

Resolving to stay fit in space and on Earth

February 23 2015



Catherine (Cady) Coleman, Expedition 26 flight engineer, performs calibrations on the VO2max Portable Pulmonary Function System (PPFS). The PPFS is located next to the Cycle Ergometer with Vibration Isolation System (CEVIS) so astronauts can measure their oxygen consumption while riding the CEVIS.
Credit: NASA

In February, our attention turns to romantic matters of the heart. As American Heart Month, this month is also a time to focus on heart health and a perfect excuse to start working out to improve your physical fitness. Astronauts on the International Space Station are working to

keep their hearts healthy too, and at the same time they are generating data to advance knowledge of health and fitness in space and on Earth.

Astronauts exercise regularly while in space to maintain muscle, bone, and cardiovascular health and fitness and to remain fit and strong enough to perform physically demanding tasks such as extravehicular activity. Scientists have frequently measured the effectiveness of that exercise during short spaceflights.

Now, researchers have assessed exercise on longer spaceflights with the help of astronauts on the space station, measuring their VO₂ peak before, during and after missions of four to five months.

Widely accepted as the best measure of [cardiovascular fitness](#), VO₂peak, also called VO₂max, is a measure of peak oxygen uptake. That represents the highest amount of oxygen your body can use to produce energy during exercise. Oxygen is used by cells to provide the energy to perform work and a more aerobically fit person's cells take up and use more oxygen, explains Meghan Downs, senior researcher at NASA's Exercise Physiology Laboratory.

VO₂peak is measured using a bicycle test, with astronauts starting at low intensity and gradually increasing pedaling resistance over a short period of time until they could no longer pedal the bike. The tests were performed three months before launch to the space station; after approximately 15 days in space; every 30 days throughout flight; and one, 10 and 30 days following return to Earth.

According to the results, published in the *Journal of Applied Physiology*, VO₂peak decreased by an average of 17 percent by day 15 in space, but then gradually increased during flight. Most astronauts never recovered their preflight VO₂peak levels during the mission, but a few were able to maintain or even improve VO₂peak during flight with frequent bouts of

high intensity exercise.

Currently, each crew member is prescribed a two-hour daily workout using three pieces of equipment on the station. This investigation will help scientists design these individualized exercise programs. The data also will help predict what activities an astronaut should be able to tolerate after a long spaceflight, which will help in planning future missions. Astronauts with higher VO₂peak levels, for example, would be better able to work in heavy spacesuits exploring an asteroid or walking around Mars.

"We now have evidence that VO₂peak can be maintained during long-duration missions using available exercise hardware and prescriptions," says Downs. "However, the hardware currently in use on the [space station](#) is simply too big and draws more power than exploration vehicles will allow. We will need to find new and creative ways to maintain astronaut health and fitness on those missions."

One way could be interval exercise, which alternates periods of high intensity with short periods of low intensity effort. According to Mark Guilliams, head of the Astronaut Strength, Conditioning and Rehabilitation group, this approach has been shown to be effective at maintaining VO₂peak in space. It also has wide-ranging applications on Earth.

"High intensity protocols are very effective in the general population," says Stuart Lee, lead research scientist in NASA's Cardiovascular Laboratory. "This form of exercise can benefit not just 20-year olds who want to be fit and strong, but also those in cardiac rehabilitation and pulmonary care." An ongoing study on the station, called SPRINT, is evaluating the effectiveness of this protocol during long-duration spaceflight.

Thanks to these investigations, improved workouts will keep [astronauts](#) fit and ready to perform, and could give the rest of us a reason to celebrate.

Provided by NASA

Citation: Resolving to stay fit in space and on Earth (2015, February 23) retrieved 1 May 2024 from <https://phys.org/news/2015-02-space-earth.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--