

Ultra-low-field MRI In A UK University Setting With No High-field MRI Infrastructure: Feasibility And Preliminary Data

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BACKGROUND

Delays in neuroimaging represent a key bottleneck in dementia assessment pathways, contributing to diagnostic delays and compounding inequalities in care. Ultra-low field (ULF) MRI is a portable, low-cost imaging technology that could be deployed in community clinics, bringing neuroimaging closer to the point of assessment. Unlike conventional MRI, ULF-MRI operates at much lower magnetic field strengths, requires no shielding or specialist infrastructure, runs from a standard electricity socket, and can be operated by trained non-specialist staff in standard clinical environments. Despite considerable promise, evidence on the feasibility and utility of ULF-MRI outside established imaging departments and institutions with prior MRI expertise, within highly regulated healthcare systems, remains limited. We present interim findings from an ongoing feasibility study conducted at a regional UK university with no prior conventional MRI infrastructure, serving coastal and rural communities. We examine whether ULF-MRI-derived volumetric measures demonstrate the expected relationships with age and cognition.

METHODS

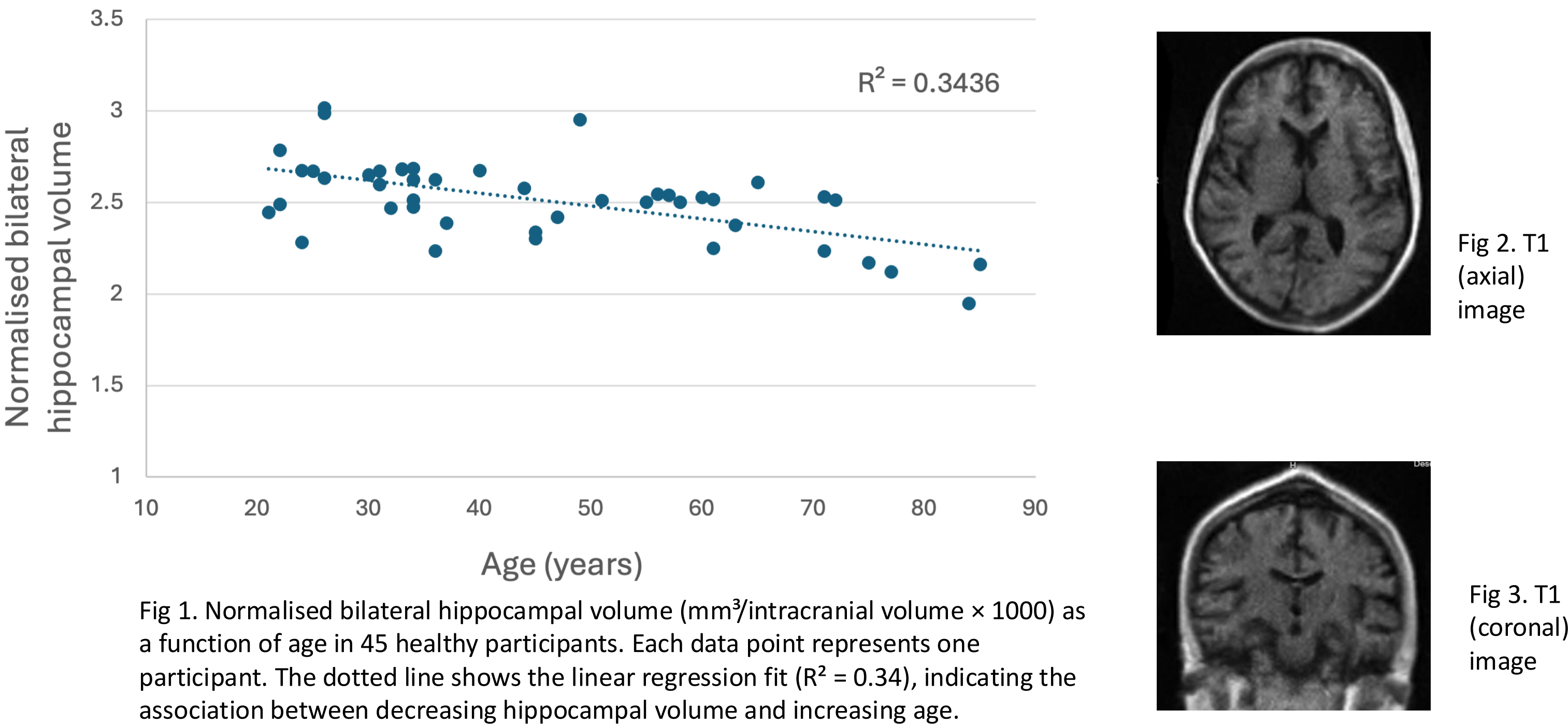
Participants aged ≥18 years underwent brain imaging using a Hyperfine Swoop 0.064T ultra-low-field MRI system. Quantitative volumetric measures were derived using multi-resolution registration of three orthogonal anisotropic scans followed by segmentation using recon-all-clinical. Participants completed computerised cognitive tests (Cognitron, including delayed object memory) alongside collection of participant experience and demographic data, including age and years of education. Analyses examined the successful acquisition of volumetric imaging data and explored preliminary associations between hippocampal volume, age, sex, education, and delayed memory performance using linear regression models.



RESULTS

Complete imaging and cognitive data were available for 45 participants (30 female, 15 male; age range 21-85 years; mean age = 45.4 years, SD = 18.5). All participants completed ULF-MRI scanning and cognitive testing, with imaging data suitable for volumetric analysis acquired in all participants. Participant feedback regarding comfort was generally positive; no scans were discontinued and noise levels were described as low.

Increased age was strongly associated with decreased bilateral hippocampal volume ($\beta=-.62, p<.001$). Educational attainment was the strongest predictor of delayed memory performance ($\beta=.48, p=.002$), whereas bilateral hippocampal volume was not independently associated with delayed memory ($\beta=-.16, p=.58$). Figure 1 shows the relationship between age (years) and normalised bilateral hippocampal volume ($\text{mm}^3/\text{intracranial volume} \times 1000$). Example images are shown in figures 2 and 3.



CONCLUSIONS

These early findings demonstrate expected age-related volumetric patterns and confirm the feasibility of implementing ULF-MRI in a UK university setting without prior MRI infrastructure, supporting further evaluation of this approach to dementia-focused research outside of conventional imaging centres.

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