sometimes more, sometimes less – in space for months.

JM: It adds up real quickly.

JV: In a six-month period, one astronaut lost 30 percent of his bone. That's a lot of bone to lose.

JM: And I'm sure they were on a pretty aggressive exercise program. I don't think any astronaut isn't exercising hours every day.

[----10:00----]

JV: Absolutely. Up to four hours a day, two hours to four hours a day of exercise, with a couple of exceptions that I need your point of view on because it's right down your way of thinking, I think.

Obviously, the exercise is complicated in space, more complicated in space than it is on Earth, because you have to wear bungee coats to hold you down on any treadmill. Your resistive exercise is much more complicated, because there isn't gravity to work against, and all kinds of things like that. But in spite of all that, the changes we see keep appearing and being faster than they are on Earth.

JM: Despite the attempts to remediate them with exercise.

JV: If you stop and think about it, we have never flown an astronaut without exercise. What we've seen is with the exercise. Okay? This is what worries me. This is what worries me, because we kind of forget. We say, "Well, exercise helps you." I'm sure it helps. I have no doubt that it helps.

JM: But there's no control that hasn't went up without exercise.

JV: There is no control and we're getting a heck of a lot of adverse effects, as it is with the exercise. I have a theory about that, because I have a theory about most things. That the minute you stop exercising in space, you're right back in microgravity. You're not back to 1 g as you are on Earth.

JM: Excuse me for a moment for interrupting. But your microgravity is – You've known it for decades, but for those who don't, maybe you can define that. It's the lack of gravity or relative –

JV: It's when it's below the threshold of what we perceive as gravity.

JM: Okay.

JV: It's 10 to a minus 5 if you want to be [precise].

JM: Okay. That's what it was. I knew it was very small. It was 100,000 to a millionth of the –

JV: Yes. Exactly.

JM: Okay.

JV: When you exercise on Earth, you have gravity to work against. The minute you stop, the response does not just cut off. The response continues over a period of time, which is a very interesting phenomenon. It's the after-response to exercise. It's very valuable. In space there's no after-response, because there is no gravity to recover in. Then you're right back down at 10 to a minus 5 g.

When the body first responds to microgravity, to low gravity, you see a sequence of changes, just as you see the same sequence in reverse when you stand up or when you return from flight. The response to gravity produces a sequence of changes. The response to microgravity, or almost no gravity, is a mirror image of your response to standing or your response to being launched.

JM: I'm sorry, go ahead.

JV: That is absent. The after-response is absent in microgravity. I think we might be able to get exercise to work in space if we distributed it throughout the day in intermittent periods.

JM: Yes. To me, after reading your new book, it seems to me the summary – if I could put it into a few words – is intermittent, low-intensity and high-frequency. In other words, move your butt all day long, unless you're sleeping.

JV: Exactly. That's what we're designed. That's the way we've been designed. Because when you wake up in the morning and you open your eyes because of light – not because of gravity. I'm sure there's an interaction there between light and gravity. You open your eyes, and what do you do first thing?

JM: Stand up?

JV: It's amazing what audiences tell me, but that's beside the point. What you do is get up.

JM: Yeah.

JV: You stand up, then you go about your business, whatever that happens to be. During the day, you are moving. We are designed to move all day long until it's night again and you go back to bed to sleep. It's a very unique system.

JM: Yes, indeed.

JV: What we've done is we've modified it.

JM: Radically modified it. I think modified is too kind a term.

JV: Yeah. We've cut this whatever up. We modified it. Not only that, but in addition, any of our defense mechanisms, any brain mechanism, any neural mechanisms that gravity keeps tuning all day long with movement are not there. We have this barrage of texting and technological input that is bombarding our system.

JM: Sure.

JV: We need this underlying movement all day long to tune us, to prime us to be able to respond to the onslaught of whatever it is, whether it is running to get away from the tiger, climbing the tree or defending ourselves against whatever stress, onslaught, electronics – you name it.

JM: Sure. This information is not radical or new. Most everyone's got to be aware of this, that you need to move. But what I want you to share and go into greater depth on is your appreciation of the influence of microgravity on the vestibular system, how that influences health, what you learned from that and what we can transfer to what we have on Earth.

JV: It is very fascinating. In one of our missions, Rick Searfoss, an astronaut who was a pilot in that mission and then became commander of the shuttle, was being tested on something called the standing plates. His balance was being tested. He's standing on this moving plate while we're all sort of chitchatting around. I suddenly see him leaning forward very gradually and just keep going. This was after his nine-day flight in space.

I rushed to catch him, of course. There would have been no way that I could've caught him coming down as deadweight. More of us fortunately came. We grabbed him. He shook his head and he said, "What happened?" as he opened his eyes. I said, "You were about to fall flat on your face." He said, "I never felt as if I was falling. I never felt the need to put my arms out to protect myself." After nine days, that is highly significant, because what it means is that the brain maps of where we are, relative to our environment, had disappeared.

As a child, as we develop, as we somersault, as we jump, as we do all these wondrous things we do as children, we develop maps in our brain that tell us where we are relative to our environment. We can shut our eyes and touch our nose for instance, among other things. In space, this relationship is not there. There are no cues from gravity, for up and down, for acceleration, for sense of direction. We're floating around in the spacecraft, or we appear to be floating weightless, and don't need them, until we get back.

I mean we knew that neuroplasticity had, not many years before, been discovered and acknowledged. But we did not know whether we could reproduce these maps that we developed as children. Of course he went through a rehab, which was more or less the same as all other times that astronauts flew. Sure enough, he reacquired these brain maps that tell [him] what his

relationship to the new environment of coming back to Earth was. We know that you can recover from that sort of thing.

If you're 80 years old and you have poor balance and someone tells you, "Well, what do you expect? You're 80 years old." The answer is, "Hell no." There is absolutely no reason that you cannot reacquire these maps and the orientation that you had as a child with your environment.

[-----20:00-----]

JM: The vestibular system actually has more features or functions than just balance. The vestibular system is the inner ear, of course. Why don't you discuss some of the other ones? Like blood pressure regulation and muscle influence.

JV: A lot of research has been done in the vestibular system thanks to NASA. It is now clear that, certainly, blood pressure regulation is very much a function regulated by the vestibular system. But also, bone loss and muscle atrophy can also be related to a functioning vestibular system. These are just three critical features and responses that we know happen when you reduce the gravity stimulus that we are exposed to all day long.

The blood pressure, of course, is one of the first things we saw in returning astronauts, the sudden drop in blood pressure when standing up and orthostatic hypotension. That is a very important indicator of the rest of the function of the cardiovascular system and its relationship to the vestibular system, because another thing that happens that is not as visible as fainting when you stand up is that the endothelium, the lining of the blood vessels, virtually disappears.

JM: Wow.

JV: We've flown rats that you can take the veins out and the arteries. They're translucent.

JM: Now, it was my understanding that the endothelium is where large amounts of nitric oxide are stored.

JV: Yes.

JM: That's a really important biomodulator.

JV: It's really, really important.

JM: I mean is that correct? Did you know that it was a bio modulator?

JV: That is correct. We haven't even scratched the surface on that possible side effect. Until we see a very obviously adverse effect, not much research is done in the area unfortunately.

JM: Wow. I had no idea that endothelium was decimated.

JV: Well, if you look at the elderly and you look at the sedentary and you look at space, it is a continuum. The changes are very much a continuum of reduced exposure to gravity or exposure to reduced gravity. Both.

JM: Now, I listened to your interview on STEM-Talk. You offered a hypothesis there on the vestibular system, which I thought was intriguing, because it's your belief that the best stimulus to the vestibular system is postural change. Can you expand on that?

JV: Yes. It's the most basic stimulus that we experience many, many, many, many times a day, or should. It involves the signal. It is perceived by the vestibular system, which then regulates blood pressure. As you stand up, if you've been exposed to space or if you've been sitting too long or if you've been bedridden for a reason, you will have the tendency to faint. You will have a low blood pressure or a sudden drop in blood pressure. Or five days with the flu in bed and you get up after having been in bed for four or five days.

JM: Did you know what the mechanism for the inability to control the blood pressure? Is it related to nitric oxide in any way, or is it another mechanism?

JV: A lot of it is dehydration, but it's not the whole story. Some people are more prone to orthostatic hypotension than others. The sympathetic nervous system and norepinephrine involvement people will have a higher blood pressure. Normally in the higher sympathetic nervous system, more sensitive higher sympathetic nervous system, are less likely to faint upon standing up after being deprived and so on.

We all get there eventually. It's a time-caused thing. Some of it are averted for a while, but eventually, they all [appear]. I think that's the third component that is very much [important]. There's also the angiotensin component, the enzyme that converts renin to angiotensin, which is found in the lung, is suppressed in flight. I have no doubt that nitric oxide is very much a participant.

JM: Now that you've elaborated on the connections of the vestibular system, maybe you can provide us with some practical strategies that we can use to circumvent the inevitable damage that occurs when we don't pay attention to the movement in our life, which is probably the majority of people watching this.

JV: I think one of the errors or oversights in the field has been the emphasis on total hours [seated] instead of what I call uninterrupted hours [seated]. In other words, if you interrupt sitting reasonably frequently, you're less likely or maybe not at all – the experiment has not been done – to show the effects of prolonged sitting.

JM: Can you expand on the effects? By effects, what do you mean?

JV: The documentation of the effects has been extensive in the last five years. It's continuing all the time because a lot of meta-analysis studies, which I think would have been too short sometimes, have been done that implicates absolutely everything, not only the cardiovascular system and heart

disease, but the incidence of stroke, cancers especially – and interestingly – colorectal cancer, GI cancer, ovarian and prostate cancers.

I feel there is a circulation component in that with sitting and a collusion aspect that contributes and makes things worse all around. Diabetes and obesity have been correlated as consequences of sitting. Depression.

JM: Okay. Loads of diseases.

JV: Loads of diseases, and significantly more and more work, especially in children, in a reduction in cognitive reactions.

JM: So, we know one of the benefits of exercise, independent of sitting, is increase in brain-derived neurotropic factor (BDNF).

JV: Correct.

JM: Also, peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1- α), which is an obscure metabolic pathway responsible for increasing mitochondrial function. That's with exercise. But most people wouldn't consider standing up from sitting exercise. Is it your belief that you still get the same metabolic benefits? It would seem like it, because what else would explain the decreases and the reductions of the diseases you just cited.

JV: I don't know. All I know is that within 30 minutes of sitting, the triglycerides are increased. That is a very significant response. If you're driving for an hour and a half to get to your doctor and you're sitting in the reception room for another half hour before they draw blood, of course you're going to be diagnosed as a pre-diabetic.

You know, we have to be a little more critical about how we do things in real life before we jump into all kinds of conclusions. The intermittent standing signal is just that. It's a signal. It's a tuning mechanism. Twelve calories burned per stand. If spread out throughout the day, terribly important.

JM: But it's not a calorie-burning benefit at all. The calorie reduction or calorie loss is pretty much insignificant.

JV: That's right. It's about 12 calories, not exactly your diet.

JM: That's standing how frequently throughout the day? Sixteen times a day?

JV: For sitting, I would recommend something in the 32 to 36 times. I'll tell you why. I did that in an experiment. One of the last experiments I did was with bedrest, lying in bed continuously.

[-----30:00-----]

The question I asked was – because we were not having a lot of success with completely preventing the changes with horizontal exercise in bed, I thought, “I wonder how many times a day would

you have to exercise, if you spread it out and you're upright, to prevent the effects of lying in bed continuously?"

I used standing up as a control. My experiment was on exercising on the treadmill for 15 minutes every two hours or every four hours throughout the day. When I got the results in – This was a double-blind study. I had a fancy statistician. He called me in and he said, "Joan, you're not going to like these results." I said, "Why not?" He said, "Well, the standing was more effective than the exercise on the treadmill in preventing the changes."

JM: Now, for clarification, is this standing up continuously or standing from being recombinant in bed?

JV: Standing from being recombinant in bed and standing for 15 minutes, okay? Because that's what I knew at that time. I took a guess. It was amazing that that was enough. Standing up every two hours was enough.

JM: For 15 minutes?

JV: For 15 minutes each time.

JM: Okay.

JV: During a 16-hour daytime period, a wait period, if you will. I thought obviously my next experiment would have even less time, more frequently, less frequently, more factors. But I went to Washington and became a bureaucrat, so the experiment was never done. However, the data that I have been seeing coming out suggests that standing up every 20 to 30 minutes is a good counteraction. I'll tell you why in a second.

JM: But when you stand up, is it stand up every 15 or 20 minutes and stand up or just stand up once and then go down?

JV: I was convinced that it was still going to take less than 15 minutes standing up. My next experiment was going to be five minutes. For instance, Professor Eric Peper at San Francisco State University has his students standing up at 30 minutes during a lecture and wave their arms around and sit again. He reported that that was sufficient to keep their mental acuity up. There are little tidbits of information here and there that it's somewhere in the 30-minute timeframe.

I did an experiment all on my own one time after I left NASA. I wrote a book, *The G-Connection*, about the law of gravity. I got an award for it. I was coming back from the platform and I saw this man waving his arm saying, "What's your book all about?" I said, "How you can stay young as long as you live." I was being flipped. I wanted to get away. He says, "Yes. How?" I said, "Well, stand up every 30 minutes," and then I realized he was in a wheelchair. I made a quick exit and returned to my table. A colleague at the table said, "You didn't know who that was?" I said no. He said it was George Mueller. George Mueller was Mr. Apollo, a rather testy gentleman that you didn't cross often. I thought, "Oh well, here's the end of a nice relationship."

Three months later, he calls me up and says, “You won’t believe this. We went to the Mueller’s and George answered the door upright and proceeded to offer drinks. We asked his wife what happened. She said, ‘He did it all himself,’ ‘What did he do?’ ‘He stood up every 30 minutes.’” Okay, that’s one. I proceeded to do six people. I recommended all the people. One 99-year-old, one 92-year-old, one 57-year-old and one 87-year-old who I met along the way and were willing to do it. They all gained a good degree of independence. Is it the answer for longevity or whatever? I don’t know. But whatever it was, it helped them with their independence.

JM: That is vital. That’s really an important point. I just want to emphasize that. Because I can appreciate, as my parents – My mom just passed away a few weeks ago and my dad is probably not too far behind. I’m absolutely confident that one of the major contributions was their inability to move.

They had some reasons for it, but this inability to stand up is – I know once you lose that, you are rapidly accelerating your progress towards death. There’s no way around it. This is such a simple strategy. Here you have a handicapped person in a wheelchair. That’s one of the questions I have for you, is what can you recommend for people who are in wheelchairs? It’s something as simple as standing up. But obviously, not everyone’s going to be able to do that if they are paralyzed. Mueller had some capacity. He just wasn’t using it.

JV: Yes.

JM: But most people aren’t paralyzed. They can stand up.

JV: Yup. Well, not only that, but there is a stand-up chair or stand-up wheelchair that props you up on demand.

JM: Nice.

JV: It’s a wonderful device, absolutely.

JM: Would you still get the same benefits because you’re changing posture? But you’re not exercising your leg muscles.

JV: Yes. That’s correct.

JM: Wow. I did not realize there was a stand-up wheelchair. I had no idea.

JV: Yes. It’s in Michigan. It’s a superb device. I’ve tried it myself. It’s very easy to use as long as your arms are functional. You can go shopping in a supermarket and look at things at eye level. You can talk to other people at eye level. It is a very, very important addition to the disabled.

JM: Yeah.

JV: And people who cannot stand on their own.

JM: And/or the elderly.

JV: And/or elderly. Absolutely. The elderly's a very interesting thing. I gave a talk recently. Someone said they've read a paper, a survey that had been done about what is the most significant factor that makes families move their parents to a nursing facility. The top most important factor was being unable to use the toilet, which you can imagine is a very simple motion of sitting down and standing up with some independence. It is so fundamental to the sense of wellbeing. Independence is very, as you said, crucial.

JM: Yeah. Once you lose that, it's been my observation that you're not going to be around here a lot longer. I mean you can, but it's just the anomaly.

JV: Well, unfortunately, nursing facilities, good as they might be, are a one-way street.

JM: Right. Yeah. There are some good ones out there that really pay attention to exercise and get people moving. They do a great service.

JV: Absolutely. But there's a lot more that can be done, both social interaction and touching. A sense of touch is extremely important to elderly people who just don't get touched that much.

JM: Yeah. That's a really good one. Thanks for addressing the disabled one. The stand-up wheelchair is a golden pearl. In your book, you outline another strategy. I'd like you to offer a few more – perhaps having a pet. Just having a pet will increase – There was a study just done yesterday that shows it increases your steps by 2,700 steps a day, an additional 23 minutes every day of moderate physical activity, which is not insignificant.

You know, I think pets are great too, because they don't live as long as we do. When they pass, they force us to learn how to deal with grief, which is a profoundly disturbing emotion. But learning how to address that is going to be useful in the future.

JV: Yeah. That is a wonderful aid to keeping us independent, because someone else depends on us. Something else depends on us. It's terribly important. Going up and down stairs, we've lost the [ability]. We have the facilities that help us get up and down and that sort of thing. It is crucial to be able to keep or retain that independence.

[-----40:00-----]

JM: Yeah. And you can just look for opportunities. I travel and see a lot of people on airports. I'm sure a lot of people travel too. There are always options. You can take the escalator or you can take the stairs. You can take the walkway or you can walk.

JV: Yes. I saw this wonderful railroad station in Paris. It was a station where people went to charge their electronic devices. They charge them by riding a bicycle. It was wonderful. It was wonderful. It was full of people. There they were charging their electronic devices, an asset in both ways.

But let me tell you another one about exercise and that we don't sometimes ask the right questions. I was giving a talk and this other colleague was giving a talk. She came up to me afterwards and said, "You know, exercising throughout the day is very important." I said, "Yes. Thank you."

She said, "You know, I have been trying to walk 10,000 steps a day. I have one of these fancy Apple devices that tell me when I've done it. Because I can't go and walk 10,000 steps in one walk or one run, I spread it throughout the day. What I found, because of my device, was that when I spread the walking, my 10,000 steps throughout the day, I lost 750 calories. I used up 750 calories more from the same number of steps."

JM: I don't know why that would show that, but I could understand how it would metabolically work – because you're changing positions.

JV: Yes.

JM: But that fitness tracker shouldn't have indicated different calories.

JV: This Apple device shows also calories.

JM: Okay.

JV: It's checking also the calories that she had burned that day, but she never put two and two together. She was looking at doing her 10,000 steps.

JM: Yeah. That goes exactly with what your theory is. You can't out-exercise inactivity. You just can't. You have to do low-frequency. It doesn't have to be a lot. Just simple standing up. How much simpler does it get? It could be expensive if you have to get a stand-up wheelchair, but what's the alternative?

JV: They're very distressed because Medicare has not been able to cover them. But most people who get them see tremendous benefit.

JM: Yeah. It's just really a major pearl. Now, one of the other points you – getting back to the astronauts who you've mentioned in your STEM-Talk interview, which I thought was intriguing. I hadn't known about it before. Because in our last interview, I wasn't really interested in ketogenic diet or burning fat for fuel and just eating healthy. Now, I've written a book on it. Really, it's a very thorough comprehensive treatise in reviewing the molecular biological literature.

JV: Excellent.

JM: You had mentioned the ketogenic diet was one strategy that you had recommended for the astronauts. I'm wondering why, because you didn't expand on it on your previous interview.

JV: Well, we want them to survive and not lose muscle and bone and maintain their brain and the rest of their physiology normally. I mean, after all, bears do it during their hibernation. They use up their fat as fuel. They don't lose muscle. They don't lose bone. Interestingly enough – not really

relevant – but they also have their young while they’re hibernating. The point was to recommend the ketogenic diet to preserve the physiology while providing an alternate fuel to glucose. Certainly if you’ve been using glucose as the fuel, you do lose muscle and you do lose bone.

JM: Yeah.

JV: We do know that the brain certainly is a lot sharper and functions more cohesively.

JM: Yeah. The little tweak that I’ve found – actually, I’ve applied it personally – was that it really needs to be done in cycles. You can go straight ketogenic. But if you do that for long-term, you’re going to really cause more harm than good, I think.

JV: It’s like everything else.

JM: Yeah.

JV: You know, it’s not a square wave. You can’t be on it forever.

JM: Right.

JV: The body is there to alternate, to change and to get signals to stay alert.

JM: Sure. Which reinforces your central thesis, which is that you need to move continuously and change your position. You should not be static unless you’re sleeping.

JV: That’s right. Exactly. Even during sleep we have cycles.

JM: Yeah. Sure. Of course. Yeah. But you’re not moving very much.

JV: No. True. I hope not.

JM: Because some people – We get the craziest readers on our site. They say, “Well, you’re supposed to be moving all day. But what about sleeping?” Well, that’s when you’re supposed to not move. That’s what the design is. It’s for rest and recovery. The glymphatic system hopefully goes into effect and does its massive job of cleaning up your brain and helping it repair.

JV: Yeah.

JM: What are you doing now? Are you in retirement?

JV: I’ve been retired for 17 years.

JM: Okay. What have you been focusing on other than writing books? Have you had any other epiphanies? Because, as I mentioned previously, when you were at NASA, you were so time-crunched that you didn’t really have time to go and go on the side and think about these things. But now, you do, and I’m wondering what conclusions you’ve reached.

JV: We have already – A colleague in France has already done a 10-day fast just to see whether ordinary people who we would recruit as volunteers would have any trouble fasting for 10 days. The answer came back: Not at all.

JM: Well, most ordinary people are overweight, so they probably would benefit from them. But if you had a really thin person, I'd be careful.

JV: Yes. I mean these are all under supervision. Obviously, they were fasting but drinking and having the tea and the coffee or whatever and all the things that are allowed.

JM: I've interviewed Dr. Jason Fung, who's a nephrologist in Toronto. He's really wrote the book on fasting. It's just a magnificent tool. I just was taking care of a patient with heart disease. It was pretty much terminal but the first thing I did for him was put him on a fast and put him on an ECP machine, external counter pulsation. His whole life changed in a week. It was amazing.

JV: You know, this is very interesting. That's why we started. As I said to you, I never had breakfast growing up.

JM: Sure.

JV: Not only that, I'm amused that the books that have been written about the Mediterranean diet and longevity and all that don't ask the simple question, "What do you eat for breakfast?" No cereal is eaten for breakfast. They don't even think about eating bread for breakfast. They'll have their coffee and they'll go about their business.

JM: Let's go into your history a little bit, because obviously anyone would recognize you have an accent. You're Greek. Ancestrally, you're Greek, but you were born in Egypt because your father was a physician.

JV: Correct.

JM: He was trained there and then you wound up getting trained in London in pharmacology.

JV: Pharmacology. I was an undergraduate in pharmacy. I went to London and got the PhD in pharmacology at the University of London.

JM: Yeah. You've had an interesting experience. Then you got married and came to the United States, which is where you are now.

JV: Yes. But you know, not eating breakfast – People have said to me, "Joan, you must eat breakfast. Breakfast is the big meal. It's the main meal of the day. How can you live without eating breakfast?" I said, "Well, it doesn't bother me." When I was reading Fung's and Asprey's or whatever, and your book, I thought to myself, "I'm fasting anyway."

JM: Yeah.

JV: From the time I eat my dinner, which is early anyway, to the time I get around to having a meal, which is lunchtime, I'm fasting anyway. I should starting looking at this.

JM: Yeah.

JV: I have. I added MCT oil.

JM: Caprylic acid is even better.

JV: Yeah. That's what I'm using.

JM: Okay, okay.

JV: That's what I'm using. Your favorite brand.

JM: Alright. Good.

JV: In fact, I started wondering whether the oil without the diet might be an effective tool.

JM: It has some of the benefits, there's no question, but it's not as good as if you're actually burning fat for fuel yourself.

[----50:00----]

For people who are metabolically compromised, relative or severe Alzheimer's, cancer, you can take ketone esters, which are far more effective than the MCT oil. But you know, I wouldn't recommend it for a healthy person.

JV: No. I was wondering whether for people who want to get started on an obesity reduction program.

JM: If it's obesity, there are simple ways. You don't have to do the fat for fuel approach. You could just fast. I mean that's going to be the quickest way to get you to burning fat for fuel. You know, the intermittent fast, I think, is profound. I used to do it for 14 to 16 hours, but I recently bumped it up. I'm going 18- to 20-hour fasts now. I'll just eat for four hours in a day.

JV: I do about 15 to 18. Yeah.

JM: Yeah. I think it's even better. I thought I should be eating when I exercise, as I strength-train and stuff. But then I realized I was probably blunting the anabolic stimulus, so I'm just doing a fasting now. I still workout as hard. I think I get a better benefit from doing it.

JV: But you don't need to lose weight.

JM: Sorry?

JV: You don't need to lose weight.

JM: No, no, no, no. I have to be careful. When I travel for a week, I variably come back losing 5 pounds. That's like, "Darn."

JV: The other way around, isn't it?

JM: Yeah.

JV: That's fascinating. I can't help but ask questions, like the survivors of the holocaust.

JM: Yes.

JV: They lived very, very long lives.

JM: Yes, indeed.

JV: Which is interesting. I wondered whether a year or a period at a critical time of being on a ketogenic diet, which they jolly well were for that period of time, fix us somehow. I'm just throwing out ideas.

JM: No. It's not just in concentration survivors, but actually whole countries. They looked at this really carefully. Usually in war circumstances, where there isn't a lot of food available and people have less calories and they're actually forced into a ketogenic state, they survive longer. They live five or 10 years longer than if they just had normal happy times and were in feasting all the time.

JV: After that period though, they've gone through our bad ways of junk food and whatever else we consume, which is interesting because whatever that was, that jolt of ketogenic period, had a lasting effect on their longevity.

JM: Yeah. I'm glad you picked up on that and you applied it yourself personally. It's a good thing. I have one question for you about combatting some of the osteoporosis and the sarcopenia in space.

JV: Yes.

JM: I suspect you're familiar with the Power Plate.

JV: Yes.

JM: It's promoted as being developed by the Russian Space Program for their cosmonauts. I think they were doing it up in space. I don't know. But it would seem that when you're strapped in, that pulsing up and down might serve a valuable benefit. I'm wondering what your research has shown.

JV: Yes. You've seen Clinton Rubin's work also? He has a plate of some sort.

JM: No, I have not.

JV: A fellow called Stefan Judex, I think, is probably the engineer who developed it. He's done several work with a variety of animals. They did try vibration in subjects in bedrest, but I don't think they did it right. Quite frankly, I don't think they did it right. Again, I think you'd have to expose them.

JM: Continuously. Yeah.

JV: In intermittent periods.

JM: Yeah. Regularly, most of the day, 16 hours.

JV: Regularly.

JM: That's the key.

JV: With breaks, with variation maybe. With slight variations in the frequency just to keep them alert and their system and the appropriate receptors alive.

JM: I mean it's a relatively small loom. It's like 2 or 3 millimeters, but it's still a generally significant force. I'm wondering if it applied with the principles you just suggested that it might be beneficial.

JV: It should be applied by something that straps it to the bottom of their feet.

JM: Right. It's got to be secured. Otherwise you're not going to get the benefit.

JV: No. You don't get that sort of thing. I am sure that it's that type of device that's going to be the solution.

JM: Interesting. Is anyone at NASA listening to you now?

JV: No.

JM: Well, there are private alternatives now. Maybe we can get you in touch with Elon Musk, because I think SpaceX is going to get to Mars well before NASA does.

JV: Absolutely. I have great hopes for the SpaceX group. There are other groups as well who just want to make sure they keep their paying customers healthy, because the last thing they want to do is have complaints.

JM: Sure. Well, keep people healthy. Do you have any speculations as to how you could best mitigate against the ionizing radiation? Is there some type of shielding you can use or a molecular remediation that you might be able to use?

JV: There is a shielding that uses polyethylene, oddly enough, which is a very simple particle.

JM: Really?

JV: Yeah. It's one of the best shields.

JM: For gamma rays?

JV: And water. Water is heavy. It's hard and it's cumbersome.

JM: But you can have the storage tanks around the vehicle.

JV: You can certainly have storage tanks around the vehicle. You can have a safe haven, also, that is surrounded by water and somehow protects that way.

JM: Interesting.

JV: But polyethylenes are some sort of plastic, if you will. Even two layers with water in between – a compromise of the two – should be an advantage.

JM: How thick does the polyethylene have to be?

JV: I don't know. Not very thick.

JM: Interesting. Because this is something that should be used on airplanes. People don't realize that when you're flying at 35,000 feet – take a Geiger counter up there. I've done this. You are getting 20 times more radiation exposure. If they're concerned about Fukushima, you should be a lot more concerned about flying up at high altitude.

JV: And going over the polar route.

JM: Is that even worse?

JV: Oh, yes.

JM: Okay.

JV: Pilots who fly regularly on the polar route – I mean I have no idea what happens to them.

JM: Well, it would seem that would be reasonable. I didn't realize polyethylene can block it. That seems kind of odd. I think it would be something like lead, but little pieces of plastic?

JV: Yeah. Lead does. But, you know, there are material scientists around, children, kids, and young people who would love to have a challenge, like the XPRIZE. For the prize out there, let them think. It would come back with all kinds of suggestions. This is the sort of thing that we should be doing. Not trying to find it by the same old way.

JM: Yeah. So you think there's a possibility you might be able to have some input into SpaceX?

JV: I think SpaceX is going to be a lot more receptive, a lot more receptive. Though their medical guy – No, that's the wrong one. No, I don't know who their medical guy for SpaceX is. I know for [inaudible 58:13]. But he's not there yet, but he should be receptive. He should be receptive. I've been trying to kind of gently – but you know, the guy's so busy.

JM: No. I imagine it wouldn't be him directly. It could be someone in his team. You certainly have credentials, well-established credentials, to be of benefit there.

JV: You never know.

JM: Because these are really serious issues. Thankfully you've learned a lot when you were there. You did the work. You basically summarized it and gave this practical implication of what we can do on Earth, which is going to affect a lot more people than the astronauts.

JV: Yeah. Let me tell the other thing that I didn't tell you. I'm just holding you up. When I said that the astronauts exercise two to four hours a day and then they do nothing, why are we surprised that it's not as effective as we would like? There have been exceptions. First, Shannon Lucid, who was menopausal when she went up on the Mir for 179 days, exercised throughout the day on the treadmill. Secondly – this will interest you – the Russians. The food they give their cosmonauts is sardines. I knew I'd get you.

JM: Yeah. I had one of these patients. I only had them eating one food. He wasn't totally fit so I had him on sardines because he had no omega-3s. Yeah. That is great. I had no idea. I guess that's the perfect food for astronauts.

JV: I went to Russia in the '70s. All they had was canned fishy stuff, including caviar.

JM: That's another great source of omega-3s.

JV: I loved it. It's wonderful stuff. But one of our astronauts, a medical doctor who went up with the Russians, lost 17 pounds in his mission because he wouldn't eat the Russian food. Okay? The Russians have always said they don't have such a problem with keeping their cosmonauts healthy. Well, maybe it's their diet they've had all along and nobody paid any attention and we turned our noses up a bit.

JM: Yeah.

JV: These are silly little things that you get to observe and to think about when you're sitting around retired or semi-retired.

JM: Most likely, it would seem that it's a real challenge to change that, because of the conventional wisdom and medical viewpoints on the whole process. You're not going to disrupt that because you're some oddball PhD who has these ideas. You're not a medical doctor.

JV: It's a seismic event that will change it. Unfortunately, that's the way we are.

JM: Yeah. But it doesn't change the reality. I didn't even realize that the cosmonauts had a more advanced way of thinking on them. It's interesting.

JV: Well, I don't think they did it with ketogenic diet on purpose. I think they did it because that's what they had.

JM: Yeah. Well, it works.

JV: It worked. They've probably gone down the hill since they've been eating American food.

JM: Yeah. I would imagine that would be the normal consequence. It's precisely what you would predict. Alright. This has been great. It's so good to reconnect with you again and see that you're still doing well. Anything up in the future? Any big plans coming up?

JV: I'm out there flagging and talking. One of the interesting things I saw in the space program, I was hired because of my stress research.

JM: That's right. That was your original position. That's why they hired you.

JV: Yeah. I think I'll go back to that. I've sort of almost done it, but I want to restructure it and do it in a different way, a more personal way, [with] a book called *Stress Beyond 50*.

JM: Great. You're doing fine.

JV: There are more of us around.

JM: Yeah. I just interviewed Dr. Dale Bredesen. Are you familiar with his work?

JV: Yeah.

JM: Yeah. Great guy. He was interviewed on STEM-Talk too. Great work that he's doing. He's just a pioneer. He comes out with a new book in September on how to end Alzheimer's, which is an epidemic. He's got some great strategies in there that are really aligned with what we're teaching.

JV: Yeah.

JM: Powerful stuff.

JV: Absolutely. It's possible.

JM: He's convinced. He's probably one of the leading experts in the world on Alzheimer's.

JV: Yeah.

JM: There's no reason to disagree with him.

JV: Yeah.

JM: Thanks for everything you've done. I really appreciate it. Keep up the great work. It's always good talking to you.

JV: Thank you. Your book is fantastic.

JM: Thank you. I'm glad you liked it.

JV: Very much.

[END]