

# Study examines concussion, cognition, brain changes in retired NFL players

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A preliminary study of retired National Football League (NFL) players suggests that history of concussion with loss of consciousness may be a risk factor for increased brain atrophy in the area involved with memory storage and impaired memory performance later in life, according to an article published online by *JAMA Neurology*.

While most individuals recover completely from [concussion](#) within days or weeks, the potential association of concussion and the subsequent development of memory dysfunction with brain atrophy later in life remains poorly understood, according to the study background.

Munro Cullum, Ph.D., a neuropsychologist at the University of Texas Southwestern Medical Center, Dallas, and coauthors examined the relationship of [memory performance](#) with hippocampal volume and with the influence of concussion history in retired NFL athletes with and without mild cognitive impairment (MCI).

The authors recruited retired NFL athletes living in Texas to build a sample of 28 former athletes, eight of whom were diagnosed as having MCI and

had a history of concussion. The study also included 21 cognitively healthy control group participants with no history of concussion or past football experience and an additional six control participants with MCI but without history of concussion. Of the 28 retired football players, 17 had reported a grade 3 (G3) concussion with loss of consciousness.

The study found that former athletes with concussion history but without MCI had normal but lower scores on a test of verbal memory compared with control participants, while athletes with a concussion history and MCI performed worse compared with both control participants and athletes without memory impairment. There was no difference in scores between control participants with MCI and athletes with MCI on the test.

Former athletes without a concussion and loss of consciousness showed similar hippocampal volumes compared with control participants across age ranges. However, older retired athletes with at least one concussion with loss of consciousness had smaller hippocampal volumes compared with control subjects and a smaller right hippocampal volume compared with athletes without a G3 concussion. The left hippocampal volume in retired athletes with MCI and concussion also was smaller compared with control participants with MCI.

All of the retired athletes older than 63 years of age with a history of G3 concussion (7 of 7) were diagnosed with MCI and only one former athlete was diagnosed as having MCI but did not have a concussion with loss of consciousness (1 of 5), according to the results. Also, there was no relationship found between the number of games played and MCI, the study reports.

"Our findings suggest that a remote history of concussion with loss of consciousness is associated with both later-in-life decreases in hippocampal volume and memory performance in

retired NFL players. ... Our findings further show that a [history](#) of G3 concussion in [athletes](#) with MCI was associated with greater [hippocampal volume](#) loss compared with [control participants](#) with MCI. Prospective longitudinal studies after a G3 concussion would add further insight to the mechanism of MCI development in these populations," the study concludes.

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