

# Olympic boxing may damage the brain

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The study shows that repeated blows to the head in the boxing ring can produce a release of brain injury markers to the brain fluid, similar to what is seen with after other types of head trauma, as well as in neurological illnesses such as Alzheimer's. Credit: Photo: University of Gothenburg

Olympic boxers can exhibit changes in brain fluids after bouts, which indicates nerve cell damage. This is shown in a study of 30 top-level Swedish boxers that was conducted at the Sahlgrenska Academy at the University of Gothenburg, Sweden, in collaboration with the Swedish Boxing Federation, published in *PLoS ONE*.

It has been debated for quite some time whether Olympic boxing (amateur boxing) is hazardous to the brain. Researchers at the Sahlgrenska Academy, Gothenburg University, joined with colleagues at the Faculty of Health Sciences at Linköping University and the Swedish Boxing Association in conducting a unique study of 30 top-level Swedish boxers and 25 reference persons.

## **Brain injury similar to Alzheimer's**

The study shows that repeated blows to the head in the boxing ring can produce a release of brain injury markers to the brain fluid, similar to what is seen with after other types of head trauma, as well as in neurological illnesses such as Alzheimer's.

"Our study shows that after bouts, some of the boxers had elevated concentrations of four different proteins in the brain fluid, which all signal [damage](#) to the brain's nerve cells. Moreover, two of the proteins were still elevated after a period of rest" says researcher Sanna Neselius, who has led the study. Sanna Neselius has self been boxing at elite level and was ranked as one of the best female boxers in the world, both as olympic and professional boxer.

## **Very few show symptoms**

As many of 80 percent of the boxers exhibited protein changes that indicate brain damage. The boxers who participated in the study competed on the top-level of Swedish boxing and all had fought at least 47 [bouts](#). None of them had lost on a knock-out, and only one of the boxers mentioned symptoms after a bout (headache).

"The brain injury markers were elevated for 80 percent of the olympic boxers directly after a bout as a result of minor brain damage. That the

brain fluid markers were elevated even after weeks of rest for some of the boxers can be interpreted as the damage had yet not healed or that some damage will remain, says Sanna Neselius.

## Call for concussion guidelines

Sanna Neselius has now scheduled a meeting with the Swedish Boxing Federation's board of directors to discuss the results. "We need to discuss the results and how we can increase the medical safety for boxers, both during training and in competition," says Sanna Neselius. "I further hope that the results will be taken seriously by other martial arts federations, where the safety regulations are not as well defined as in [boxing](#). The results may also be useful when discussing concussion guidelines.

## Blood test a future option

"Preferably, we would like to find a simple blood test that provides the same information as our more advanced brain fluid examinations. The capability does not presently exist, but can perhaps become an option in the future with further and more extensive studies."

**More information:** CSF-Biomarkers in Olympic Boxing: Diagnosis and Effects of Repetitive Head Trauma was published in *PLoS ONE*, April 4.

Provided by University of Gothenburg

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