RUNNER'S WORLD

In the U.S., **DRUG & ALCOHOL ABUSE IS RAMPANT.** The face of addiction is your sister, your nephew, your next-door neighbor. New science suggests **RUNNING MIGHT HELP USERS FIGHT THE DISEASE.** Is this the

breakthrough we’ve been searching for?

THE RUNNER'S HIGH

A Special Report

by Caleb Daniloff (http://www.runnersworld.com/person/caleb-daniloff)

The author, shown above in Moscow in 1984, was often inebriated as a teen. / Photograph courtesy of Caleb Daniloff; above photo collage by Runner's World/Getty Images

I first got drunk at 12 years old.

Young perhaps, but it was Soviet Moscow, where my dad was stationed as an American journalist in the 1980s. I wasn't very good at drinking, though I tried. When I was 15, I was arrested three times for public drunkenness, twice in one day. Back in the States, while I was still in high school, a litany of drug and alcohol violations got me kicked out of boarding school—with the final incident just hours before my graduation ceremony, my father the keynote speaker (nope, no daddy issues there). In college, the morning I was scheduled to clock in for a new job, I woke up behind the wheel, on a highway in another state, facing the wrong way. Several years later, a DWI and drug charges landed me in the crime log of the newspaper where I worked as a reporter. And so it went.

Fast-forward 17 years and I'm catching my breath near the 14,115-foot summit of Colorado's Pikes Peak, my race bib fluttering in the wind. Bracing myself at the halfway mark of the grueling mountain marathon, taking in the countless jagged switchbacks I'd just picked across, I couldn't help but think about the distance I'd put between Then and Now. And the irony: that after nine marathons and thousands of miles, this is how I get high. Standing on a vast rooftop shingled with mountain peaks, the thin air fizzing my brain, I was feeling pretty buzzed. And grateful. I largely have running to thank for my transformation. After years of face-plants (literal and figurative) and a self-image curdled by guilt and self-loathing, a simple pair of running shoes had returned momentum, even joy, to my life and allowed me to evolve into a capable person—a genuine human being.

And I wasn't alone.

About five years into my running life—mostly solitary back-country road work—I started to come across stories about other troubled souls who had traded in chaos for running shoes: a meth-head-turned-Ironman-competitor; a recovering crack addict who once ran 350 miles in a week; an ex-convict alcoholic who would tackle the equivalent of almost six back-to-back marathons across the Gobi Desert. Later, I'd read about a treatment center in East Harlem that trains rock-bottom people suffering from addiction to finish the New York City Marathon (http://www.runnersworld.com/nyc-marathon) and another in Canada that mandates running, complete with a natural track area on the premises and an annual race named the "Redemption Run."

I wrote a recovery memoir in that time, and when it was

released, my in-box swelled with messages from around the country: from other drunks-turned-runners, sober marathoners, freshly quit opioid addicts, the imprisoned, psychiatrists, and drug counselors. Other than some skeptical 12-steppers arguing I'd substituted one addiction for another (I didn't go the Alcoholics Anonymous route), all were firm believers in the healing power of the run. In something as simple as hitting the road, they, too, had felt a loosening of addictive thoughts and a sparking of positive changes in the brain, and in the heart. But was there much to it beyond our personal stories and a would-be "swapping of vices"?

John Tavolacci, the founder of Run for Your Life, leads a group run through Harlem. / Photograph by Jacob Pritchard

RE-LACING THE BRAIN

While most agree that addiction is a neurological disease or disorder rather than a moral failing or question of willpower, scientists still aren't sure why certain people who experiment with drugs and alcohol become addicted while others don't. Many point to an imbalance in dopamine (the feel-good brain chemical) and a deregulation of glutamate, the brain's main excitatory neurotransmitter responsible for parts of our learning and memory.

Environment, genetics, and stress are believed to play roles, too. But a growing body of research suggests that aerobic exercise like running can, in fact, rebalance those neurotransmitters, reduce sobriety-crushing cravings, and even repair drug-damaged parts of the brain.

"The studies are showing that there's definitely an effect in the interaction between physical activity and the way that we respond to drugs," says Nora Volkow, M.D., director of the National Institute on Drug Abuse (NIDA), an arm of the National Institutes of Health in Bethesda, Maryland. "Some of the research has started to document the molecular mechanisms responsible for these interactions, but that's in the very early stages. But we don't need to wait for all of the evidence, to cross all the T's and dot all the I's, before we can recommend it."

John Ratey, M.D., has been preaching the lace-'em-up cure for years. The associate clinical professor of psychiatry at Harvard Medical School in Boston says that even a little bit of running can make a big difference. "What happens immediately when

you begin to run is you get a boost in dopamine, noradrenaline, and serotonin, just as if you were taking a little bit of Prozac and a little bit of Ritalin," he says.

Ratey, a longtime runner who logs about 15 miles per week and a practicing psychiatrist who has counseled plenty of people with addictions, says quitting isn't necessarily the hard part. It's the maintenance of sobriety, which is too often undermined by stress, anxiety, and depression, things that are rife in the newly sober life.

"Many of the great [exercise] studies have been done on smokers because nicotine, which is really our toughest addiction, acts similar to drugs of abuse by pumping up the dopamine system," Ratey says. "Smoking cravings are intense. One of the ways of dealing with them is to go for a run or a brisk 10-minute walk. Not only is that a positive activity, it changes the brain chemistry so you are much less responsive to stressors. It just is a fact. It takes more to stress you out than it did before running."

Plenty of clinical and preclinical research supports Ratey's views. In 2011, researchers at Vanderbilt University in Nashville set a dozen heavy-using pot smokers on treadmills and, over two weeks, had them run ten 30-minute sessions at 60 to 70 percent of their maximum heart rate. The result? A more than 50-percent decrease in sparking up. In London, in 2004, researchers showed that even 10 minutes of moderate exercise dulled the craving for a drink among recently detoxed alcoholics. A 2013 study out of the University of Colorado at Boulder even showed a possible reversal of cognitive brain damage in recovering alcoholics who exercised aerobically.

These are just a few of the nearly 100 studies that Wendy Lynch,

Ph.D., an associate professor of psychiatry and neurobehavioral sciences at the University of Virginia School of Medicine in Charlottesville, gathered into a comprehensive article titled, "Exercise as a Novel Treatment for Drug Addiction: A Neurobiological and Stage-Dependent Hypothesis," published in the June 2013 issue of *Neuroscience and Biobehavioral Reviews*. Lynch says that much like the development of AIDS or diabetes, addiction takes hold in distinct phases and alters different parts of the brain accordingly. At almost all stages —initiation of drug use, addiction, withdrawal, and relapse —according to the studies Lynch reviewed, exercise had a positive impact no matter the substance of abuse.

"In the early stages of addiction, where dopamine is primarily motivating drug use, exercise also activates dopamine," Lynch says. "So it could serve as an alternative to the drug reward and prevent future drug use."

"We've shown even modest amounts of exercise can reverse relapse vulnerability."

Wendy Lynch, Ph.D., an expert in exercise and addiction, runs the Rivanna Trail in Virginia. / Photograph by Pat Jarrett

YOUR BRAIN ON RUNNING

A healthy brain releases pleasure-jolting dopamine when we engage in life-sustaining behaviors like eating and sex. The good times are then encoded in regions that control memory, new learning, and motivation, ensuring that we continue to engage in these activities and, in turn, live to see another day.

In this simple, efficient system, drugs and alcohol can act as gremlins opening flood walls. Dopamine flows down the reward pathway, which we experience as euphoria. Then, just as the reward-motivated brain is programmed to function, it teaches us to repeat the behavior. For the predisposed, the mind begins to burn with a new central concern: another drink, the next score. At the same time, we start producing less dopamine naturally to compensate for the tide of outside stimuli. That means people with addictions need more drugs to achieve the same high, and eventually to simply stave off the pain and anguish of a dopamine dearth. Life becomes strictly about maintenance—not chasing a good time. The party's over.

When a chronic user decides to quit and shuts off that outside

dopamine spigot, the brain is suddenly bereft and perceives survival to be at stake, just as if faced with a lack of food. With next to nothing going on in the pleasure-jolting department, the addict's mind and body receive bright, desperate flares of craving. Throw in depression, a bad day at work, or a memory trigger—something as small as the sweat beads on a bottle of beer—and you have a recipe for relapse.

It's during the early days of abstinence, Lynch says, that glutamate starts to rise and etch the directions for craving into the mind. A recovering addict who experienced heightened glutamate levels in withdrawal will see those sweat beads on the beer and experience pangs of craving months, even years, after their last sip.

In 2012, Lynch and her team found evidence in a preclinical trial that exercise may reduce craving by normalizing glutamate signaling. She gave a group of laboratory rats access to high levels of cocaine, essentially addicting them, then abruptly cut off the supply for two weeks. During that time, she gave one group a running wheel two hours a day while another was left alone with just their little white knuckles. During the abstinence period, the running rats pressed the empty drug-release lever 35 percent less than their counterparts. When small doses of the drug were reintroduced, the running rats pressed 45 percent less. (Similar results were found in an independent study conducted at the University of Minnesota at the same time.) In 2016, a second trial showed that when exercise was implemented within seven days after suspending drug use, cravings were dramatically reduced.

"We've shown that even a modest amount of exercise early in abstinence can reverse changes in the brain and reverse

subsequent relapse vulnerability," Lynch says. "Now, we're trying to figure out how exactly exercise is doing that."

One element, she says, may be an exercise-induced elevation of brain-derived neurotropic factor (BDNF), which helps make a protein necessary for brain cell communication and memory-encoding. Imagine this protein as the telephone lines between brain cells and synapses. Drugs come in like lightning, causing worn and downed cables. But scientists say a good, lung-heaving sweat can actually repair drug-induced neurological damage. What's more, BDNF might encourage the growth of new cells critical to the brain's ability to learn as well as to repair synapses that can stave off depression, both of which can contribute to success in recovery. One study showed that running degrades traumatic memories among mice, thus potentially blunting a prominent trigger for relapse.

BDNF may also increase levels of GABA, the chief inhibitory neurotransmitter in the central nervous system. GABA makes us feel more tranquil and gives us a sense of well-being. Without it, a person would constantly be on edge, anxious, unable to relax—how an addict often behaves when gripped by cravings. In other words, GABA counterbalances the excitatory role of glutamate, acting as the brain's brakes, in a sense.

Ultimately, Lynch says, if scientists can pinpoint when and how these various exercise-prompted changes are taking place in the brain, one could then figure out how to, literally, prescribe physical activity—in minutes instead of milligrams—and also at exactly what points along the addiction spectrum. "Exercise acts like a drug on the brain chemicals," she says. "But it's a good type of drug that enhances systems that are in deficit. It re-regulates brain functions and can prevent relapse."

David Jones, Ph.D., believes in a holistic approach to recovery and prescribes running. / Photograph by Cedric Angeles

FLIPPING THE SWITCH

When I quit drinking in 1998, there was no dramatic rock bottom. But just like the seemingly fateful constellation of factors that had set me down a dark path, a number of mishaps set me straight. I was exhausted. Controlling my behavior (minimizing, lying, deceiving) had become a full-time job. And despite my avoidance of mirrors (except with a rolled-up bill

between my fingers), I'd caught too many harsh-lit glimpses: of a guy who got rock-star wasted alone in his apartment, who brought homeless men back to his place for beers, whose waking state was either guilt or stage fright, usually both. I wanted to feel different, something, anything. So just shy of my 30th birthday and with the pending implosion of yet another romantic relationship, this time with a young child involved, I gritted my teeth, dug in my fingernails, and resolved to change course.

But without the gauze of booze and cocaine, my depression, anxiety, and insecurities were practically blinding. Not surprisingly, I didn't exactly part ways with my addictive mind-set, my brain still triggering any dopamine blast it could. I continued to smoke heavily, gulped coffee, and ate like a boss, my hands and mouth a blur of activity. At the center of my life gaped a bottle-shaped void that I packed with pizza, burgers, and ice cream. Two years later, someone snapped a photo of me on the beach. I was unrecognizable—my nose and eyes were buried under a mound of pale dough, my belly drooped down toward the sand. I was sober, but not exactly the poster boy for recovery.

"The classic treatment of addiction is simply the treatment of the drug the patient is abusing and not addressing other health issues like smoking or overeating," says David Jones, Ph.D., a psychologist at Three Oaks Behavioral Health near Jackson, Mississippi. "People still maintain that addictive cycle on a daily basis, that up-and-down cycle of 'When do I get my next smoke or that next Twinkie?' It keeps patients in a state of hypervigilance."

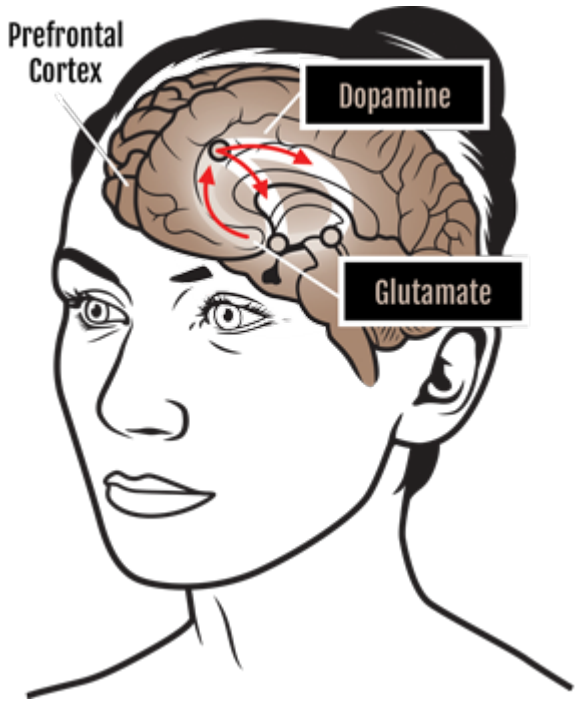
Jones, himself recovering long-term from addictions to alcohol

and codeine, has been running for 40 years, and the 10-time marathoner is known to begin some group therapy sessions by taking his patients out for a few miles. Running not only softens some of the pains of sobriety, he says, but it can interrupt those displaced addictive behaviors. "What running does is makes you pay more attention to other issues as you're starting to produce your own levels of dopamine rather than depending on those external sources."

While I can't deny it was anything more than vanity that first prompted me to break an honest sweat—in the pool, at first—I did find myself starting to sleep better and cutting back on the chocolate and doughnuts. When I found my way onto a treadmill, little by little, other things started to click. I eventually worked up the courage to run outside, on a dirt road outside of the small Vermont town where I'd been living.

Lighting Up the Craving-Reward Pathway

One way drugs affect the brain is by flooding it with the euphoria-inducing chemical dopamine. The more drugs are used, the less dopamine is produced naturally—so users need more drugs to achieve the same high. When an addict abstains, levels of glutamate, the excitatory neurotransmitter responsible for memory and learning, start to rise, causing extra anxiety and amplifying craving in the user. The diagram at right depicts the approximate regions in the brain where these processes take place. / Illustration by TM Detwiler



Those first mornings were coal-black, predawn, when no one except cows could see me. But the miles began to steer me through sobriety's rough patches—ones I hadn't yet faced—blunting the depression and panic just enough for me to start unpacking the shame and guilt that still burned under my skin.

All of my apologies would be drafted at six miles an hour as I picked across roadkill and ruts. The shin splints (http://www.runnersworld.com/shin-splints), sore muscles (http://www.runnersworld.com/muscle-soreness), and seared lungs put me in a state of penance. The rare moments that I did come upon another runner, even getting that simple wave, with its silent understanding of work and reward, was enough to keep me going. After years of drawing the shades, I gradually began to rejoin the human race.

There may have been a transition of a different sort taking place, according to Harvard's Ratey. A key marker of recovery, he says,

is the psychological move between the brain's two reward systems: the Reactive Reward System, which operates from a more primal, instinctual, short-term position, and the Reflective Reward System, which is marked by the ability to delay gratification, to make considered decisions, and to think in the long term.

"The Reactive is more animalistic," Ratey says. "It's your craving, you're going for it, you're being pushed from below. When you start running, you build additional brain connections to help break the craving and hold back the Reactive, to make it less potent. Reflective is more of a decision behavior. You have goals and motivation, an overall wish, other activities. You're building up the frontal cortex, which promotes new and wonderful learning to help you achieve your goals."

John Tavolacci, executive vice president and chief operating officer at Odyssey House treatment centers in New York City, is a long-term recovering addict and 22-time marathoner who founded a program called Run for Your Life, which has offered clients running and marathon training since 2000. Tavolacci says he's witnessed not only the critical return of self-esteem in his clients, but flat-out redemption. So far, 350 men recovering from addictions under his watch have crossed the finish line at the New York City Marathon—and continued moving forward toward healthier, productive lives.

"Odyssey House is the last stop on the recovery train," Tavolacci says. "It's not a luxury, private rehab center. These are individuals who may have been in prison, from low socioeconomic backgrounds. There's this history of failure, of everyone giving up on them. The Run for Your Life program is really about showing the world you're not useless, not part of a

society that everyone gave up on. This is an opportunity to prove everyone wrong."

And redemption can lead to belonging, both of which can translate to success in sobriety.

"People who have addictions just want to fit in," Tavolacci says. "They're misfits. People relapse because they don't add anything to their life to make them feel like they belong. They go to AA. They go to NA. But nothing else. What I find is people who go through the running program stay in treatment longer and the research says that with long-term treatment, the longer you stay in it, the more likely you are to succeed."

Up north in Ottawa, Ontario, all able-bodied residents at the Harvest House treatment center are *required* to run five times a week as part of the program. In the winter, they shovel the track on the grounds behind the main building, a converted school. In less inclement weather, they can run the adjacent trail system.

"Survival" skills developed in addiction, like tolerance for pain, can be harnessed on that 100-mile run.

"When you talk about relapse, the ability to recognize stress and manage it through exercise and diet is so key to people staying sober," says associate program director Gary Wand, himself a runner and in long-term recovery from addiction. "That's the big transformation I see. People are recognizing that *I'm going to have more stress than the next guy because of my background, my history with drugs, and all the other related problems, but what works for me is a really good exercise program*... With running and good nutrition, we're seeing people staying sober longer."


CALEB
774
PAIN NOW
BEER
LATER

Daniloff crosses the finish in triumph at the Pikes Peak Marathon (http://www.runnersworld.com/pikes-peak-marathon) in 2013. / Photograph by MarathonFoto

TWELVE STEPS VERSUS A MILLION

I don't want to suggest that running is inherently a better approach than others, such as AA. But 18 years down the road, it's played a leading role in my life, and for whatever reasons (perhaps divine grace), I never relapsed. When it comes to sobriety, I'm a believer that we all must forge our own paths. For some, perhaps for many, running is just one of several tools. Plenty of runner friends in recovery whom I admire and respect swear by the 12-step approach.

"It's like when we treat cancer, we don't just give one chemotherapy agent, we give multiples," says NIDA's Volkow, herself a dedicated runner. "Same with HIV: Three antiviral remedies are given so the outcomes are much better. My perspective on addiction is the same. Addiction is a dangerous disease. It can have devastating consequences, including death, and you treat it aggressively. Not everybody responds to the same treatment approach, so in that respect it's no different from any other medical diseases."

I can understand why people think I've merely traded one addiction for another. But ultimately I find this thought too narrow. Unlike boozing, running has never filled me with shame or regret, not once turned me into a monster. I have never stolen, lied, or cheated for running. I don't need more miles to get the same effect. The trade that, literally, took place was sobriety for addiction, a dark central rhythm recast in light.

While not enough scientific studies have been conducted on the

addictive qualities of exercise, I can see ways in which running—or rather, *not* running—has effects that can echo withdrawal. If I miss several days, I might feel a little sluggish, unfocused, sometimes irritable. I have sometimes found myself envious seeing other runners even if I'd laced up the day before.

"I would be cautious to say 'withdrawal,'" says Volkow. "That term is one I use with very specific connotations. But I can tell you that if I don't exercise, I actually feel very uncomfortable. Running gives me a great sense of well-being and calms me down."

Ironically, people recovering from addiction may even have an advantage when it comes to endurance sports, stemming from a personality that once chased drugs with bottomless zeal. In fact, certain "survival" skills developed in addiction—tolerance for pain, single-minded focus, ingenuity born of desperation, ease with isolation, a cold comfort with humiliation—can be harnessed on that 100-mile run or double triathlon.

I remember one morning when I was drinking, I showed up for a physical job, to help move several tons of hay, after a raging bender. It was Vermont in winter, and the cold only made my head ache more. I had slept only two drunken hours and made it to the job with what felt like battery acid in my belly. I soiled myself halfway through. But despite the shakes and existential crises spooling through my mind, I kept going—partly because going home sick would be a shameful admission of a problem and partly because I knew I had a six-pack waiting for me at the end. So today, to gird against giving up in the late stages of a race, I'll say to myself, *You haven't even crapped yourself yet.*

And sure, we roll with the punches. We get knocked down and

continue to rise. "As addicts, we're subject to being easily devastated, and those setbacks can kill," says Charlie Engle, author of *Running Man: A Memoir* (https://www.amazon.com/Running-Man-Memoir-Charlie-Engle/dp/1476785783?ie=UTF8&tag=runnersworld06-20), which details his journey from crack addict to endurance athlete who once ran across the Sahara Desert. He's an expert in the field of pain and, in his sober life, rising up against adversity (which for him included a stint in jail). It's something he's learned through running. "At least five times during an ultra, everything goes wrong," he says. "But I've learned that no single event is the end of the world." It's not that life or the run need be perfect, he explains, it's how we adapt to the setbacks—and that we continue to run.

Volkow says that an intense drive, even compulsive patterns, should not necessarily be viewed as abnormal in the context of achieving athletic goals. "At the end of the day, there is a reason we have the capacity to sustain effort even when it's painful," she says. "Because it provides an advantage for survival." Back in Colorado, as I begin zigzagging down from the Pikes Peak summit toward thicker air, I think about my past, my own toughness, my brain chemicals—hopefully on the normal spectrum by now—and the life that running has given me. During my drinking and drugging years, despite deep-seated insecurities, I fell under the spell of my own perceived grandeur. Now, I need to continually reinforce that I am no longer that degenerate loser I once was. This conflict in me still exists—corroding at my edges—at times drifting to the surface if I stay still for too long.

In this race, as all others, I will get passed. I'll struggle against giving up, with the limitations of my body. I'll assess my worth as an athlete, as a person. And that's why I run. For a sober

person—hell, for anybody—the greatest gift running can give is its ability to render us human while simultaneously showing us the strength we have.

Running down the edge of this mountain, I look around at the terrain and at other people, runners who slap me on the back as they dash by. This is where joy is found. Out here. This moment. As long as I keep running, I can remain in this state—a state not only of moving forward, but of being. R1

(http://www.runnersworld.com/)

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