

Mid-Life Brain Health in Former Elite Soccer Players

The Sharp Lab | Advanced BRAIN Health Clinic, Institute of Sport, Exercise & Health



UK Dementia
Research Institute

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Background

- Large health record studies suggest former soccer players may have increased risk of dementia and other neurodegenerative disease, potentially linked to repetitive head impacts^{1, 2}.
- One such condition is Chronic Traumatic Encephalopathy (CTE)³, which can only be definitively diagnosed post-mortem.
- Longitudinal studies with robust cognitive and head impact measures are needed to clarify exposure–neurodegeneration links.

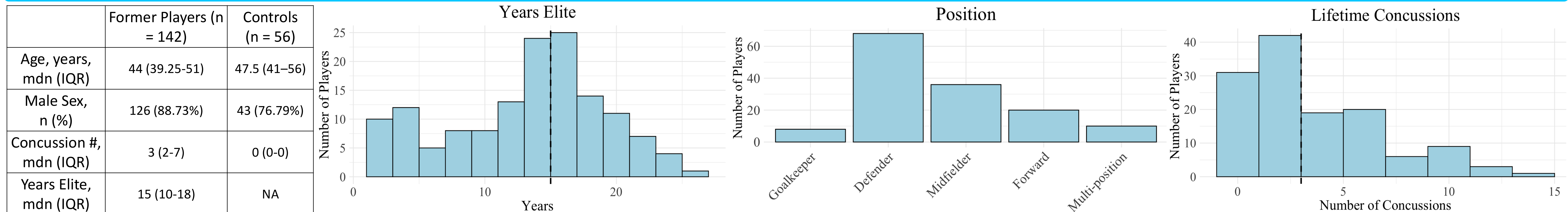
Aims

- Interim analysis of symptom burden, cognition, and brain volume between ex-soccer players and healthy controls.

Materials & Methods

- Data included neurobehavioral outcomes, cognitive testing, and multimodal MRI from the Advanced BRAIN Health Clinic⁴ football cohort.

Cohort Characterisation



Result 1: Former Soccer Players Display Higher Symptom Burden Compared to Controls

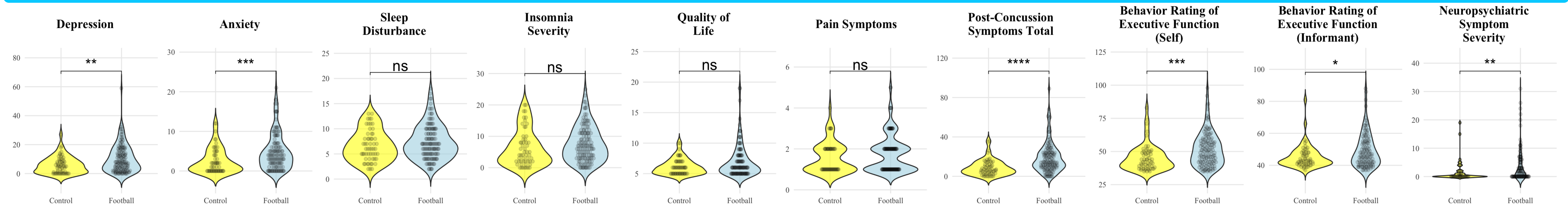


Figure 1: Violin plots of symptom differences between ex-players and controls; Stars indicate significance on group comparisons using univariate Wilcoxon rank sum *p-values < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001.

Result 2: Former Soccer Players Display No Significant Difference in Cognition

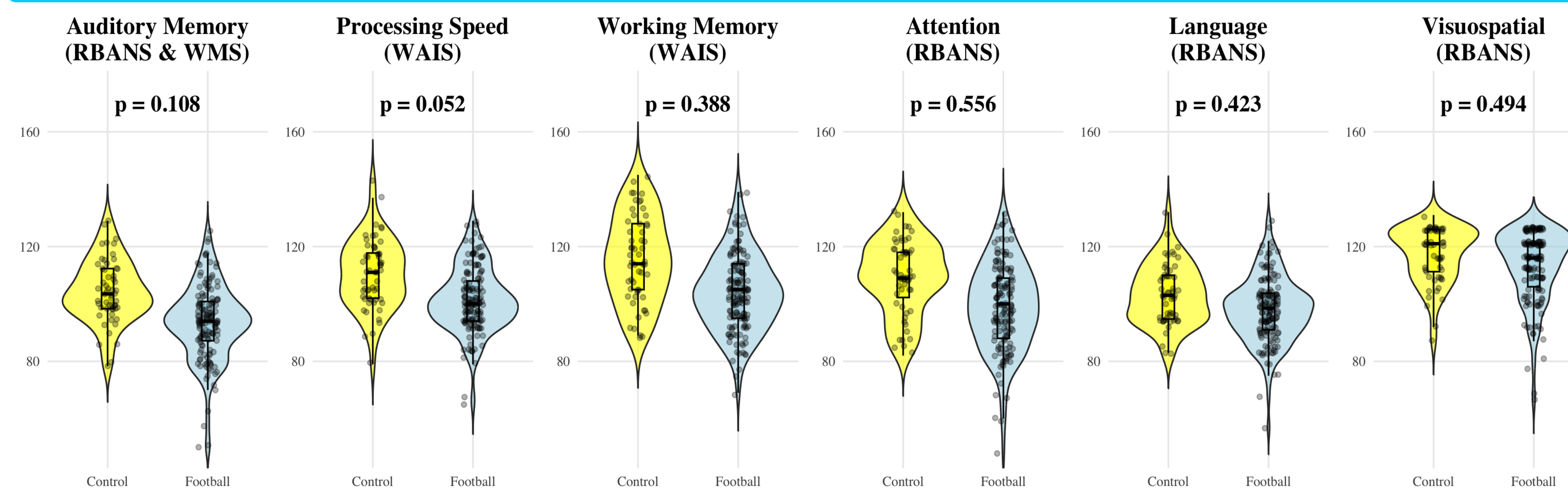


Figure 2: Violin plots of cognitive performance in soccer players and controls. P-values from GLMs adjusted for age, sex, FSIQ, and education.

Conclusions

- In this interim analysis, we found significant differences in symptom burden and brain volume between former professional soccer players and controls.
- Future work will focus on expanding the sample size, incorporating measures of head impact exposure, and evaluating neurodegenerative biomarkers.
- When combined with long-term clinical follow-up and post-mortem neuropathology, these early indicators may help clarify how cumulative head impacts relate to increased risk of neurodegenerative disease.

Result 3: Former Soccer Players Show Reduced Grey Matter

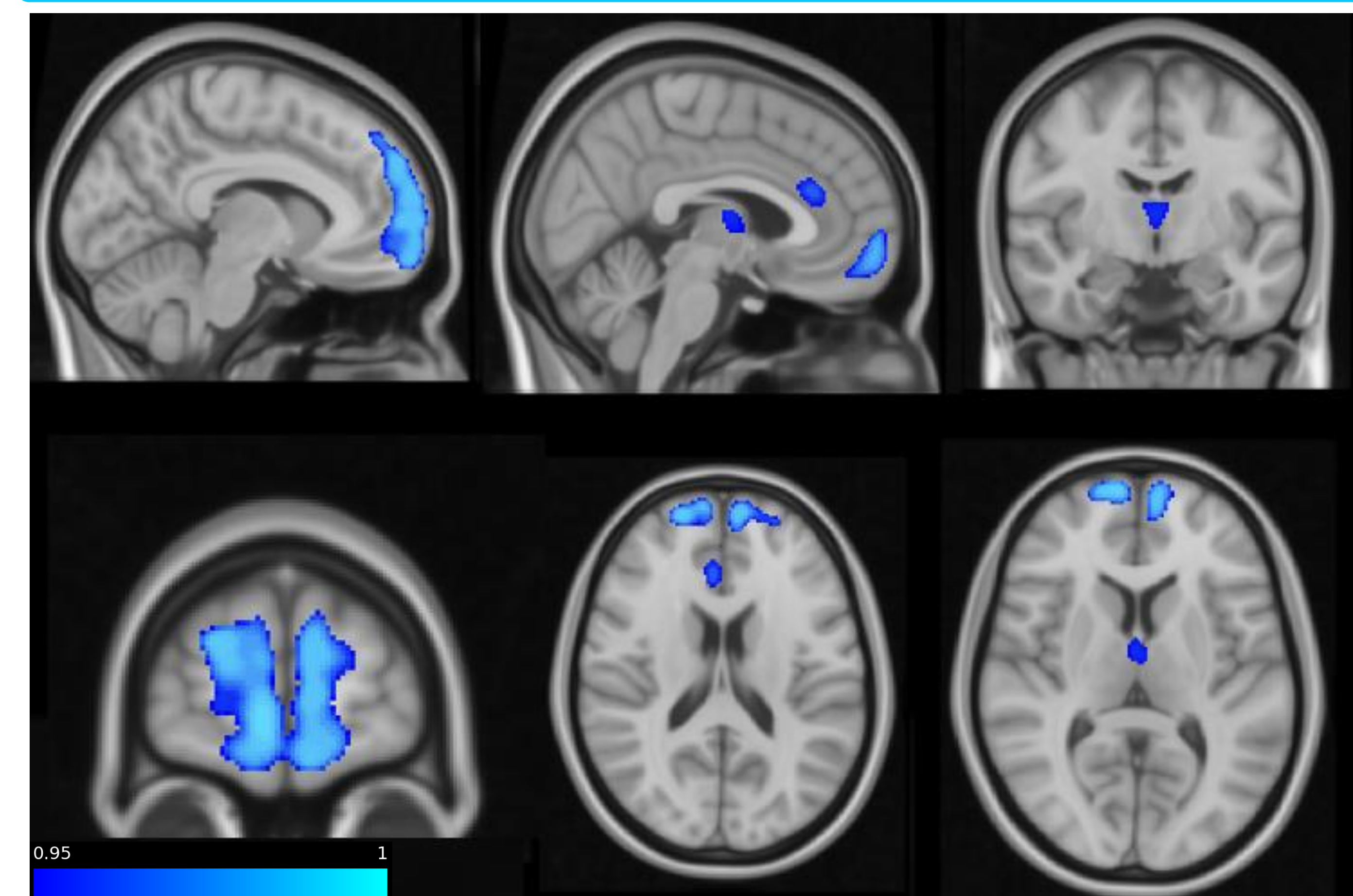


Figure 3: Grey matter volume comparison between ex-players (n = 140) and controls (n = 56). TFCE-corrected significance map shown (one-tailed t-test); lighter blue indicates greater significance.

References

- Macnab T-MP, et al. Cognitive impairment and self-reported dementia in UK retired Professional Soccer Players: A Cross Sectional Comparative Study. *Sports Medicine - Open*. 2023;9(1).
- Mackay DF, et al. Neurodegenerative disease mortality among former professional soccer players. *New England Journal of Medicine*. 2019;381(19):1801-1808.
- McKee AC, et al. Chronic traumatic encephalopathy (CTE): Criteria for neuropathological diagnosis and relationship to repetitive head impacts. *Acta Neuropathologica*. 2023;145(4):371-394.
- Zimmerman KA, et al. Prospective cohort study of long-term neurological outcomes in retired elite athletes: The advanced biomarker, Advanced Imaging and neurocognitive (Brain) Health Study Protocol. *BMJ Open*. 2024;14(4).