

THE SECRET MISSION THAT DEFEATED THE TALIBAN

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Men's Journal

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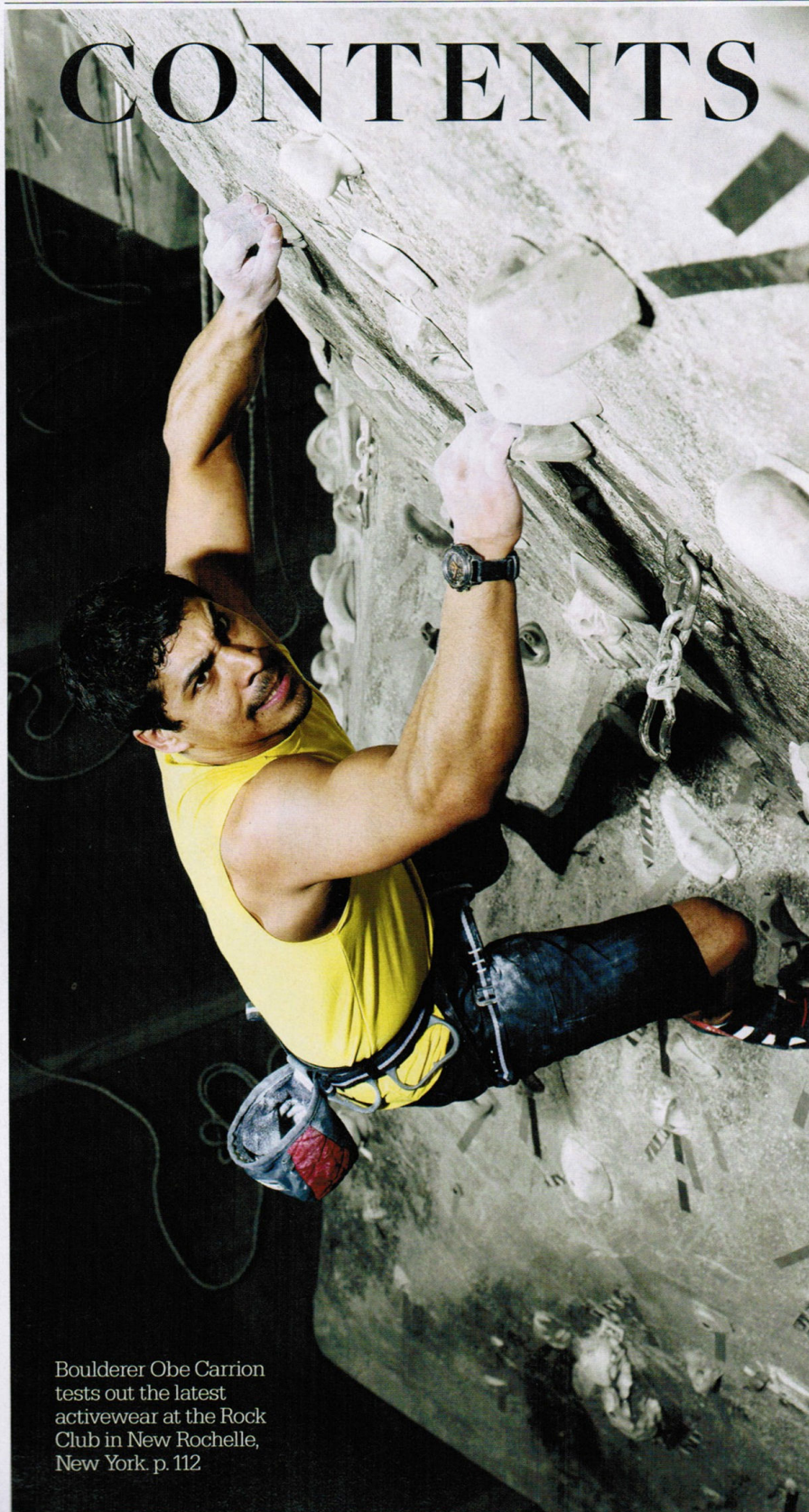
10 Trips You
Can Train for &
Take in Six
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photograph by Michael Dwornik

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FITNESS'S FINAL FRONTIER

NASA's scientists looking to keep astronauts fitter during long missions to space have figured out how to keep us all younger.

by JASON STEVENSON

photographs by **Scott McDermott**

DUE TO THE FACT THAT ONLY A HANDFUL OF people ever make it above the stratosphere, it may seem strange that the newest set of rules regarding health and fitness here on Earth would emanate from the stars. But thanks to expensive trial and error by NASA, that's exactly what has happened.

It all started in 2001 when missions to space became longer and longer and scientists needed to figure out a way to keep employees in shape while in orbit. "In zero gravity your muscle mass and bone density drop incredibly fast, about 1 percent per month,"

says Suzanne Schneider, a former NASA scientist and professor of physical performance at the University of New Mexico. "Your heart muscle atrophies, and bones in your hips, spine, and legs shrink, causing you to lose strength and power."

In an attempt to remedy this, a group of astronauts aboard the International Space Station (ISS) strapped themselves into an exercise machine called the Interim Resistance Exercise Device. The multimillion-dollar iRED was simple enough: Elastic coils were packed in trash can-size metal cylinders and bolted to the floor a little farther than two feet apart. After donning enormous

shoulder pads connected to the cylinders by steel cables, astronauts pushed upward from a squat position, pulling the cables to stretch the elastic bands, thus achieving a lower-body workout in a weightless environment.

But when astronauts returned to Earth, scientists discovered that their bodies had become so brittle that they had actually aged 12 times faster than if they had been on Earth. "They were losing cortical and trabecular bone, which stall osteoporosis and protect against fractures," says Yamil Garcia, an astronaut training specialist at NASA's Johnson Space Center in Houston. "Losing bone like that is a key indicator of aging." In space, this happens after just 10 days; on Earth, most men start having a harder time adding bone mass around age 30.

Scientists found that the only way they could reverse this process was by using exercises that deformed the bone cells (think of them squishing, like a tennis ball you're standing on). This, they found, slowed bone mineral reabsorption (a natural process in the body that weakens bones) and increased bone density. They thought the iRED would accomplish this. But it didn't work.

"The elastic bands simply didn't provide enough resistance," says Garcia. "And the resistance they did provide wasn't consistent enough to affect the bone mass of the astronauts."

The news wasn't all bad. "The failures of the iRED helped us discover exactly what kind of exercises people need to be doing to reverse the aging process," says Barry Spiering, an exercise physiologist and a colleague of Garcia's at Johnson Space Center. "We were able to discover three key rules about fitness and longevity."

RULE 1: Use heavy weights (at least 80 percent of your max).

"In order to sufficiently work muscle and bone fiber to the point where the aging process is slowed," says Spiering, "people can't just run and play sports." In space, the NASA astronauts experienced accelerated atrophy — even if they ran on treadmills. Heavy lifting — rather than static loading, as during a jog — was the only way, NASA scientists found, to deform the bone cells enough to grow cortical bone. To achieve this effect on Earth, Spiering found that resistance training — exercises such as squats, bench presses, and dead lifts — at 80 to 85 percent of the maximum amount you can lift is the optimum way to stop bone and muscle deterioration.

RULE 2: Slow down. Lifting weights isn't nearly as critical as how you lower them.

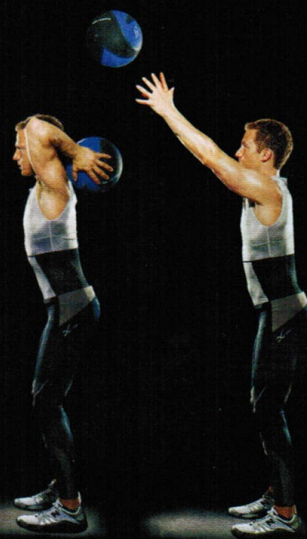
The iRED revealed that the fluctuating resistance due to its elastic webbing limited eccentric forces — the resistance generated by lowering a weight — by 60 percent. Although iRED users were able to gain some muscle strength from the machine, their bone density decreased rapidly. Schneider assumed that the machine's inability to generate eccentric force was the culprit. So in 2003 she put a group of men on a steady diet of exercises with free weights, which increase eccentric force when lowered slowly. (This theory had been out there before. In the early 2000s, many fitness buffs began clinging to an exercise program called Super Slow, which promised to increase metabolism and lower bad cholesterol. It seemed to work — though people weren't sure why — and soon after many people replaced it with more functional training like CrossFit.) After 16 weeks, she tested the men's bone mineral density and found that it had improved dramatically from their pre-program levels.

RULE 3: Drop the number of reps (keep the intensity high).

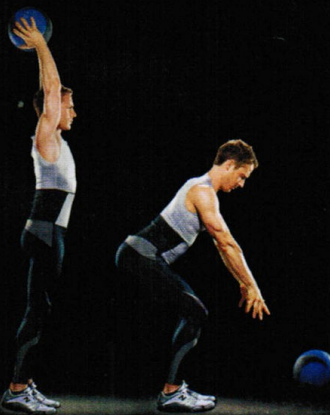
Earlier this year Scott Trappe, the director of the Human Performance Lab at Ball State University, in Muncie, Indiana, used NASA's data from nine astronauts aboard the ISS to conduct and publish a study about weightlessness and exercise in the *Journal of Applied Physiology*. Using MRIs and biopsies to measure muscle fibers, he concluded that intense movements, like sprinting, jumping, and throwing (see the exercises at right), along with lifting heavy weights, resulted in better muscle size, a key element to protecting bones and thus keeping them from aging too quickly. The discovery wasn't exactly surprising, but Trappe's study did bust one misconception about the amount people exercise. "Most people think that more is better," he says. "But our study showed that exercise should be done much less frequently than conventional wisdom suggests — but with much greater intensity." Says Garcia: "The most recent space flight research indicates that doing six to eight reps — not the typical 10 — best maintains muscle function and strength." In a recent study, Trappe found that elderly men who had been training three days a week, at 80 percent of their maximum loads, were able to maintain their muscle mass with just one high-intensity workout a week. ■

SPACE TRAINING

Along with lifting weights, these exercises, done once a week, start to turn back the aging process.



▲ MEDICINE BALL OVERHEAD THROW
Stand four feet from a solid wall with your knees slightly bent, holding an 8- to 10-pound medicine ball with two hands behind your head. Throw the ball, using your shoulders without moving your torso. Catch the rebound. Repeat five times.



▲ MEDICINE BALL SLAM-DOWNS
Looking forward, stand on the balls of your feet while holding an 8- to 10-pound medicine ball straight over your head. Fully extend your back, knees, ankles, and elbows, then slam the ball to the ground, allowing your feet to flatten. Catch the rebound. Repeat five times.



◀ MEDICINE BALL CHEST THROW

Stand four feet from a solid wall. Hold an 8- to 10-pound medicine ball in both hands at chest level, your elbows out to the sides. Heave the ball with both hands — like a forward push pass — at the wall at a spot slightly higher than your chest. Catch the rebound. Repeat five times.

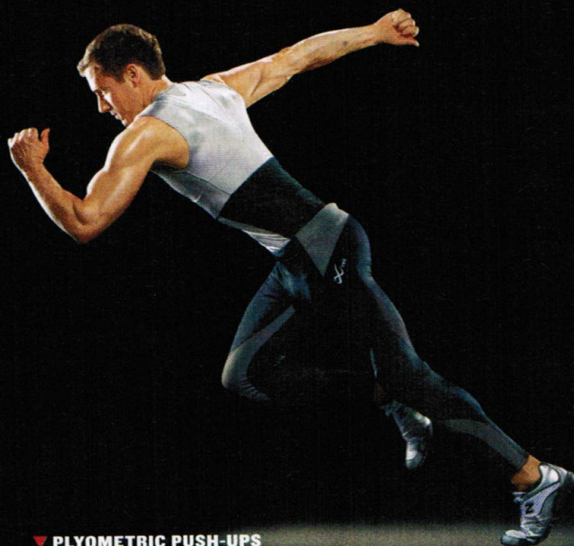
▼ LATERAL CONE HOPS

Line up five cones (or small boxes that you can leap over) two to three feet apart in a straight line. With your feet shoulder-width apart, jump sideways down the row of cones — jumping over each cone. Throw both arms over your head to add momentum to your jumps. When you reach the end of the cones, reverse direction to complete one set. Repeat the entire exercise five times.



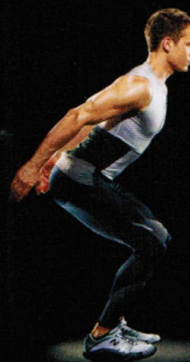
▼ SPRINTS

Run six sets of 30- to 45-second sprints as hard as you can, with a 90-second rest between each set.



▼ PLYOMETRIC PUSH-UPS

Assume a regular push-up position, but when you push up, use enough explosive force so that your hands leave the ground. Keep your arms straight while your body is suspended in mid-air. Touch down and lower your chest slowly, then push up again. Repeat five times.



▲ BOX JUMPS

Stand facing a 12- to 16-inch-tall sturdy box. Keep your head facing forward and your torso upright. With your feet just under your shoulders, leap onto the box, extending your arms upward as you jump. After landing, extend your body up to full height (don't crouch). Jump down backward from the box. Repeat five times.