

BACKGROUND

- Dementia with Lewy bodies (DLB) involves neuronal loss and synaptic degeneration, yet conventional MRI markers such as cortical thickness may lack sensitivity to subtle cellular changes.
- Advanced diffusion models such as NODDI do not estimate neuronal cell body properties.
- SANDI (Soma and Neurite Density Imaging) quantifies grey matter soma signal fraction (f_{soma}), a proxy for neuronal cell body density.
- To date, SANDI has not been applied in DLB.

OBJECTIVES

- To assess the feasibility of acquiring SANDI f_{soma} maps using a clinical multi-shell diffusion protocol on a standard 3T Siemens Prisma scanner.
- To examine whether SANDI-derived f_{soma} shows promise as a marker of microstructural grey matter changes in a pilot series of DLB cases, relative to cortical thickness.

METHODS

- **Participants:** 4 DLB and 3 cognitively unimpaired controls (CU).
- **Age:** DLB: 70.8 ± 6.3 vs CU: 71.1 ± 4.8 yrs ($p = 0.94$).
- **Acquisition (3T Siemens Prisma):** Multi-shell DWI, 2.0 mm isotropic, TE/TR = 87/3700 ms
- **SANDI modelling:** f_{soma} estimated via AMICO (Accelerated Microstructure Imaging via Convex Optimization).

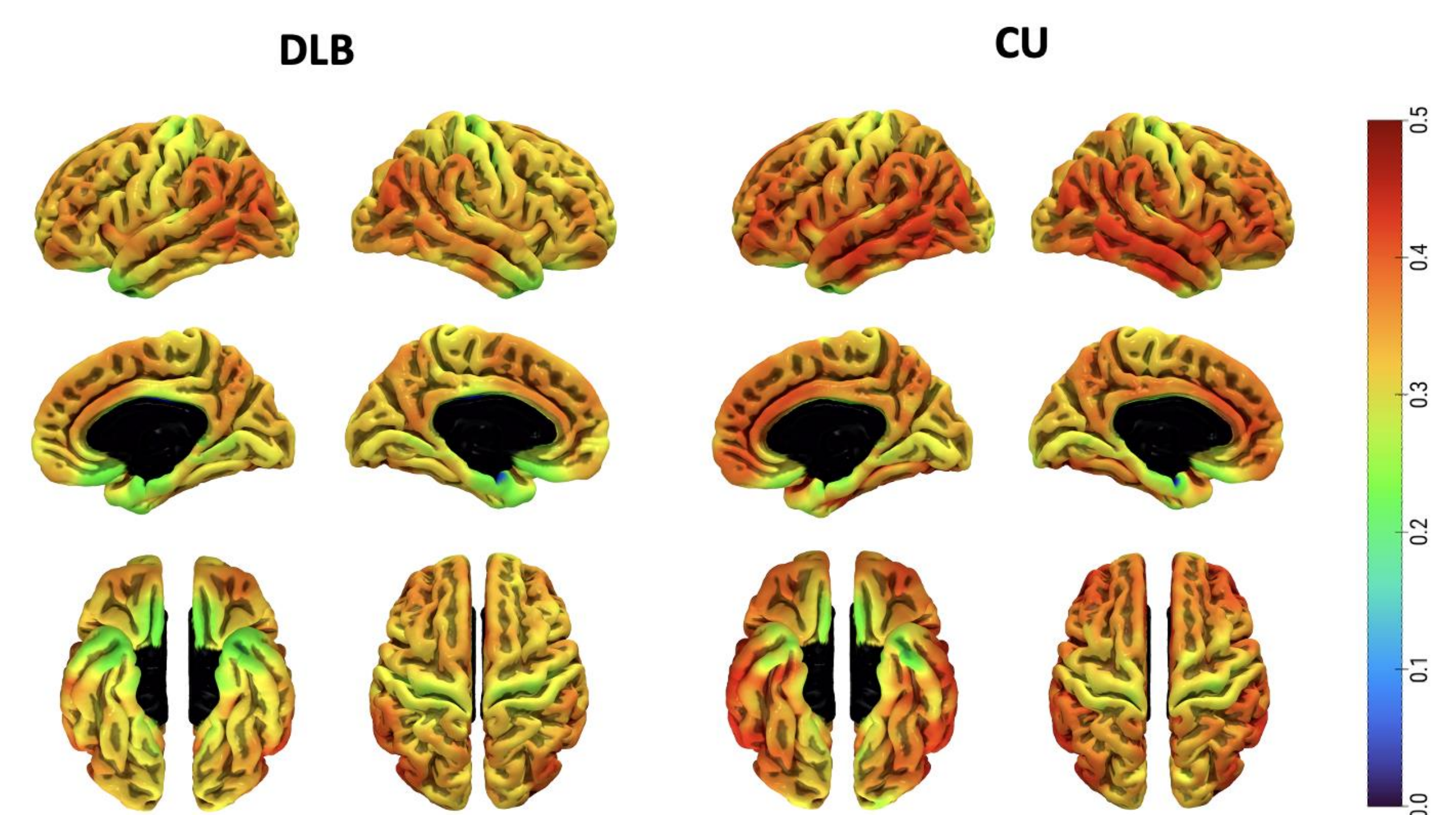


Multi-shell diffusion MRI acquisition protocol. Total acquisition time: 12 min.

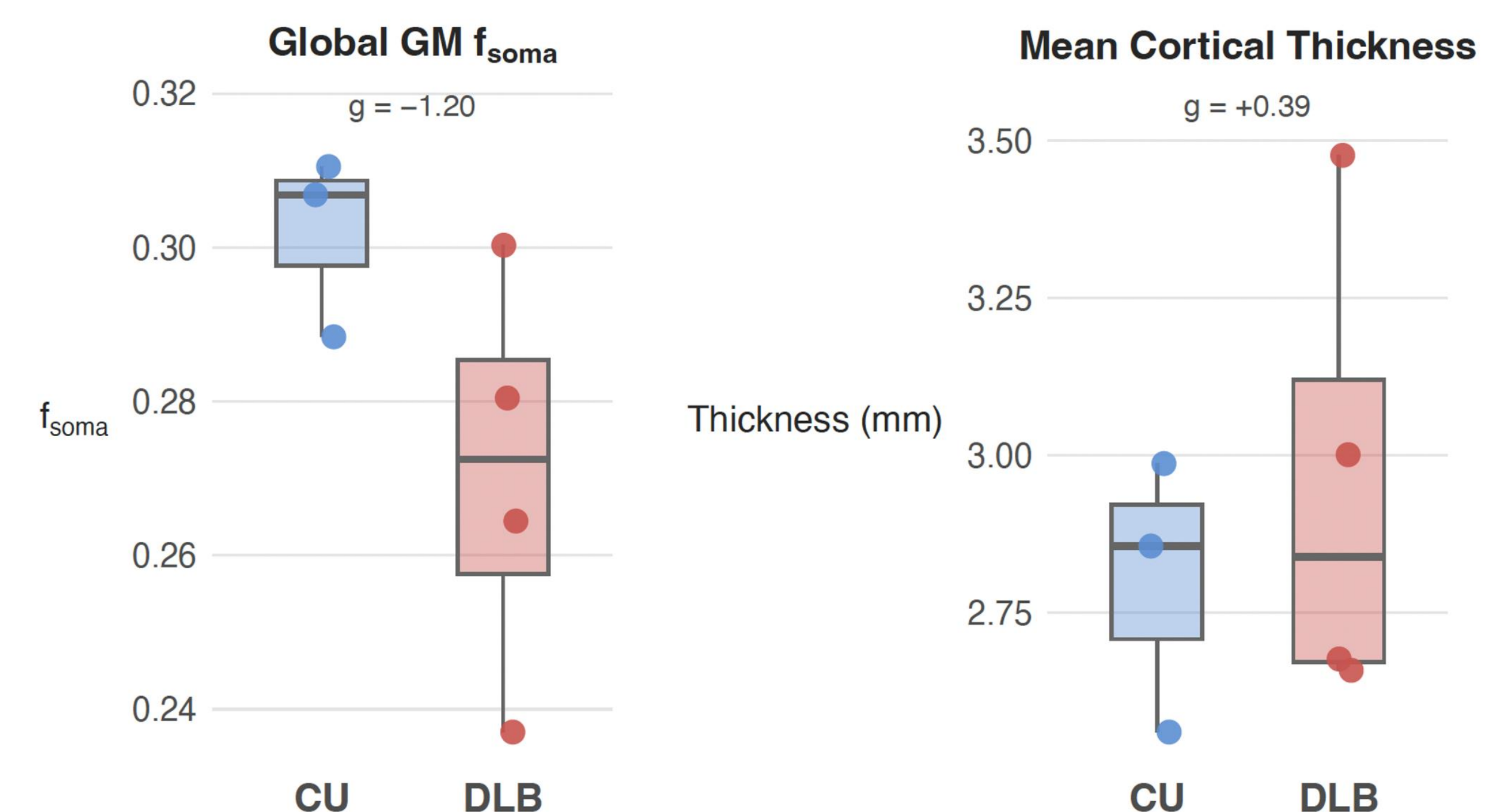
- **Cortical thickness:** Mean cortical thickness derived from T1-weighted structural MRI using ANTs cortical thickness pipeline, with surface-based sampling to derive group averages.
- **Statistics:** Hedges' g effect sizes (small-sample bias corrected) for global GM f_{soma} and mean cortical thickness.

RESULTS

- Group-average SANDI f_{soma} surface maps for DLB ($n=4$, left) and CU ($n=3$, right).
- DLB shows lower f_{soma} across cortical regions, most notably in frontal and parietal cortex, compared to CU.



- Global GM f_{soma} was lower in DLB than CU (0.271 ± 0.027 vs 0.302 ± 0.012 ; Hedges' $g = -1.20$), while mean cortical thickness was broadly comparable between groups (2.95 ± 0.38 vs 2.80 ± 0.22 mm; Hedges' $g = +0.39$)



These preliminary findings demonstrate the feasibility of acquiring SANDI soma fraction maps on a clinical 3T scanner, with promising effect sizes that support further evaluation in larger cohorts of patients with neurodegenerative conditions.