

# Structural and Functional Brain Imaging Findings After Acute Sport-Related Concussion in American Football Players: Systematic Review and Meta-Analysis

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## Introduction

- Sport-related concussion (SRC) has emerged as a major public health issue
- Advanced brain imaging techniques have raised questions about long-term effects of SRC [1,2]
- The clinical significance of brain imaging findings after SRC remains unknown

## Methods

- Systematic review of studies reporting brain imaging findings after SRC in the acute time period (within 6 months of SRC)
- Inclusion: football players, brain imaging within 6 months of SRC, sample size >5
- Assessment: 1) methodology, 2) imaging outcomes, 3) number of positive statistical comparisons

## Results

**Table 1**

	Immediate Outcome		Subacute Outcome	
	Positive N=9	Negative N=2	Positive N=3	Negative N=6
Appropriate control selection N=9*	8/8 (100%)	1/1 (100%)	3/3 (100%)	4/4 (100%)
Controlled for type I error N=11	7/9 (78%)	1/2 (50%)	2/3 (67%)	4/6 (67%)
Recall bias N=9*	1/7 (14%)	2/2 (100%)	2/2 (100%)	2/5 (40%)
Baseline advanced neuroimaging N=11	2/9 (22%)	1/2 (50%)	0/3 (0%)	2/6 (33%)

\* Excluded studies that did not provide enough information to determine classification.

Comparison of study methodology between studies reporting positive and negative findings in the immediate (<1 week) and subacute (>1-6 weeks) timeframes after SRC

### Statistical Comparisons:

- 8 of the 11 studies made a total of 809 comparisons of brain activity
- Only 18% (146/809) of comparisons were statistically significant

## Conclusions

The study of acute brain imaging findings after SRC is in its infancy. The transitory nature of positive imaging findings and methodological limitations complicate study interpretation. Further research is required to correlate imaging findings with clinical outcomes.

## References

1. Alosco ML, Mez J, Tripodis Y, et al. Age of first exposure to tackle football and chronic traumatic encephalopathy. *Ann Neurol*. 2018;83(5):886-91. doi:10.1002/ana.25245
2. McCrea M, Guskiewicz KM, Marshall SW, et al. Acute effects and recovery time following concussion in collegiate football players: the NCAA Concussion Study. *JAMA*. 2003;290(19):2556-2563. doi:10.1089/neu.2014.3413