

CLUSTERS OF FUNCTIONAL ABNORMALITIES PRESENT IN RETIRED CANADIAN FOOTBALL LEAGUE PLAYERS

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CONTEXT

- Sport-related concussions are a known risk for collision sport athletes
- Cognitive, emotional, physical and sleep disturbances
- Research has utilized network connectivity analyses
- Expand on our previous work on post-concussion BOLD signal complexity decreases (Dona et al. 2017)
- Amplitude of low-frequency fluctuations (ALFF)
 - Measures the spontaneous neural activity and frequency composition of the BOLD signal in each voxel (Lowe et al. 2000; Zang et al. 2007; Zou et al. 2008; Zuo et al. 2009)

OBJECTIVES

Objectives:

- To better understand the potential lasting effects of sport-related concussions
- Use resting state functional MRI (rsfMRI) data to examine rsfMRI signal spontaneity properties in retired Canadian Football League (CFL) players

Hypothesis:

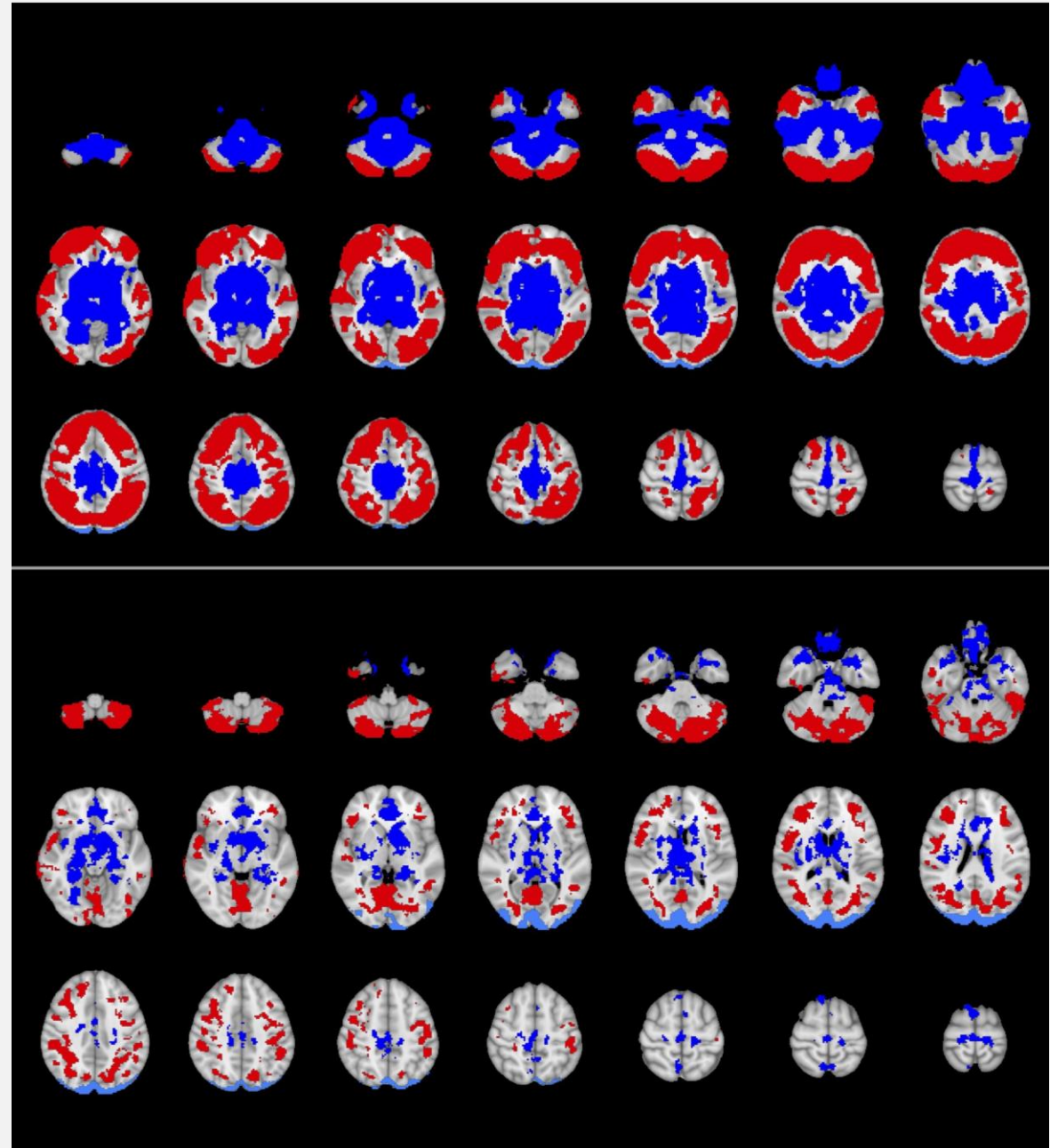
- Retired CFL players would exhibit regional clusters of abnormal amplitude of low-frequency fluctuations (ALFF) and fractional ALFF (fALFF)

METHODS & PROCEDURES

- 18 retired CFL players (male, aged 58.78 ± 6.10)
- 3 Tesla GE MR750 Discovery MR system and 32 channel head coil
- 62 healthy age and sex-matched control (male, aged 58.81 ± 5.69)
- CONN was used to:
 - process the raw rsfMRI data
 - calculate ALFF and fALFF values
 - conduct a group-wise analysis
- General linear modelling and threshold free cluster enhancement (TFCE) involving 10,000 permutations to identify significantly different voxel clusters
 - family-wise error corrected p-values

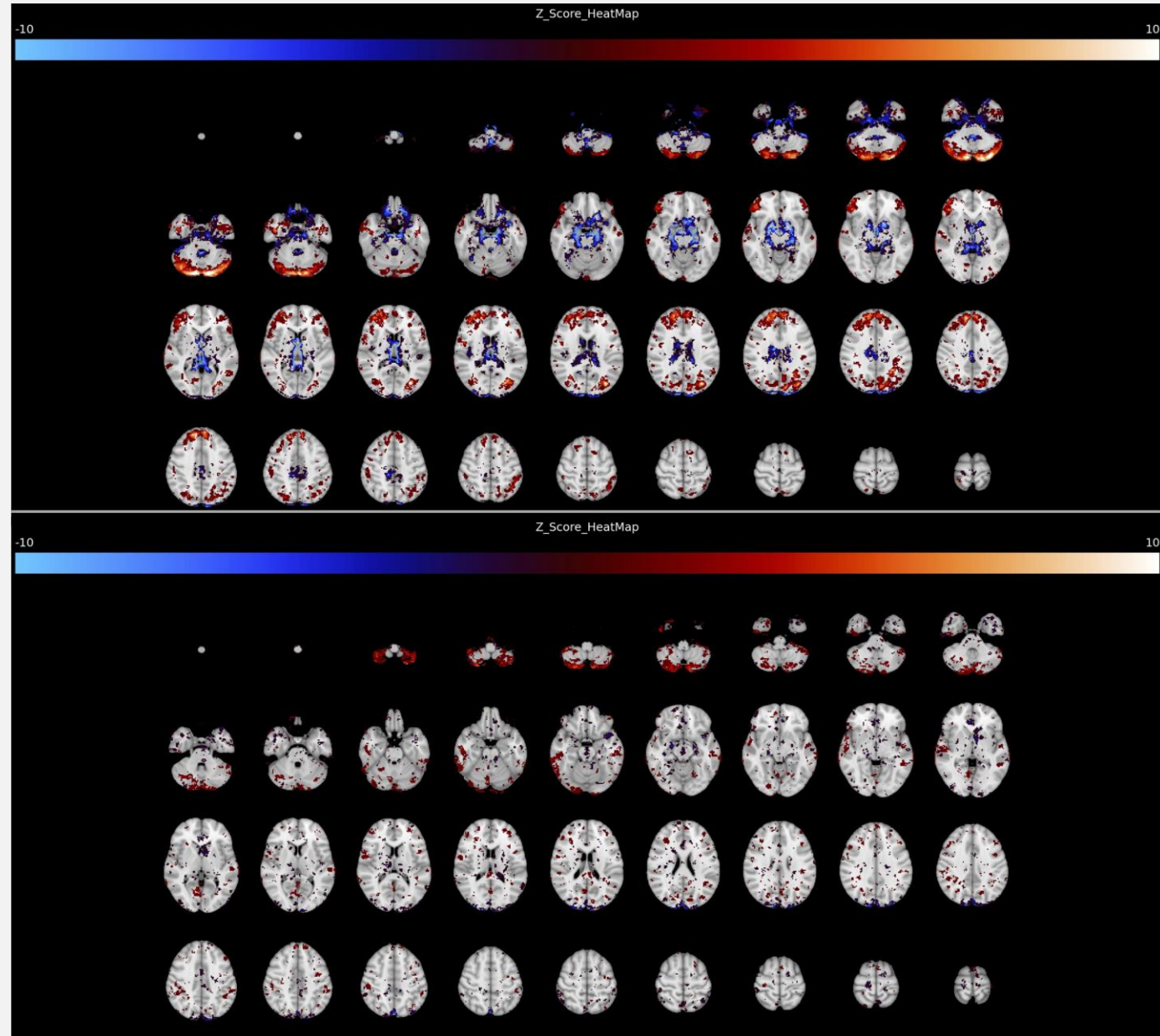
RESULTS

- Significantly different clusters based on ALFF and fALFF calculations
- Decreased BOLD signal spontaneity in:
 - Deep brain structures
 - Anterior cerebellum
 - Superior occipital lobe
- Increased BOLD signal spontaneity in:
 - Exterior aspects of the entire brain
 - Posterior cerebellum



RESULTS

- Significantly different clusters consistently present in >10 subjects



KEY TAKE-AWAYS

- 1) A history of concussions could cause functional abnormalities
- 2) Decreased in central and subcortical regions
- 3) Cerebellum had complex mixture
- 4) Future directions of research:
 - Decreased ALFF could be cognitive deficits
 - Increased ALFF could be metabolic inefficiencies
 - Exploration of specific brain regions

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