R_2* age variations in subcortical structures in young adults at 7T

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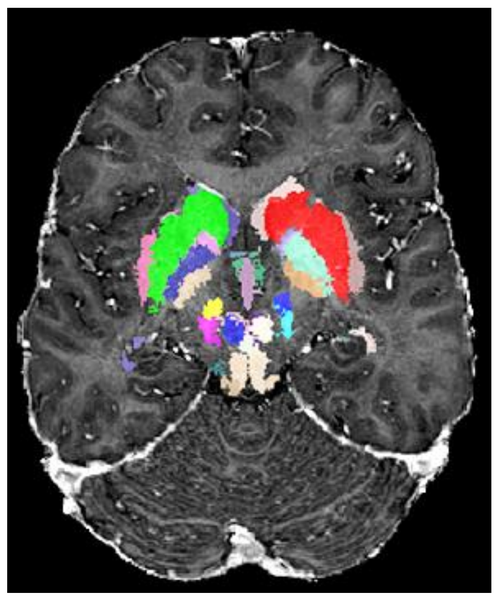
Introduction

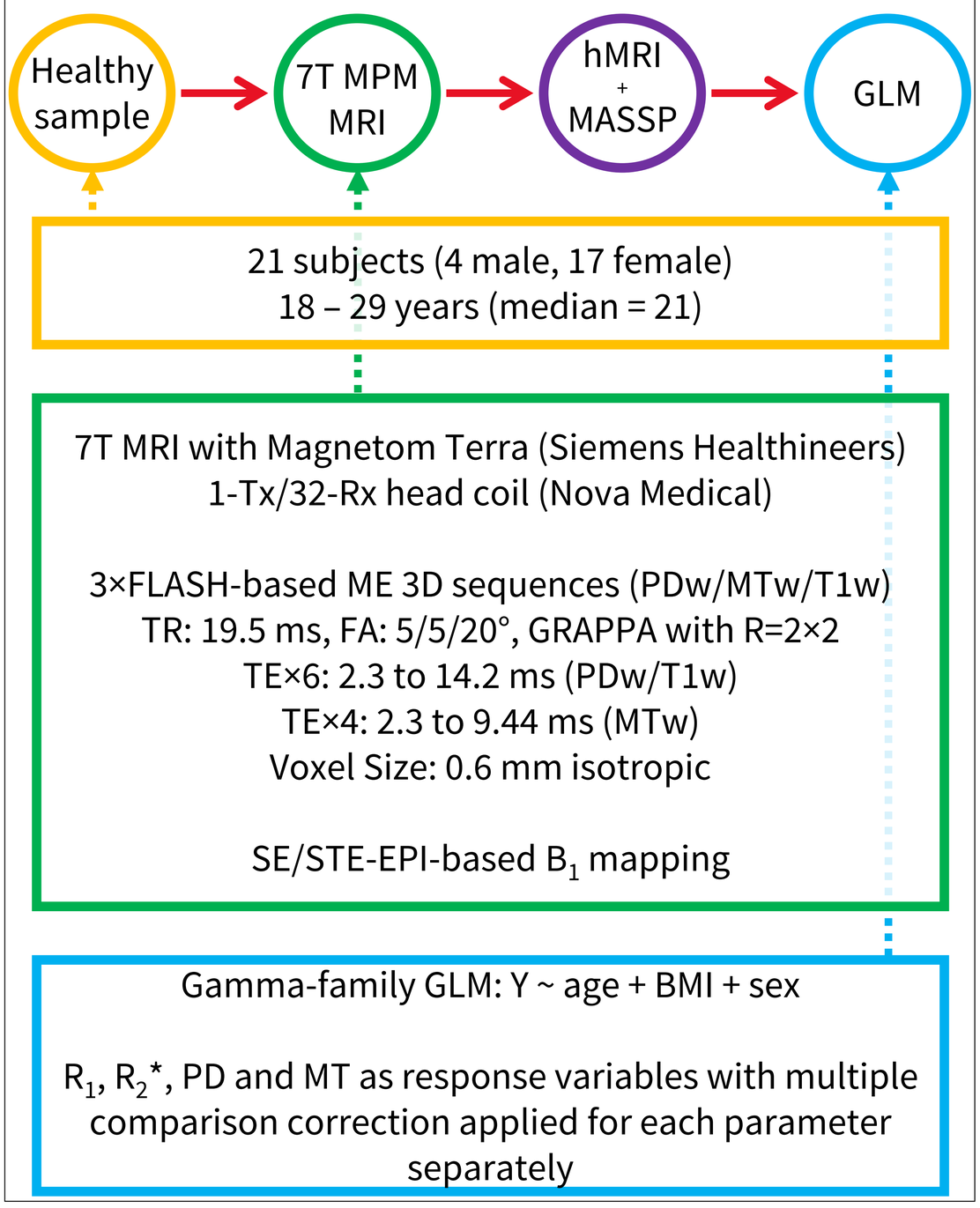
Ultra-high field (UHF) MRI is a promising modality for imaging small subcortical structures. Quantitative MRI (qMRI), allows mapping MR-parameters of these structures in hope of assessing their function in healthy population, and in neurodegenerative disorders.



An example of subcortical structures delineation based on UFH-qMRI data

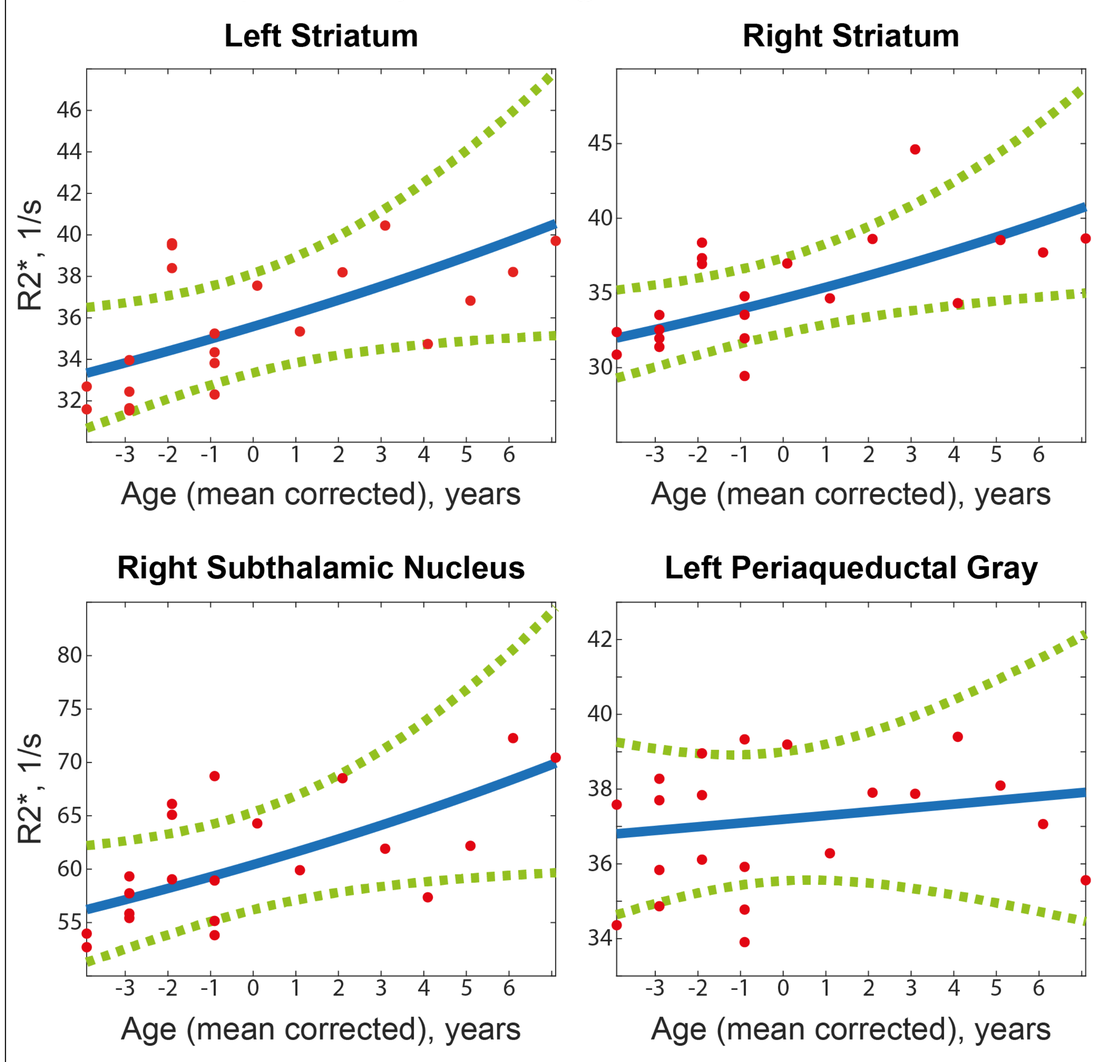
Methods

21 healthy volunteers underwent the multiparameter mapping (MPM[1]) scan at 7T MRI. Quantitative parameters were derived from the images with the hMRI toolbox[2]. Subcortical structures were parcellated by Multi-contrast Anatomical Subcortical Structures Parcellation (MASSP[3]) tool. Generalized linear models were built to analyze the association between median qMRI values and age.



Results

High quality, 0.6 mm resolution, co-aligned maps of qMRI parameters R_2*, PD, R_1, and MTsat were obtained in all participants. Bilateral striatum, the right subthalamic nucleus, and left periaquedactal gray matter showed significant (FDR-corrected $p < 0.05$) R_2* increase with age. Other areas and qMRI parameters showed dependency below significance threshold.



Slice plots through the GLM models, which exhibit significant age dependency of qMRI parameters. Each plot shows the fitted response values as a function of a single predictor variable, with the other predictor variables held constant. The 95% confidence bounds for the response values are also shown.

Discussion

We provide a first set of values that show age-variation in quantitative MRI parameters obtained at UHF in small subcortical structures in healthy young adults. The detected variations in R_2*, which have been previously reported, but only for larger brain structures and at lower-field MRI[4], can reflect age-related iron accumulation.

To increase the changes detection power, this study will be complemented by a larger sample of older individuals.

References

1. Weiskopf et al. 2013, Frontiers in Neuroscience (7)
2. Tabelow et al. 2019 NeuroImage (194)
3. Bazin et al. 2020 eLife (9)
4. Callaghan et al. 2014 Neurobiology of Aging (35)

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