

Can red-light therapy treat brain injuries? Some research shows ‘striking’ results

Larry Carr and his wife, Laurie, got into a terrible fight. It was 2010. He remembers that he yelled and yelled. She left, trying to gather her own emotions. Alone with his thoughts, Carr felt he had reached a bottomless abyss.

“Broken,” he says.

No one understood what was happening to him. Out of nowhere, he’d explode in anger. Paranoia and depression hounded him. Laurie tried to tiptoe around his emotions, unsure what might trigger an outburst. He didn’t resemble the man who had been her high school sweetheart — even-keeled, playful. Logical. He held a Ph.D. in physiology/exercise physiology. He had been a star middle linebacker for BYU’s football team in the 1970s, still holding the record for tackles per game over a career.

But that night, alone in his home, Carr took a knife and held it to his chest. “I wanted it to be over,” he remembers. And yet, something stopped him. Laurie came home soon after, finding him with a trail of blood dotting his shirt. She took him into her arms and the two quietly held each other.

The next morning, he received a phone call: BYU Athletics wanted to induct him into its Hall of Fame. The dissonance was jarring. He was to be celebrated for part of his past that he’d soon learn was potentially debilitating him. He would be officially diagnosed at age 60 as having significant brain damage following several years of progressive emotional and cognitive decline, likely due to his history of playing football and repeated head impacts, his doctor told him.

The knife, the call, the diagnosis in 2013, would lead him on a life-changing mission — one in which he and a team of researchers at the University of Utah would eventually compile research that one of those researchers, Elisabeth Wilde, Ph.D, co-director of the Traumatic Brain Injury (TBI) and Concussion Center, calls “striking.”

The treatment they are studying is called photobiomodulation therapy, or itPBM (intranasal transcranial PBM), also known as red-light therapy. It is different from the kind of superficial red-light usage one can find on social media skincare channels or at a wellness boutique, and its application is broader.

The research includes multiple studies, and is not just focused on ex-football players, but on women and men in various walks of life. The group recently published their latest results in the [Journal of Neurotrauma](#), based on a study that followed 26 BYU football players throughout a season, suggesting the treatment could “[potentially safeguard neurological health](#) without reduced playing time or contact exposure.”

This red-light treatment, delivered through a headset, produces a much stronger effect in terms of power, pulse frequency, penetration and wavelength compared with commercial devices, researchers say. Courtesy of Vielight

Definitive clinical trials haven't been run yet; broader research and validation is required, and some in the field are [skeptical](#). Carr acknowledges some have told him that it could be "too good to be true." Still, other outside experts who spoke with *The Athletic* call the findings promising. They make sure to caution: This is not a cure-all, and there is much more to be tested. But the findings have been compelling enough to justify more research and more speculation.

"It's a turning point in the field of photobiomodulation," says Dr. Paolo Cassano, Ph.D, Director of Photobiomodulation, Division of Neuropsychiatry at Massachusetts General and Assistant Professor of Psychiatry at Harvard Medical School, who is not involved in the Utah studies.

Some people who took part in the research believe they are already benefitting. The BYU football program has continued using the treatment since the study conducted during the 2021 season.

Several recent studies show that [chronic traumatic encephalopathy](#), or CTE, has been [linked](#) with repetitive head impact exposure. More than [five million](#) Americans suffer from disabilities related to TBI, and could potentially benefit from a new treatment. The New York Times recently [wrote about a study](#) that revealed that [one in four](#) NFL players develop brain diseases like CTE.

Carr has read many of their stories: former football players, men in their 50s or 60s, dealing with unexplained depression, anger or violence, their families torn apart. Now, Carr says, "there's hope."

Around for decades, red-light therapy has traditionally been used to treat chronic muscle and joint pain and various injuries, and has shown cosmetic benefits for skin and facial care, purposes for which it's cleared by the FDA.

The technology researchers are using is different from the mainstream popular applications of red-light therapy. In this case, for treating brain injuries, itPBM is delivered through a medical-grade, accessible, portable headset device with a nose clip that one can wear at home, shining near-infrared light onto and into the head. Vielight, the maker of this patented device, recommends using them for 20 minutes, three times a week; Carr has said he has found that daily use produces the best results.

Compared with commercial devices, this treatment, which uses 810-nm near-infrared light, produces a much stronger effect in terms of power, pulse frequency, penetration and wavelength, Utah's researchers say. Light at this frequency interacts with cells in a way that boosts cellular energy, potentially reducing inflammation to improve neural network connectivity.

Tests have resulted in 14 peer reviewed studies, finding that the treatment results in improved mental health measures and cognitive measures, Carr says. The study that followed the BYU football players was published this year with similar findings.

itPBM is how Carr began to heal himself, he says. Larry and Laurie, members of The Church of Jesus Christ of Latter-day Saints, decided to go on a mission to Boston in 2017. Knowing Dr. Ann McKee, a renowned researcher in the field of CTE with ex-NFL and college players, was based in Boston, Carr reached out to her for help.

McKee, who declined to comment for this story, steered him to Dr. Margaret A. Naeser, a research professor at Boston University School of Medicine for nearly 50 years. She allowed him into an itPBM trial she was conducting at the Boston VA Medical Center.

“The red, near infrared light, whether it’s laser or LED, is going to help the cells recover,” Naeser says.
“Because with brain damage ... the cells are not dead. They are just low on oxygen and working very poorly and interfering with all other kinds of pathways that should be smoothly operating in the brain.”

Carr, who played two seasons in the CFL after college, was dubious, but his wife quickly noticed changes in his demeanor after using the headset for a six-week period in Boston. His symptoms and overall cognition seemed to improve, which was confirmed with post-testing. The relief continued as he returned home and continued using the headset. He felt calmer and more in control. “The changes I’ve seen in him were so profound,” Laurie says.

Now 74, Carr continues to use the headset, as he has for nearly seven years. He says he probably will for the rest of his life, and wants to give others a chance to experience similar relief.

Larry Carr was inducted into BYU's Hall of Fame while dealing with progressive emotional and cognitive decline. He said he believes red light therapy helped him and can help many more. Courtesy of Larry Carr

Carr is an adjunct professor at the University of Utah School of Medicine, part of a team that stands at 27 researchers. While many studies in collision (or contact sports) athletes have historically focused on male football players, the Utah researchers have focused on both men and women, including intimate partner violence survivors, ex-football players and athletes from other sports, first responders (firefighters), veterans and the BYU football team.

In published studies, including work by the investigators at the University of Utah, individuals treated with itPBM show improvements in cognition, mood, anxiety and motor performance. Changes in the brain itself are also apparent through MRI results and advanced imaging, including less inflammation and improved functional connectivity.

When researchers followed 26 BYU football players in 2021, half were treated with itPBM and the other half were not. The comparison group, who used identical-looking sham devices, developed significant and widespread inflammation (as measured by [DTI imaging](#)) over the season, where no inflammation was present in the group treated with itPBM. In fact, the treated group even demonstrated some decreased inflammation in some brain areas on these imaging markers.

"I believe our BYU data suggests the players' brains using itPBM are actually healthier after the season," Carr says. "That is a first."

Untreated, chronic inflammation has been linked to increased risk of cancer, cardiovascular disease, arthritis and metabolic conditions like Type 2 diabetes, as well as neurodegenerative conditions such as Alzheimer's disease, Parkinson's disease and CTE.

Their findings suggest that itPBM may have a neuroprotective effect or modify the course of disease, according to the group.

Overall, Carr says groups treated with itPBM showed fewer symptoms of depression, anxiety, stress and PTSD, and showed more efficient processing, faster response speed, improved sustained attention and enhanced executive function. The researchers have also seen improvements in measures of physical performance, such as balance, motor control and grip strength.

Carrie Esopenko, co-director of the TBI and Concussion Center and also part of the research group, says the research is still at the early stages of validating the biological mechanisms. And the Utah researchers say there is far more research to be done, including with different populations and for longer periods of time. “We are still trying to define the limits of what itPBM can and cannot do in the context of brain injury, concussion and other associated disorders,” says Wilde, who helped assemble the Utah group.

Nate Roy, an MD candidate and neuroscience researcher at Cornell, says he understands why it could sound too good to be true. But he sees the therapy as a “Swiss Army Knife” in its ability to improve health and performance.

There is reason for “healthy skepticism” of “new interventions,” says Dr. Daniel H. Daneshvar, Ph.D, Director of the LATE-TBI Lab at Harvard Medical School and Chief of the Division of Brain Injury Rehabilitation at the Mass General Brigham Spaulding Rehabilitation program. He wants to see more data on itPBM as a treatment for TBI.

“I wouldn’t go so far as to say that it is proven yet,” Daneshvar says, “but I think it’s really exciting and promising.”

Some are less optimistic, including Dr. Theodore A. Henderson, Ph.D, president of Neuro-Luminance, a brain health treatment center in Denver. He has published studies in the field, and has been skeptical about the devices’ ability to actually penetrate the skull. “They’re not directly treating the brain,” Henderson says.

“It’s not that I’m skeptical about transcranial photobiomodulation,” he says. “It’s that I am skeptical that they’re (the Utah studies) actually transcranial. They’re just treating the skin.”

“If you look at all the studies of these low power devices, whether it’s treating depression or traumatic brain injury or cognitive impairment. The results are there. There’s some benefit,” Henderson says. “But the important thing is: the benefit is quite small.”

Carr disputes these points, saying that the light indeed reaches the deep brain, pointing to both the BYU study and a [study](#) that he was not part of out of Rotman Research Institute in Toronto from March of this year.

Both studies, Carr says, show “that this light not only reaches the brain, but it stimulates the deep areas of the brain, the thalamus and amygdala.”

“The BYU study,” Carr continues, “shows such a profound difference between the sham group and the treatment group that the question of penetration is settled. The penetration is certain.”

Coleby Clawson, director of health and performance for BYU football, has worked with Carr to use the devices since September 2024. Clawson says players were interested in the treatment if it could result in a competitive advantage (think reaction time, executive control; the split-second decisions players make). “I tell our players everything starts with the brain,” Clawson says.

As of February 2026, Clawson says “probably 20-25 percent of players use it consistently.” Carr says more players used the light the last two seasons than when implementation first began in 2021.

Clawson says BYU football, which is coming off one of its best seasons in recent memory — finishing with a 12-2 record and earning a berth in the Big 12 title game for the first time — has incorporated usage of the device into its concussion rehab protocol.

Tom Holmoe, former BYU athletic director and football player, who won three Super Bowl rings as a player and one as a coach in the NFL, was also a participant in the study. “I know players,” Holmoe says, “whether they’re my teammates or not — and I can’t name names, too sensitive and too sacred, almost — they have difficulties,

cognitive difficulties. And anything that could prevent this from happening in the future, we wanna be involved.”

Holmoe, too, reiterates that there is necessary skepticism and caution. And yet: “I’m a firm believer that this is something that has great promise,” he says.

itPBM is delivered through a medical-grade, portable headset device with a nose clip that one can wear at home for about 20 minutes each day, shining near-infrared light into and onto the head.Courtesy of Vielight

The Athletic spoke with several other participants in Utah's studies who say they have benefited from the red-light therapy.

Carol McIntyre called her moments of confusion "come aparts." The word she sought was right there — and then it disappeared. That led to anger, which was masking something else: sadness.

She's had at least five concussions from myriad sports and an accident on her Harley. Eventually she had to stop working.

Each morning, Rico Petrini, 53, drove and drove. The former star inside linebacker for Oregon State had a 30-mile commute to his job.

"I'd be crying for no reason," Petrini says.

When he played, there was no protocol for what researchers now realize are the dangers of repetitive hits to the brain. Players would get their "bell rung," he says, "and everybody'd just laugh it off."

When he reached his 40s, things changed. Sometimes he'd get out of bed in the morning and pass out — simply drop to the floor. Small things triggered explosive anger. Sometimes it took him time to realize his wife and kids had left the dinner table. He had no history of mental-health issues in his family.

Christian Smith, who played for both Arkansas and Dixie State (now Utah Tech), also had similar symptoms to Petrini, which doctors believe could have stemmed from repetitive hits over his years both as a football player and later a competitive boxer.

He'd lose his keys at least five times a day. Sometimes he'd end up at Walmart, walking laps, not able to remember why he was there. Once, he didn't show up for his family's annual Christmas celebration, which was unlike him, because they were "normally my world," he says.

Then, through articles and Facebook groups, they all found Carr and his study.

Not everybody experienced significant improvement. Carr says that one former major Division I football player, who later coached in the NFL, did feel some changes — but not dramatic effects. That former player did not respond to *The Athletic's* interview requests.

Petrini, however, was astounded at how quickly his temperament improved. "You're singing in the shower," his wife noticed.

Smith says he would have doubts. "Maybe it's just me imagining it's working," he says, and he would stop using the headset. "Then I tell you what: Hell comes back."

McIntyre thinks of how far she's come because of the treatment. "I haven't had a come apart," she says, "in days."

The Utah researchers have outlined their next steps.

Wilde says there is much to be learned about optimal dosing and duration and how long the treatment works, given the need for definitive clinical trials.

Another critical issue is funding, at a time when the Trump Administration has [cut](#) more than \$1.8 billion in National Institute of Health grants to date. However, the Utah researchers say they're launching a large, methodologically rigorous four-year study, funded by the government, to investigate the use of itPBM with and without cognitive remediation therapy in veterans, active duty military personnel and first responders.

Dr. Allen Sills, the NFL's Chief Medical Officer, told *The Athletic* that itPBM is "something we're very interested in, we'll continue to track."

Sills says that though the NFL is open-minded about new therapies, the league is focused on prevention. "But that being said, we know that when an injury occurs, we do want to make sure that we are offering the most up-to-date treatment."

The NFL's emphasis on concussions, Carr says, doesn't account for damage that is accumulated by hits to the head over time.

"I was never diagnosed with a concussion in 15 years of football," Carr says.

The Utah participants still use the headsets daily, including Petrini. It allows him to not just function well but also to hold down a demanding sales job in which he travels around the world. He feels the same urgency Carr does about spreading the word, because he knows there are others just like him, searching for answers in the dark.

If you or someone you know is having thoughts of suicide, call or text 988 for the Suicide and Crisis Lifeline, or contact the Crisis Text Line by texting TALK to 741741.