

## Introduction

Repetitive brain trauma (RBT) in American football has become a topic of recent interest. The objective of this study was to assess the interrelationships among neuroimaging findings with neurocognitive test performance and symptom endorsement in a cohort of retired professional (NFL) football players.

## Learning Objectives

By the conclusion of this session, participants should be able to: 1) understand the relationship between brain imaging findings and neurological outcomes in retired NFL players.

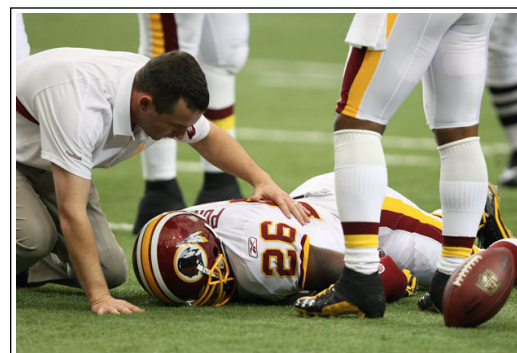


## Methods

Magnetic resonance imaging (MRI) scans were performed in 45 retired NFL players. Three neuroimaging parameters were recorded by blinded, board-certified neuroradiologists: 1) the absence or presence of small or large cavum septum pellucidum; 2) a global mean score of Fractional Anisotropy (FA); and 3) the presence or absence of microhemorrhages, (microbleeds). The subjects underwent a battery of 9 paper and pencil neuropsychological tests (yielding 12 separate scores), a computerized neurocognitive test, and multiple (4) symptom and depression scales. The associations among the three independent neuroimaging results with these outcome measures were assessed utilizing Pearson's, Spearman's Rank, and Point-Biserial Correlations.

## Results

Data from 45 retired NFL players (average age: 46.7 years ) were analyzed. The retirees reported an average of 6.9 ( $\pm 6.2$ ) concussions and 13.0 ( $\pm 7.9$ ) sport-related "dings" in the NFL. Assessment of cavum septum pellucidum yielded a negative finding in 10 subjects (22%), while 32 (71%) had a small, and 3 (7%) had a large one. Four (9%) of the subjects had microhemorrhages present and average FA mean was 0.459 ( $\pm 0.035$ ). Number of sport-related "dings" was correlated with an increased risk of microhemorrhages ( $r=0.305$ ,  $p=0.042$ ). The majority (50.8%) of the correlations obtained among the three neuroimaging parameters and the neurocognitive/symptom scores were below the threshold of a "small" effect size ( $r < 0.10$ ). The remaining (49.2%) correlations fell somewhere between "small" and "medium" effect sizes ( $0.1 < r < 0.3$ ). However, all correlations were statistically non-significant.



## Conclusions

The current results demonstrate minimal and statistically non-significant correlations among neuroimaging, neurocognitive, and symptom scores in a cohort of NFL retirees. The results indicate that in this cohort, neuroimaging findings do not relate directly to neurocognitive test performance and clinical symptom burden. While an often-accepted paradigm, associating the severity of structural brain changes to neurocognitive performance and symptom presentation after chronic RBT is complex, may involve other moderating variables, and requires further study.