

Punching Through Clearance: Unveiling Glymphatic Dysfunction in Elite Boxers using Diffusion Kurtosis Imaging within Brain Perivascular Spaces

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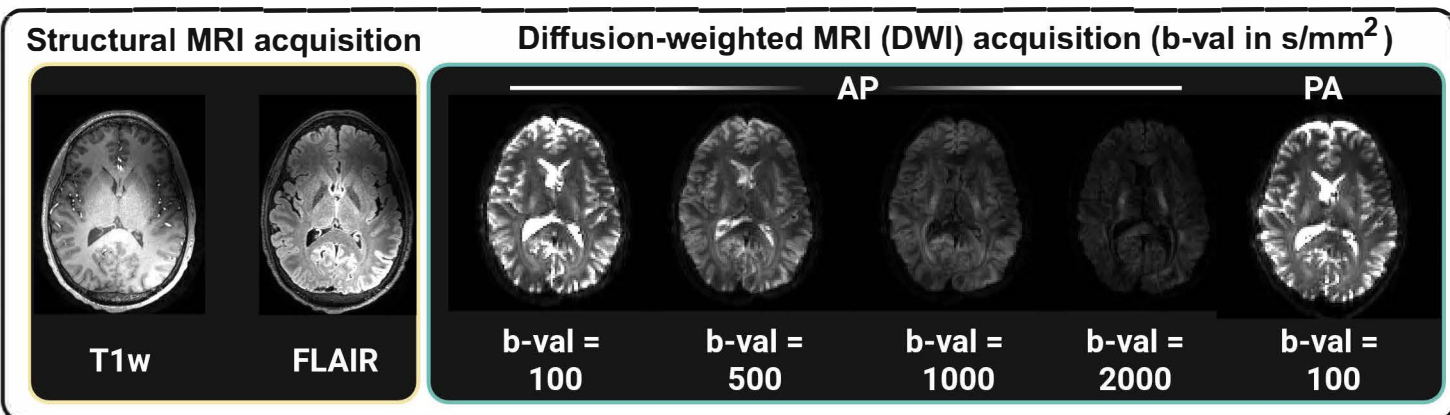
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Scanned **HC**, **PPCS**, and **RHI**

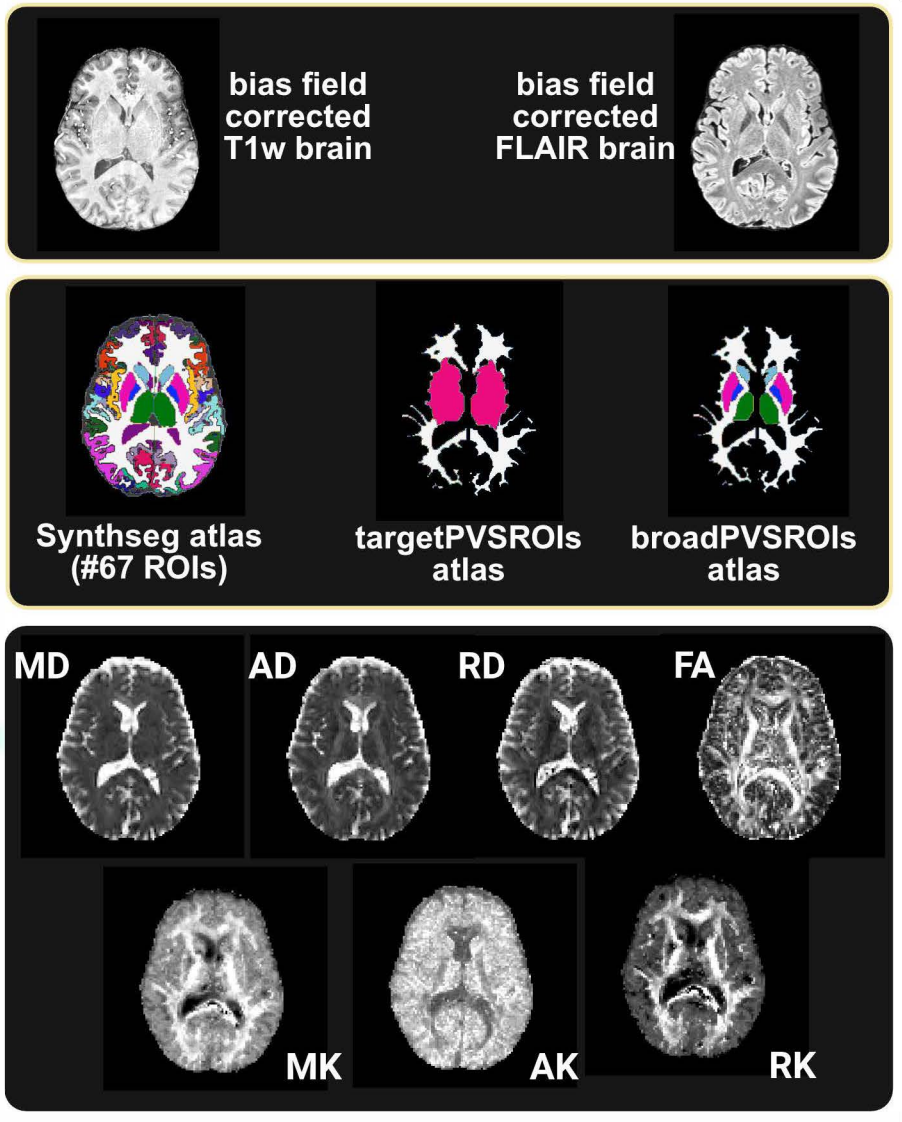
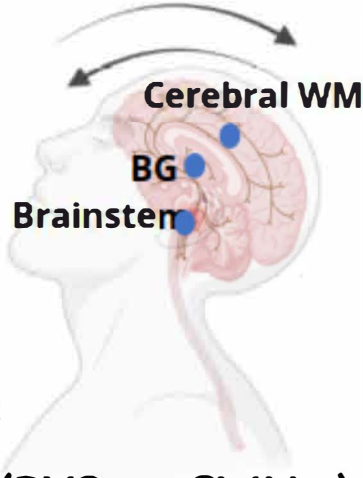
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7T scanner

Elite boxers (RHI)
(24.7 +/- 1.7 years, 18M/3F)



- Proposed pipeline**
- Correct for bias field on T1w, FLAIR
 - Co-register FLAIR-to-T1w
 - Parcellate the whole-brain on T1w
 - Compute a white matter hyperintensities (WMH) mask
 - Process DKI (denoising, Gibbs-ringing artefact correction, motion and eddy currents correction, susceptibility-induced distortions correction)
 - Fit a DKI model & then affinely co-register FA-to-T1w
 - Segment PVS using the RORPO method at the cerebral white matter (CWM), the basal ganglia, and the brainstem
 - Compute PVS-weighted metrics
- e.g.in the case of MD within CWM:
- PVS_{vol}-weighted MD = MD × (PVS_{vol} ÷ CWM_{vol})**
- Segment the parasagittal dura (PSD)



- Key findings on elite boxers (RHI) compared to HC and PPCS:**
- Significantly reduced tissue volumetry :
 - Total intracranial ROI
 - Grey matter
 - Brainstem
 - Cerebral white matter
 - Significantly elevated PVS fraction in:
 - Cerebral white matter
 - Basal ganglia
 - Significantly elevated PVS-Weighted diffusion metrics (MD, AD, RD, MK, AK, RK) in:
 - Cerebral white matter
 - Basal ganglia
 - Brainstem
- Conclusion:** Elite boxers exhibit impaired PVS solute diffusivity, revealing disrupted glymphatic clearance pathways linked to RHI

