

# Engineering Better Minds and Bodies

Healing therapies come in many forms—including these innovative biohacks.

BY AMY PATUREL



In today's fast-paced world, you can't survive unless you find ways to bolster both body and mind. Whether you're a Gen-Yer looking to mastermind the latest app, a Gen-Xer trying to land a top executive job or a baby boomer who is entering your golden years, there are a slew of nerve- and neuron-stimulating gadgets promising to help you stay at the top of your game.

Bonus: You can use these tools without a doctor's prescription—

and often in the comfort of your own home. From specialized garments designed to stimulate your nerves to freezing cold chambers that speed recovery, the following biohacks are changing the healing therapy landscape.

## SMART CLOTHING

Musical mastermind Davey Johnstone has been performing with Elton John since he was 20 years old. The 66-year-old musician plays more than 100 guitars, mandolins and banjos on stages from

Las Vegas to Queensland.

"Performing onstage for three hours straight, four nights a week, really takes a toll," Johnstone says. Add a heavy travel schedule to the mix and it's no surprise Johnstone suffers from chronic neck and back pain. "I told Elton, if this keeps up, I'll have to quit!"

To preserve his form and function, Johnstone tried functional garments instead. These so-called "medical devices" strive to alleviate pain by forcing the body into alignment.

“[THE ALIGNMED SHIRT] TRULY IS FUNCTIONAL APPAREL. YOU PUT IT ON AND IT STABILIZES YOU, ALMOST LIKE A SPLINT. IF YOU HAVE A TREE THAT’S BENDING, A STAKE CAN HOLD IT INTO POSITION SO IT GROWS TO STAY UPRIGHT. THE SAME IS TRUE OF A MISALIGNED SPINE.”

—CARLOS PRIETTO, M.D., ORTHOPEDIC SURGEON AND TEAM PHYSICIAN FOR THE UNIVERSITY OF CALIFORNIA IN IRVINE AND MATER DEI HIGH SCHOOL IN SANTA ANA, CALIFORNIA



“Good or bad, posture has dramatic affects on everything from physical performance to mental focus,” says Carlos Prietto, M.D., orthopedic surgeon and team physician for the University of California in Irvine and Mater Dei High School in Santa Ana, California. After all, if you’re mechanically distorted, you’ll have less energy for thinking and healing. So it’s no wonder the American Medical Association labeled poor posture as a condition that exacerbates all other chronic diseases.

To circumvent the negative side effects of poor alignment and to help people stand taller, manufacturers have created “smart” clothing equipped with trackers that vibrate when you slouch or that stimulate specific muscle groups. One such maker, Southern California-based Alignmed, is creating garments with something called neurobands. The tightly woven elastomeric material gently coaxes the body’s muscles into alignment.

“The bands lay on important muscle groups where they stimulate nerves, enhance circulation and reduce inflammation,” says Alignmed founder Bill Schultz. “And the bands activate with the slightest body movement, creating a sort of controlled resistance so it’s almost like you’re getting a workout without working out.”

The science behind functional garments by Alignmed and IntelSkin has been used for decades through the practice of skin taping (commonly used in orthopedic and chiropractic medicine). The health benefits of Alignmed’s outfits are so striking that the Food and Drug Administration registered them as class 1 medical devices and they’re eligible for prescription use under Medicare and private insurance.

These high-powered shirts, bras, tank tops and tights not only improve posture and activate muscles, but they also may increase blood flow, reduce inflammation and trigger the body’s natural healing mechanisms. That’s why Johnstone wears the garments on transatlantic flights—for their ability to keep muscles engaged, even when sitting for hours.

“At first, it’s uncomfortable—almost like someone wrapped you in bandages,” he says. “But after a show or a flight, when you take all the garments off, you don’t feel any pain.”

Most important, Johnstone discovered that wearing functional clothing enhanced his mobility. “When I visited my orthopedic surgeon after wearing Alignmed products for about a year, he couldn’t believe how well I was moving,” Johnstone says. “He did a repeat MRI of the disk contusion in

my neck and discovered the inflammatory fluid level had dropped by almost 40 percent.”

But high-powered performers and celebs aren’t the only ones who benefit. In fact, the majority of functional garment wearers are everyday folks suffering from overuse injuries and chronic neck and back pain from too much computer time (among other sedentary activities). Some products, such as PostureTek, come equipped with an electronic sensor that detects when you slouch and vibrates as a reminder to stand straighter.

“Hunching over a computer for 40-plus hours each week makes everyone prone to spinal misalignment as well as back and neck pain,” says Prietto, who wears an Alignmed shirt while he’s performing surgery. “It truly is functional apparel. You put it on and it stabilizes you, almost like a splint,” he says. “If you have a tree that’s bending, a stake can hold it into position so it grows to stay upright. The same is true of a misaligned spine.”

More good news: When your head is aligned with your spine, there’s better blood flow to the brain, creating more energy for mental pursuits.

In a 2016 study published in the



“OVER TIME, WE’RE GETTING LESS AND LESS SLEEP

... WE’RE LOSING ON AVERAGE ABOUT 90 MINUTES, OR AN ENTIRE REM SLEEP CYCLE.”

—SUZANNAH BOZZONE, M.D., FAMILY MEDICINE PHYSICIAN AND LIFESTYLE MEDICINE DIPLOMAT ASSOCIATED WITH ERLANGER INSTITUTE OF SPORTS AND HEALTH IN CHATTANOOGA, TENNESSEE

*International Journal of Occupational Safety and Ergonomics*, researchers reported that sedentary computer workers were 13 percent more productive and had 29 percent less muscle fatigue when wearing posture shirts. That competitive edge is certainly true for Johnstone, who in his mid-60s, still rocks the stage like a teenager.

#### LED LIGHT DEVICES

University of Oklahoma student Jackson Stoever suffered his first blow to the head around age 6 or 7 when playing baseball. He endured multiple concussions playing high school sports, including one incident where he did a face-plant on the basketball court and knocked out four teeth. During his senior year in high school, he literally hit a

wall trying to keep a ball from going out of play.

Once a bright student with a 4.0 grade point average, Stoever began suffering from debilitating headaches, depression and an inability to focus or stay on task. “He couldn’t study, he couldn’t have the lights on, he couldn’t even watch TV,” says his mom, Sally Stoever. “By his freshman year of college, he was

## SNOOZE TOOLS

Sleep deprivation is America’s epidemic with nearly 50 million Americans reporting a sleep disturbance in the past year and up to 40 percent suffering from insomnia nearly every night. Trouble is, insufficient shuteye—whether medically related or not—can sabotage your ability to function at your best. You might even find yourself nodding off at your desk, never mind what sleep deprivation does to your relationships.

“Over time, we’re getting less and less sleep. Compared to our great-grandparents, we’re losing on average about 90 minutes, or an entire REM sleep cycle, which is the most restorative type of sleep,” says Suzannah Bozzone, M.D., family medicine physician and lifestyle medicine diplomat associated with Erlanger Institute of Sports and Health in Chattanooga, Tennessee.

From weighted blankets to sleep-friendly light bulbs, these high-tech tools can help ensure that you achieve restful slumber.

### 1 RED LIGHT BULBS

“Darkness [is] best for sleep, but if you have to have a night light, use a red light spectrum bulb,” Bozzone suggests. Not only are red wavelengths of light more conducive to sleep, they’re also a nice way to wind down before lights out.

their usual activities boosted their nighttime melatonin levels 58 percent over two weeks. They also reported sleeping better and longer—up to 24 minutes more each night. Don’t want to wear funky glasses? Use the “night shift” setting on your smartphones and computers—if you must use them—after hours.

### 2 BLUE LIGHT BLOCKERS

Blue light emitted from smartphones, computers, e-readers and, on a smaller scale, TVs and LED bedroom lights, interfere with your body’s ability to produce the sleep hormone melatonin. In a study published in *Ophthalmic & Physiological Optics*, people who sported blue light-blocking glasses for three hours before bed while still performing

### 3 WEIGHTED BLANKETS

Occupational therapists have been using heavy blankets on healthy adults for decades to quell stress and anxiety. The functional linens feel, well, heavy. With hundreds of weighted pellets sewn into the fabric, weighted blankets envelop your body like a warm hug. The weight of the blanket acts like a form of touch therapy, encouraging

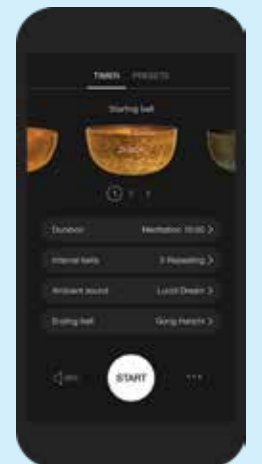
production of the feel-good hormone serotonin while simultaneously reducing stress and anxiety. In fact, Swedish researchers reported that adults fell asleep easier and slept longer when resting under a weighted blanket.

### 4 SOUND MACHINES

Busy hotels, loud neighbors or even a noisy radiator can make falling asleep a challenge. The noise in your mind also can prevent restful slumber. Your best bet: Amp up the soothing background noise. Turn on a sound machine, Zen out to a guided imagery CD or play background music. The low, continuous sounds from any of these aids can help drown out disruptive racket.

### 5 RELAXATION APPS

From apps that encourage deep breathing to meditation timers, myriad tools exist to lull you to restful slumber. “Calm, Insight Timer and Headspace are three meditation apps worth checking out—and have free components to them,” Bozzone says. “Apps that guide you and cue you to use your breath are helpful not just for sleep but also for a lot of the cognitive and emotional ailments we face.” Each of these tools helps ground us in the present moment.



ready to drop out of school.”

Sally started investigating options and discovered a low-level light therapy device called Vielight. “Fifteen minutes into his first 20-minute treatment, Jackson called me and said, ‘Mom, this is a miracle! I can move my head from side to side without getting a headache,’” she says. “Within a couple of weeks, he was able to focus, stay on task, and within six weeks, he was making a 4.0 again.”

Turns out, people—like plants with photosynthesis—react positively to light. From Babylon to ancient Greece, light has been used to promote healing for centuries. But it wasn’t until the early 1990s that doctors in America began using light to alleviate skin conditions, stimulate wound healing and quiet the storms of seasonal depression. More recently, researchers have learned that certain wavelengths of light, including red and near

infrared, can stimulate, regenerate and protect damaged tissue—and that makes it an ideal treatment for everything from a sprained knee to traumatic brain injury.

“Unlike sunlight and incandescent light bulbs, light in the red and NIR wavelengths can penetrate deep into the tissue and potentiates athletic and cognitive performance,” says Michael R. Hamblin, Ph.D., principal investigator at the Wellman Center and associate

## BIOHACKS BUYER'S GUIDE

Whether you're interested in an at-home healing device or you're seeking novel therapies, it's important to do your homework. While there are many reputable companies in the healing space, there's a lot of snake oil out there, too.

“Research the manufacturer of the device you're interested in, ask for safety and efficacy data and find out if the company has a medical adviser on staff and what credentials that person has,” suggests Anthony Lyssy, M.D., medical director of Diamond Physicians in Dallas.

Then, no matter which device or therapy you choose, pay attention to how your body responds. Do you have more energy? Are you sleeping better at night? Have you been able to skip pain medications? If you don't notice a measurable difference in your health or quality of life within a few weeks of starting a new therapy, consider taking a break or trying something else. A few of our experts' favorite picks:

### POSTURE GARMENTS

Many people confuse compression garments with functional apparel, but they are entirely different animals. Compression garments squeeze the muscles and work while you're wearing them; nerve-stimulating functional wear uses the science of taping to engage muscles, enhance blood flow and reduce inflammation, even hours after you've taken them off.

#### Some favorites:

PostureTek, Aligneded, IntelliSkin

### LIGHT TOOLS

Visit Amazon.com and you'll find dozens of light devices.

reVive  
light  
therapy  
slippers



According to Michael R. Hamblin, Ph.D., associate professor of dermatology at Harvard Medical School, some boast a lot of power—others, not so much. Unfortunately, the average Joe doesn't know what is what.

“People who don't understand the elementary principles of optics or light don't know which wavelength, energy density or power density to choose—and they don't know which part of

the body to shine the light on,” Hamblin says.

His advice: Select a LED array and use it on your entire body for general wellness. The whole-body devices will set you back by at least \$2,000 or more, but proponents say its power is well worth the investment. “I tell people to take their clothes off, lie down in bed and cuddle the



reVive light  
therapy neck pillow

thing,” Hamblin says.

#### Some favorites:

Joovv, THOR Photomedicine, Vielight, reVive Light Therapy

### CRYOTHERAPY DEVICES

While most people get cryotherapy in a gymlike



CryoNiQ Cryochamber

setting, you can purchase at-home devices to use at your convenience. Since research on cryotherapy is still in its infancy, it's best to work with a qualified professional to guide your purchasing decisions.

#### Some possibilities:

Zimmer Cryo 6, CryoNiQ Cryochamber

professor of dermatology at Harvard Medical School, who has been studying light therapy for more than 30 years. Whether you're a healthy adult, an injured athlete or a senior who can't remember where you left your keys, light acts as a trigger to help the body heal itself.

"One way light produces these systemic effects is by stimulating stem cells," Hamblin explains. "The light coaxes stem cells out of the

remarkable effects. In addition to coaxing stem cells into circulation, phototherapy stimulates mitochondria, or what University of Wisconsin-Milwaukee researcher Janis Eells, Ph.D., dubs the battery pack for all the body's cells. "When injury or illness triggers the immune response, NIR not only resets the mitochondria so they can function normally again, it also tamps down the inflammatory response so

lasers and LEDs for treating pain and skin conditions such as acne and psoriasis. Any other use is considered experimental.

Another issue: dose. It's no secret that light, at least in the UV spectrum, can be dangerous. Natural sunlight, for example, causes fine lines, wrinkles and, yes, skin cancer. And while light in the red and NIR wavelengths appears to promote healing and boost energy in cells, there isn't enough research yet to say that phototherapy is risk-free.

That doesn't deter Stoeber. He's convinced light therapy has obliterated his headaches and improved his quality of life. "For a while, I couldn't do anything but lay in a dark room," he says. "Now my headaches are gone, I'm more active and I get more accomplished."

"FOLLOWING A SERIES OF LIGHT THERAPY TREATMENTS [IN THE 1960S IN BUDAPEST, HUNGARY], THE WOUNDS HEALED OVER AND [DIABETIC] PATIENTS NO LONGER REQUIRED AMPUTATION OF THE FOOT OR LEG."



—MARGARET NAESER, PH.D., LIC.AC., RESEARCH PROFESSOR OF NEUROLOGY AT BOSTON UNIVERSITY SCHOOL OF MEDICINE AND AT THE BOSTON VETERANS AFFAIRS MEDICAL CENTER

bone marrow and into the circulation where they can repair and rebuild tissue."

In a 2014 study published in the *Journal of Neurotrauma*, researchers reported that applying red and near infrared LEDs to specific locations on the scalps of people with mild traumatic brain injury for 10 minutes every 48 hours for six weeks enhanced their ability to think clearly, multitask and solve problems. Another study, published in *BBA Clinical*, reported that when dementia patients wore a device that delivers NIR to the skull and inside the nostril for 20 to 25 minutes daily for 12 weeks, they performed better on tests of thinking and memory. Other studies suggest light therapy can increase wound healing.

Scientists believe that when red and NIR light hits the body, several factors converge to produce these

tissue can heal," she says.

The FDA cleared the first low-level laser device in 2002 after a study among General Motors employees reported that light therapy effectively minimized symptoms of carpal tunnel syndrome. But according to Margaret Naeser, Ph.D., Lic.Ac., a research professor of neurology at Boston University School of Medicine and at the Boston Veterans Affairs Medical Center, low-level light therapy has been used in other parts of the world for decades—first in the 1960s in Budapest, Hungary, to treat nonhealing wounds in diabetic patients. "Following a series of light therapy treatments, the wounds healed over and patients no longer required amputation of the foot or leg," she says.

Results like these are astonishing, but in the United States, light therapy is still in its infancy. The FDA only has approved low-power

## CRYOTHERAPY

Forty-six-year-old Kloe Barcus of Dallas had been running her whole life when two bulging disks forced her to quit after the birth of her third child 11 years ago.

"I couldn't sit or stand still for extended periods of time," she says. "Airplane lines were miserable, I had to pull my leg up on a chair while sitting at dinner and I was constantly trying to figure out how to maneuver my body to make myself more comfortable."

In an attempt to avoid surgery, she visited a chiropractor, popped pain meds and even tried steroid injections, but nothing dulled the pain. So when her chiropractor suggested cryotherapy, Barcus didn't hesitate. "I figured it couldn't hurt and might help," she says.

Within one month of treatment, Barcus experienced tremendous relief. "I had more energy, I was more productive and, because I wasn't suffering from pain, I was able to enjoy my life."

For centuries, doctors have been turning to the cold in the form of ice packs, cold compresses and

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—ANTHONY LYSSY, M.D., MEDICAL DIRECTOR OF DIAMOND PHYSICIANS IN DALLAS AND MEDICAL ADVISER TO PHOENIX REGEN CENTERS



ice baths to reduce inflammation, ease pain and speed recovery. In the 1970s, researchers in Japan uncovered the tremendous health benefits of shocking the body with freezing temperatures. But cold therapy didn't start heating up until 2011 when the Dallas Mavericks began using whole body cryotherapy and won the NBA championship.

During treatment, gaseous nitrogen circulates around the body and hypercools the skin. But unlike ice, which can penetrate deeper tissue and cause tissue death, gaseous nitrogen only penetrates about 1 millimeter into the skin—just enough to trigger your cold receptors and reduce the blood supply to your extremities.

The rapid, extreme cold tricks

your body into producing a fight or flight response. “Blood rushes to your heart, brain and other vital organs. Then, when you get out of the chamber after three minutes, blood flushes back to your extremities, washing out toxins and encouraging muscle growth and renewal,” explains Anthony Lyssy, M.D., medical director of Diamond Physicians in Dallas and medical adviser to Phoenix ReGen Centers. Immediately after treatment, most people experience marked improvements in pain and swelling and many report an endorphin boost that is similar to a “runner's high.”

While research on cryotherapy primarily focuses on muscle recovery, a spate of new studies suggests spending three minutes in a minus-

167-degree chamber can have whole body effects ranging from clearer skin to enhanced energy.

Bill Moore Smith, M.D., M.H.A., is medical director of sports medicine and medical director of primary care for Erlanger Health System and uses cryotherapy in his practice. Among his clientele, about half are avid runners suffering from overuse injuries such as sore knees and backs. Another 25 percent are people with chronic inflammatory conditions such as rheumatoid arthritis, psoriatic arthritis and fibromyalgia and pre- and postsurgery patients who need antiinflammatory relief. The remaining 25 percent run the gamut from high-powered execs who hunch over a computer for hours at a time to people with head injuries who want to reboot their brains.

In a study of 100 fibromyalgia patients, researchers found that those who received cryotherapy had lower inflammation markers, less pain and better quality of life compared to patients who didn't undergo treatment. A 2011 study published in the scientific journal *PLOS One* reported that whole body cryotherapy helped reduce the inflammatory response among endurance athletes. Another study suggests that daily cryotherapy helps runners' muscles recover more quickly compared to NIR light and passive therapies.

Not all studies show positive, immediate effects, though—and many show no long-term effects at all. But if chilling the skin and reducing acute inflammation is the goal, cryotherapy plays an undeniable role.

“Whole body cryotherapy chills the skin's outermost tissues from 88 degrees to 48 degrees in 30 seconds compared to 59 degrees in 15 to 20 minutes from submerging yourself in an ice bucket,” Moore Smith says. “Plus, cryotherapy produces 10 times the increase in blood flow and 10 times the reduc-



Bill Moore Smith at his clinic.

JACK PARKER

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tion in inflammation compared to an ice bath—and because it's dry cold, it's a lot more comfortable."

Treatments shorter than four minutes won't result in trauma or frostbite and treatments over three minutes yield no additional benefit, but according to Moore Smith, chambers involving the head (in addition to the body) yield the greatest benefits.

"One of my patients who has been battling fibromyalgia for 20 years tried multiple medications to get relief but nothing worked. He started doing cryotherapy every day for three minutes and now he's off all of his medications," Moore Smith says. "Another patient, an avid trail runner, uses cryotherapy to enhance performance. He gets deeper sleep, recovers more quickly from injuries and his muscles are working better than ever."

With these impressive results, it's no surprise that the cryotherapy industry is booming. Sports teams use cryotherapy during and after play (localized units offer the equivalent of a full day's worth of 20-minute ice pack treatments in just three minutes), runners indulge in multiple sessions before and after marathons and organizations such as CryoUSA and The Cryo Crib are servicing people across the country with conditions ranging from carpal tunnel syndrome to stroke, triggering the body's natural healing response.

But experts are quick to point out that cryotherapy doesn't cure anything or reverse disease. And it's not appropriate for people with heart conditions, thyroid disease or circulatory conditions, such as Raynaud's disease, which is marked by insufficient blood flow to the extremities. "What cryotherapy does, though, is reduce inflammation, and that's the root cause of nearly every disease," Moore Smith says. ▽



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