

UB specialized exercise regimen shown to relieve prolonged concussion symptoms

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University at Buffalo researchers are the first to show that a controlled individualized exercise training program can bring athletes and others suffering with post-concussion syndrome (PCS) back to the playing field or to their daily activities.

In a paper published in the January issue of the *Clinical Journal of Sport Medicine*, the researchers report that a program of progressive [exercise](#) developed individually for each participant and performed at levels just below the onset of symptoms is safe and can relieve nearly all PCS symptoms.

Their results counter the accepted wisdom that PCS should be treated with rest, reassurance and antidepressants, and that physical activity should be avoided.

"Perhaps the most exciting aspect of this study is that all of the subjects that participated, both athletes and non-athletes, got better eventually, although the athletes certainly improved the fastest," says Barry Willer, PhD, UB professor of psychiatry and [rehabilitation](#) sciences and senior author on the study.

"It also was reassuring to discover that the use of exercise was safe and did not prolong symptoms, a worry expressed by other practitioners."

John J. Leddy, MD, associate professor of orthopaedics and co-director of UB's [Sports Medicine](#) Institute, where the study was conducted, is

first author on the study. Willer, Leddy and Karl Kozlowski, PhD, UB clinical instructor of exercise and [nutrition](#) sciences, developed the exercise protocol.

For unknown reasons, 5-10 percent of people who experience a concussion have symptoms that persist beyond six weeks. These persons are diagnosed with PCS. Previously there was no treatment for the condition with proven success.

The UB regimen is based on the hypothesis that the regulatory system responsible for maintaining [cerebral blood flow](#), which may be dysfunctional in people with a concussion, can be restored to normal by controlled, graded, symptom-free exercise.

The researchers developed their program in 2004. "We were testing athletes for return to sport using an exercise test," says Willer, "and we decided that if an athlete becomes symptomatic at a heart rate of, say, 140, maybe they could exercise at a heart rate of 125, without complications. We soon discovered that the athletes got better much quicker if they exercised."

Physicians in UB's Sports Medicine Concussion Clinic initially used their approach only with athletes from UB teams, but word spread, and they now have assessed and treated many professional athletes, especially those from the National Hockey League.

"One of the advantages we offer to professional teams is a more precise test of post-concussion syndrome," says Leddy. "If the patient does not develop symptoms during the exercise test, then the cause of their difficulties is likely to be another source. Most commonly it is neck strain, which tends to cause headaches that mimic post-concussion headache."

For the preliminary study just published, the researchers enrolled six non-athletes who suffered concussions in auto accidents or falls, along with six athletes, five who were injured in their sport and one in a car accident.

Participants were tested initially on a treadmill to determine the exercise intensity that triggered symptoms. With individual baselines established, each participant exercised at 80 percent of that intensity every day for three weeks and then returned for a repeat test. In most instances, retesting demonstrated that participants could work at a higher intensity and the exercise protocol then was increased. This pattern continued until participants could exercise completely without experiencing PCS symptoms.

As might be expected, the athletes recovered more quickly than the non-athletes, results showed. They returned to normal within 11 to 36 days, while the non-athletes required 41 to 112 days of intervention. All participants had returned to work, school or athletic activities at a three month post-program follow-up.

Ten of the 12 participants were completely free of symptoms at follow-up. One participant still experienced cognitive and visual symptoms, and another, who had a history of migraines, continued to experience headaches.

"The data suggest that some PCS symptoms are related to disturbed cerebral autoregulation, and that after this treatment, the brain was able to regulate blood flow when the blood pressure rose during exercise," says Leddy. "We think progressive stepwise aerobic training may improve cerebral autoregulation by conditioning the brain to gradually adapt to repetitive mild elevations of systolic blood pressure."

Kozlowski adds that although each concussion should be considered a

"unique injury," a randomized trial that included a PCS control group should be conducted to address the possibility that PCS symptoms would have resolved spontaneously without intervention.

"All of our subjects had been symptomatic for months before treatment and were not getting better on their own," says Kozlowski, "so we are pretty convinced that the regulated exercise program did the trick." A grant application to NIH to conduct such a randomized trial currently is under review.

Provided by University at Buffalo

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