

# A Body in Motion Stays Healthier Longer

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## STORY AT-A-GLANCE

- › Intermittent, low-intensity but high-frequency movement is a powerful, inexpensive and highly effective strategy for health and longevity
- › Without gravity, your vestibular system begins to deteriorate; hence, astronauts lose spatial awareness. Inactivity mimics low gravity situations, so inactivity will increase your risk of poor balance and the possibility of falling
- › Standing up for 15 minutes every two hours effectively counteracts the ill effects of sitting. Other data suggest standing up once for a minute or two every 20 to 30 minutes is a good countermeasure

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Getting consistent movement into your daily life is a profoundly powerful intervention for health and longevity. Several years ago, I interviewed Joan Vernikos, Ph.D., on this topic. She's a true pioneer in this field and was one of the first professionals to understand the value and importance of regular movement, not exercise, for the preservation of health and prevention of disease.

Vernikos was hired by the National Aeronautics and Space Administration (NASA) in 1964, five years before Neil Armstrong landed on the moon. She served as director of the Space Life Sciences at NASA from 1993 until 2000, and has written over 200 scientific papers. Her book, "[Designed to Move: The Science-Backed Program to Fight](#)

[Sitting Disease and Enjoy Lifelong Health](#)," is the sequel to her previous book, "Sitting Kills, Moving Heals."

## Health and Fitness Supersedes Age

"Designed to Move" is dedicated to John Glenn, the first American astronaut to do an orbital flight and a U.S. Senator. He died in 2016 at the age of 95, but made headlines when he flew back into space at the age of 77. Vernikos was instrumental in helping him get back into space.

*"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?'" Vernikos says. "The oldest person at that point was Musgrave at 52 ... Glenn wanted to fly again because John F. Kennedy had prevented him from going to the moon.*

*He was a national hero and it wouldn't be politically pleasant if something happened to him, so he was forbidden from flying again ... Then one day, as senator, he arrived at NASA. My administrator said, 'What do you think? Should we let John fly again?' ...*

*I said, 'Arbitrarily, why not? But let's do some homework with the National Institute on Aging.' We started asking questions of experts. The answer came back. 'Well, there is no reason to exclude him, as long as he is healthy and fit' ...*

*[Glenn] was extraordinary. My concern was not that anything would happen to him during the flight, but how would he recover or would he recover? ... He came back, of course ... We had a session at the National Institutes of Health on the results, which were all double-blind ... The chart was put up with the clustered data from all seven crewmembers ...*

*[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, Glenn was among the cluster, and the one outlier was 35 years old ... [Glenn] also recovered very fast ...*

*The message came back loud and clear: If you are healthy, you are fit and you take care of yourself, there's no reason you can't do anything that anyone else can do whatever your age."*

## **Inactivity Simulates Lack of Gravity**

One of the things we discussed in depth in the last interview was the effects of microgravity (defined as gravity below the threshold of what we perceive as gravity) on the human body, and how inactivity produces effects that are very similar to those experienced by astronauts in space. Changes occur in the microgravity of space that are very reminiscent of those of aging on Earth, except they happen 10 times faster.

Take bone loss for example. On Earth, you lose about 1% of your bone mass per year, starting at the age of 20. Astronauts, on the other hand, will lose about 5% of their bone mass after just a few months. In one case, an astronaut lost 30% of his bone mass in six months, and that despite an aggressive exercise program. Astronauts spend between two and four hours a day exercising to counteract the effects of zero gravity.

*"We have never flown an astronaut without exercise. What we've seen is always with the exercise. This is what worries me ... There is no control [group] and we're getting a lot of adverse effects as it is, even with exercise. I have a theory about that ... 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 ...*

*This after-response to exercise is 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. When the body first responds to microgravity ... 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 microgravity ... is a mirror image of your response to standing ..."*

Vernikos believes exercise can be made more effective for astronauts if it's distributed throughout the day in intermittent periods. In other words, the answer, she thinks, is intermittent, low-intensity but high-frequency all day. The same applies to us here on Earth. The key to optimal health is continuous movement during waking hours.

The fact that most people spend long hours sitting for work is a significant problem, and Vernikos' book outlines a program developed specifically to help deskbound professionals counteract the ill effects of uninterrupted sitting.

An interesting side note, with regard to the bone and muscle loss astronauts suffer, is that diet can also have a tremendous influence. Specifically, Vernikos recommends a ketogenic diet for astronauts to protect their bone and muscle mass and optimize mental functioning. Russian cosmonauts typically had fewer health problems, which she attributes to their diet, which (at the time) included a lot of canned fish like sardines, which are high in healthy omega-3 fats.

## **Spatial Awareness Diminishes With Inactivity**

Space research also reveals that, without gravity, the vestibular system (located in your inner ear) and the brain maps that tell you where you are, relative to your environment, begins to deteriorate. Hence, astronauts begin to lose spatial awareness. In one case, an astronaut who had spent a mere nine days in orbit nearly fell on his face while standing on a posturography sway platform back on Earth. Yet, he remained completely unaware that he was leaning forward and had started to fall.

With inactivity mimicking microgravity, what this means in terms of being a human on Earth is that inactivity worsens your spatial awareness, thereby increasing your risk of losing your balance and falling. The good news is, you can reacquire this function.

*"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," Vernikos says.*

Your vestibular system also influences biological functions such as your blood pressure. Bone loss and muscle atrophy can also be related to a dysfunctional vestibular system. "These are just three critical responses that we know happen when you reduce the gravity stimulus," Vernikos says.

Astronauts returning from space flight will typically experience a sudden drop in blood pressure when standing up. This orthostatic hypotension is an important indicator of the function of the cardiovascular system and its relationship to the vestibular system. Another effect is that the endothelium, the lining of your blood vessels, virtually disappears. Experiments with rats reveal their veins and arteries turn translucent after spending time in space.

This is important because the endothelium is where large amounts of nitric oxide (NO) are stored, and NO is a really important biomodulator. At present, scientists have barely scratched the surface on that side effect and its implications. Vernikos believes the best way to stimulate your vestibular system is with postural changes – in other words, physical movement. She explains:

*"[Movement] is the most basic stimulus that we experience many, many times a day, or should. It involves the signal that 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, you will have the tendency to faint. You will have a low blood pressure or a sudden drop in blood pressure."*

## **Practical Strategies**

So, what are some practical strategies you can use to circumvent the damage that occurs during inactivity? Vernikos believes one of the oversights in the field has been the emphasis on total hours seated instead of the uninterrupted hours seated.

In other words, if you interrupt sitting reasonably frequently, you're less likely to experience the adverse effects of prolonged sitting, which include a heightened risk of cardiovascular problems, stroke and cancer, especially colorectal, gastrointestinal, ovarian and prostate cancers.

Diabetes, obesity, depression and a reduction in cognitive reactions in children are also associated with excessive uninterrupted sitting. "I feel there is a circulation component with sitting – a collusion aspect that contributes and makes things worse all-around," Vernikos says.

## **Intermittent Standing Is an Important Biological Tuning Mechanism**

One of the benefits of exercise is an increase in brain-derived neurotrophic factor or BDNF. Another is an increase of peroxisome proliferator-activated receptor gamma coactivator 1-alpha (PGC1- $\alpha$ ), an obscure metabolic pathway responsible for improving mitochondrial function.

While it's unclear whether merely standing up might impart these same metabolic benefits, what is known is that within as little as 30 minutes of sitting, triglyceride levels increase, often related to diabetes. That's a 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," Vernikos says.*

*"We have to be a little more critical about how we do things in real life before we jump to all kinds of conclusions. The intermittent standing signal is just that. It's a signal. It's a tuning mechanism ... If spread out throughout the day, that's terribly important. For sitting, I would recommend [standing up] 32 to 36 times [per day]. I'll tell you why.*

*One of the last experiments I did was with volunteers in bedrest, lying in bed continuously ... I used standing [for 15 minutes] as a control. My experiment was on exercising on a treadmill for 15 minutes every two hours or every four hours throughout the day.*

*When I got the results (this was a double-blind study) ... [my] statistician ... said, 'Joan, you're not going to like these results ... Standing was more effective than exercise on the treadmill in preventing the changes induced by the continuous inactivity of bedrest.'"*

## **Intermittent Standing Benefits the Elderly and Handicapped**

Remarkable as it may seem, simply standing up for 15 minutes every two hours was more effective for preventing biological changes than walking for 15 minutes every two or four hours. Other data suggest standing up every 20 to 30 minutes is a good countermeasure. Importantly, Vernikos' experiments suggest even the elderly can regain mobility and independence simply by standing up for a short time every half-hour or so.

*"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 participate all gained a good degree of independence. Is it the answer for longevity? I don't know. But it helped them gain their independence," she says.*

Even those who are wheelchair bound can benefit from standing, using a stand-up capable chair. There are a number of sit-stand wheelchairs on the market, allowing you to raise yourself up to standing position provided you have use of your arms. "It's a superb device," Vernikos says. "You can go shopping and look at things at eye level. You can talk to other people at eye level. It is a very important addition to the disabled."

## **Keep Your Body in Constant Motion**

The take-home message is that for optimal health, you want to stay in more or less continuous motion during waking hours. (Sleep has its own specific regenerative

functions, and movement is not on the list of things that need to occur at night.)

The good news is there are virtually unlimited opportunities for movement throughout the day. It doesn't need to be anything special at all. Housecleaning, stirring a pot of sauce, rolling dough, gardening, hanging clothes to dry or bending over to pick up an errant sock all count.

So does standing and shifting your posture to and fro. At bare minimum, you'll want to interrupt your sitting every 20 to 30 minutes, even if it's just to stand up for a moment and then sit back down. If you're currently struggling with poor mobility, consistently doing this may help you regain some of your lost independence. Once you can do more, do more. When I am at home I typically sit less than an hour a day.

One strategy that can effectively improve your activity level is having a pet. According to a 2017 study,<sup>1</sup> having a dog will increase moderate physical activity by an additional 22 minutes a day, which is not insignificant. Other suggestions include using a vibrating platform such as the Power Plate or even a mini trampoline. Both work by increasing the force of gravity on your body, which is at the heart of the issue.

A trampoline or rebounder, of course, will increase G forces on your body to a far lesser degree than a vibrating plate, but it's enough to increase circulation of oxygen and nutrients to your tissues and organs, and promote increased muscle and bone strength. A vibrating platform is the ideal choice for the elderly and infirm, for whom a rebounder might be too hazardous.

In fact, whole body vibration training has been scientifically shown to mimic the metabolic effects of exercise,<sup>2</sup> and can help those who are too obese to exercise get started.

To learn more, pick up a copy of Vernikos' book, "[Designed to Move: The Science-Backed Program to Fight Sitting Disease and Enjoy Lifelong Health](#)." In it, she provides deskbound professionals a practical, easy-to-follow movement plan to fight the debilitating effects of uninterrupted sitting.



## Sources and References

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- <sup>1</sup> BMC Public Health volume 17, Article number: 496 (2017)
- <sup>2</sup> Obes Facts. 2010;3(2):93-100