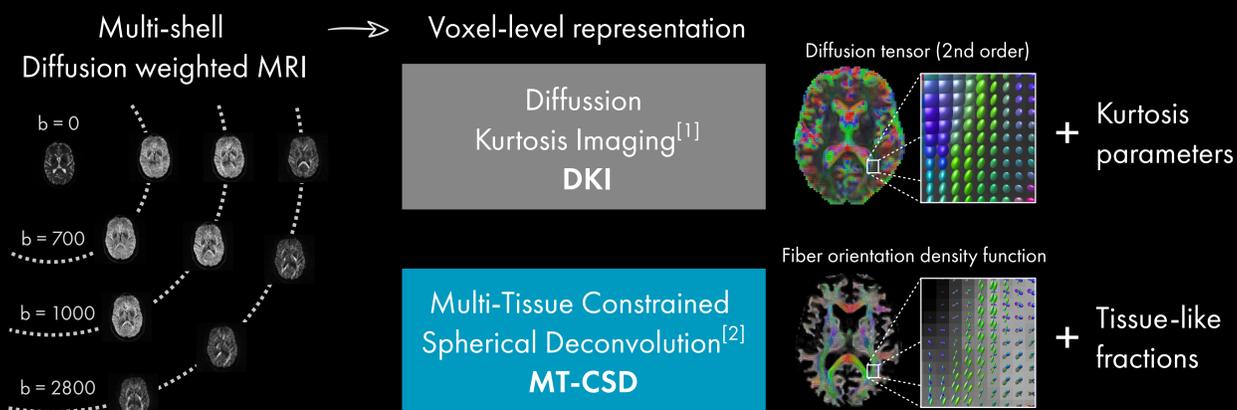


Comparison of diffusion kurtosis imaging and multi-tissue CSD for the investigation of group differences in Alzheimer's disease

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BACKGROUND



OBJECTIVE

We compare the results of investigating group differences^[3] in **Alzheimer's Disease (AD)** with two different approaches:

Voxel-based analysis of **DKI** measures.



Fixel- and voxel-based analysis of **MT-CSD** measures.



MATERIALS & METHODS

DW-MRI acquisition

multi-slice, single-shot EPI, spin-echo imaging sequence
b = 0, 700, 1000, 2800 s/mm² in 10, 25, 40, 75 directions.

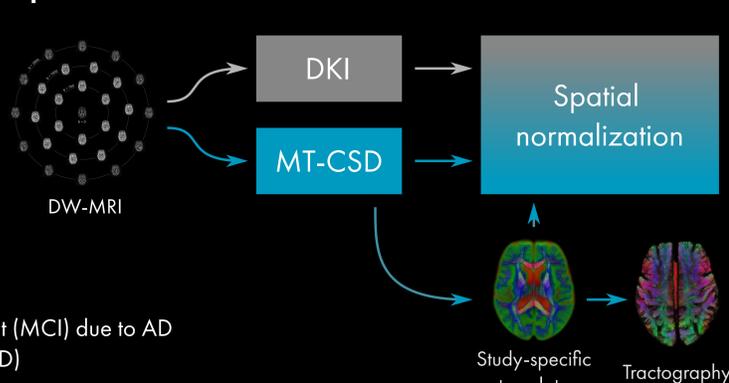
Pre-processing

Denoising; Gibbs ringing, rigid motion, eddy current distortion, and bias field correction.

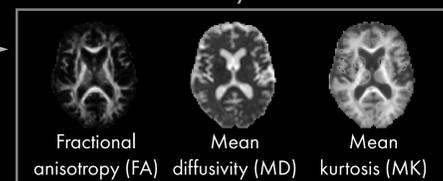
Study sample

29 patients with mild cognitive impairment (MCI) due to AD
23 patients with dementia due to AD (ADD)
27 age-matched controls

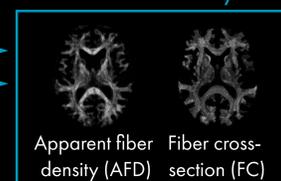
Pipeline



Voxel-based analysis



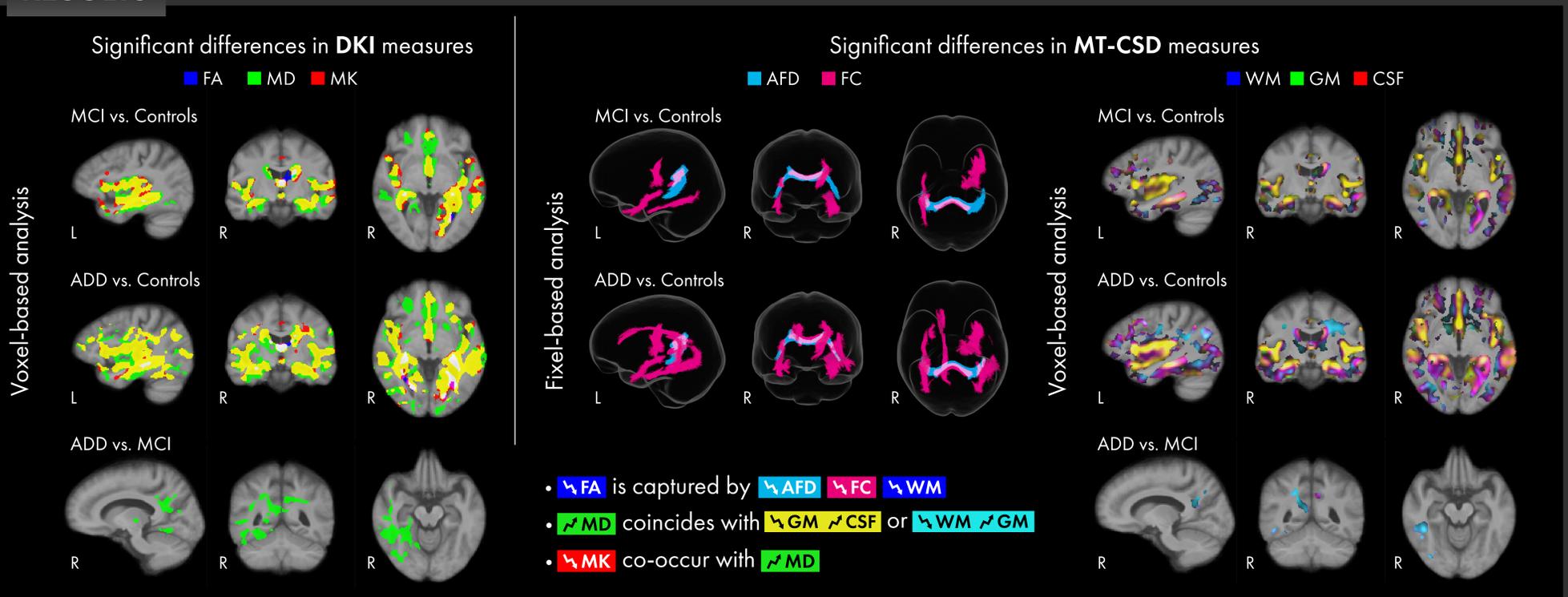
Fixel-based analysis^[4]



Voxel-based analysis



RESULTS



CONCLUSIONS

- FA sensitivity is limited compared to fiber-specific measures and WM-like fraction.
 - Tissue-like fractions explain increased MD as increased free-water content or increased cellularity
- DKI and MT-CSD detect a similar extent of group differences. However, MT-CSD offers more **specific and interpretable** information about the nature of those differences.

REFERENCES

- Jensen et al., Magn. Reson. Med., 53(6), 1432-1440, 2005.
 - Jeurissen et al., Neuroimage, 103, 411-426, 2014.
 - Winkler et al., Neuroimage, 98, 381-397, 2014
 - Raffelt et al., Neuroimage, 144(A), 58-73, 2017.
- *Tools for data pre-processing, modelling, and statistical analysis are available as part of **MRtrix3**.

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Giraldo et al., "Investigating Tissue-Specific Abnormalities in Alzheimer's Disease with Multi-Shell Diffusion MRI" J Alzheimers Dis., 90(4), 1771 - 1791, 2022.

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