

A. Benítez González¹, V. Sasía Saldivar¹, H. Martínez Orozco¹, A.R. Aguilar Vázquez¹, A.J. Cisneros Mejorado¹, S.Y. Díaz Miranda¹

✉ Correspondence: agnesbenitezgonzalez@gmail.com

¹ Instituto de Neurobiología, Universidad Nacional Autónoma de México, Campus Juriquilla, Querétaro, México.

1. BACKGROUND & AIM

Diffusion Tensor Imaging (DTI) is a magnetic resonance imaging technique that measures water diffusion within brain tissue. In white matter (WM), diffusion patterns reflect fiber organization, axonal structure, and myelin integrity, making DTI useful for detecting microstructural alterations (1).

In Alzheimer's disease, WM changes may appear during early stages and disrupt structural connectivity between regions involved in memory and cognition, potentially before evident cognitive deficits emerge (2).

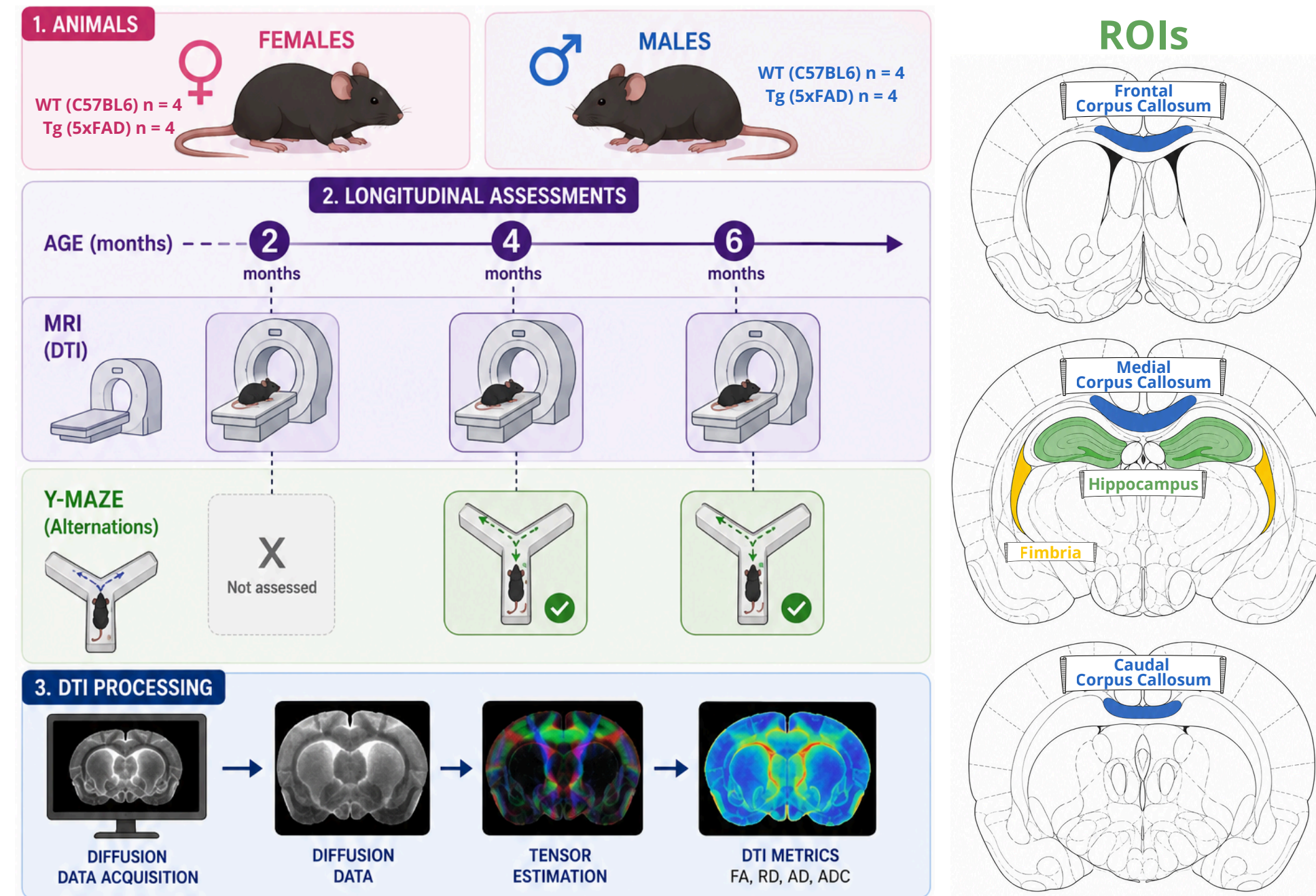
Therefore, DTI may help identify subtle WM alterations before overt cognitive impairment.

Aim: To identify early genotype, age, and sex-related changes in WM microstructure in the 5xFAD mouse model using DTI.

2. HYPOTHESIS

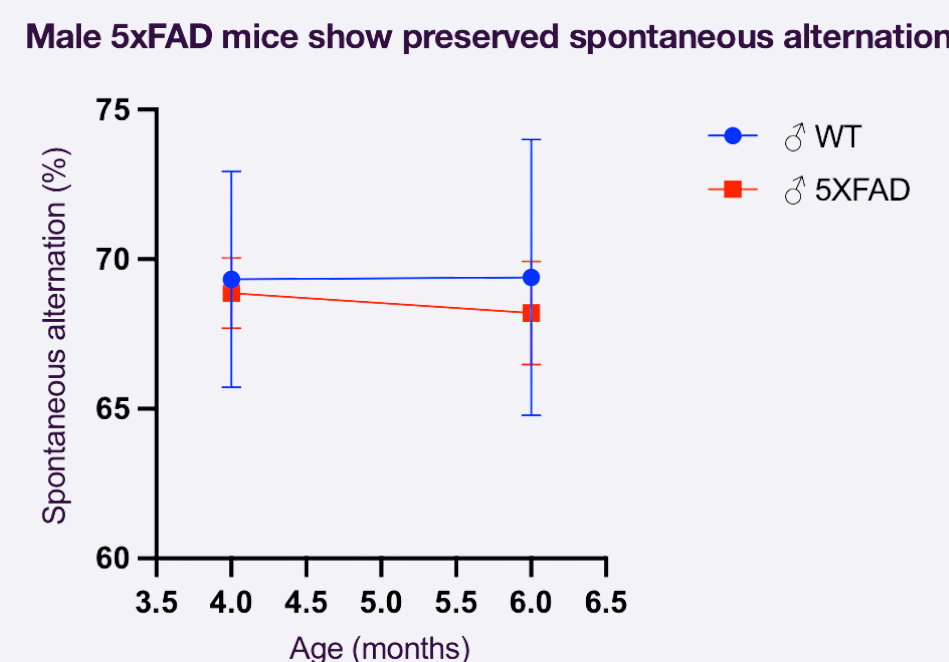
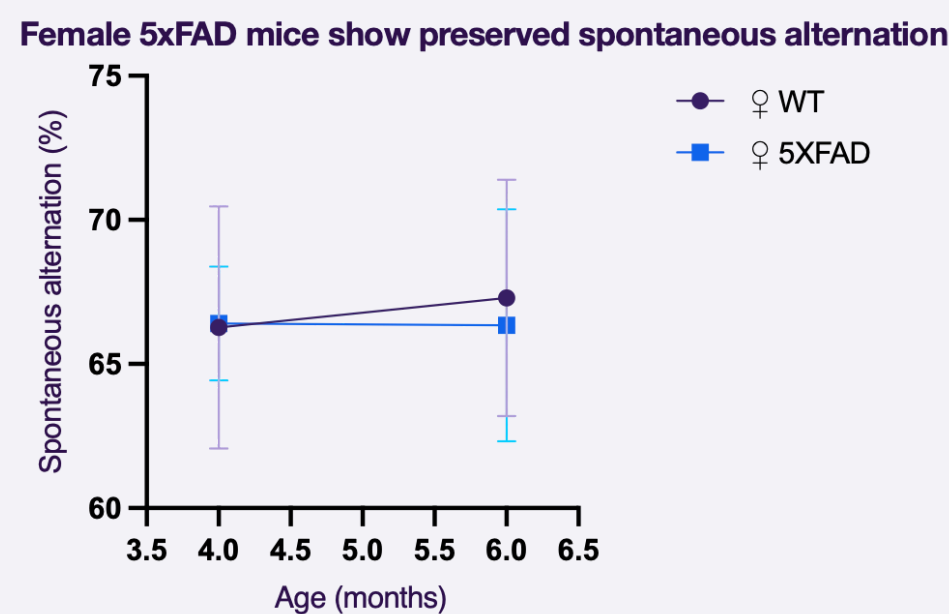
Diffusion tensor imaging will detect early white matter microstructural alterations in 5xFAD mice before evident cognitive deficits, with differences influenced by age and sex.

3. METHODS



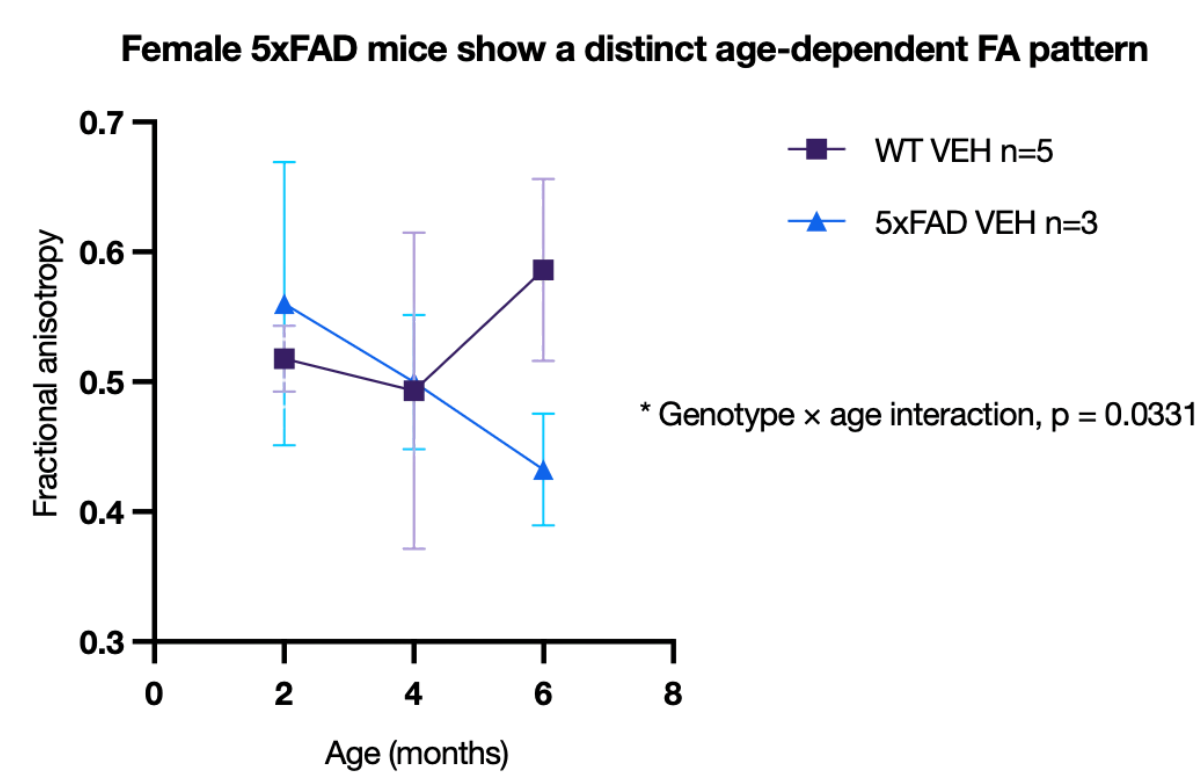
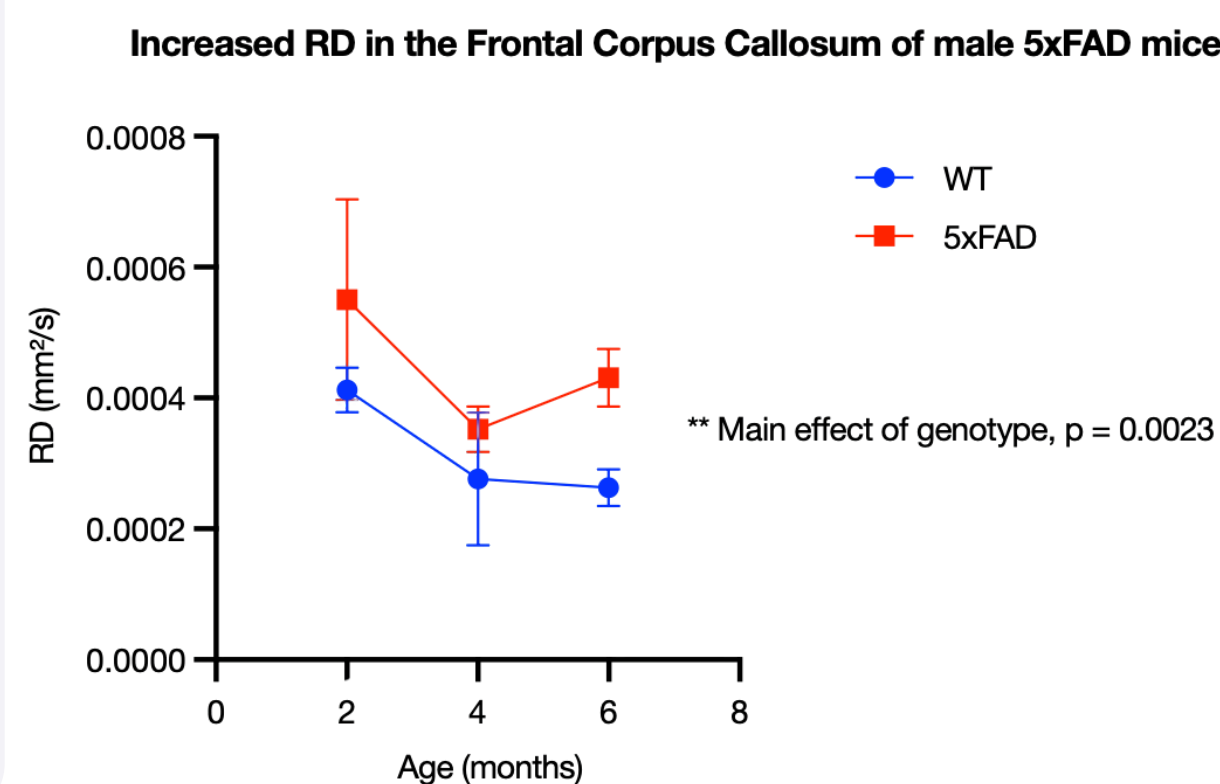
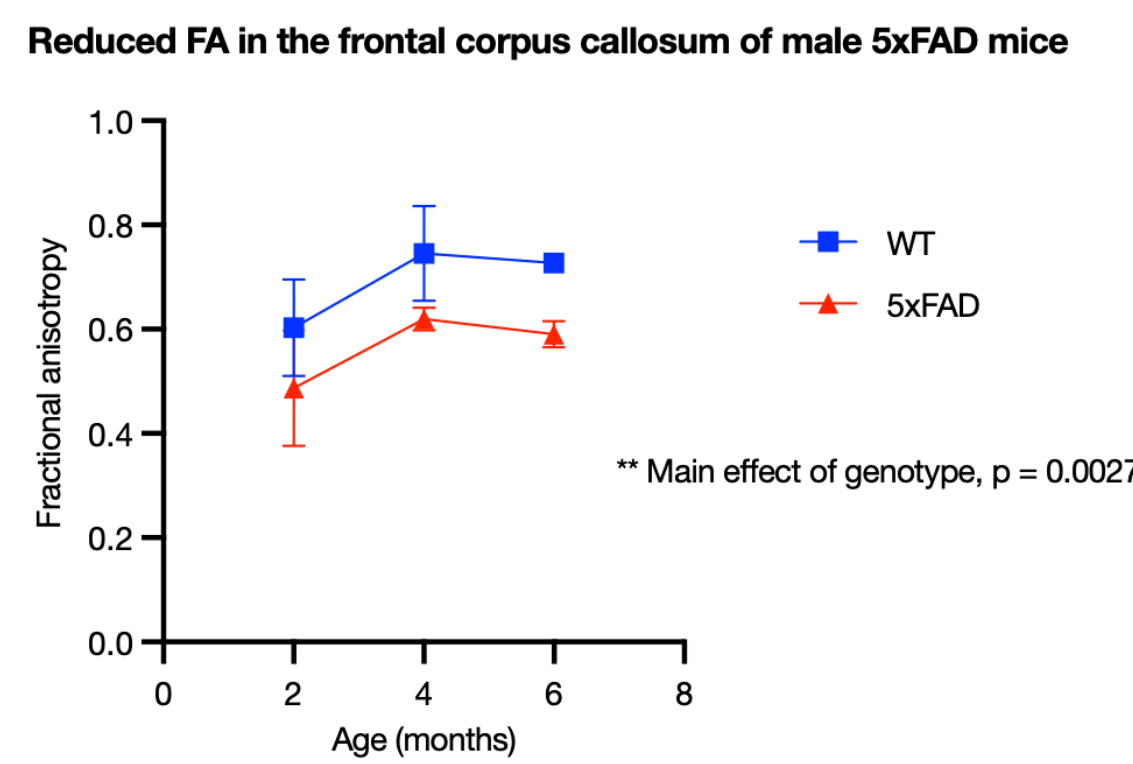
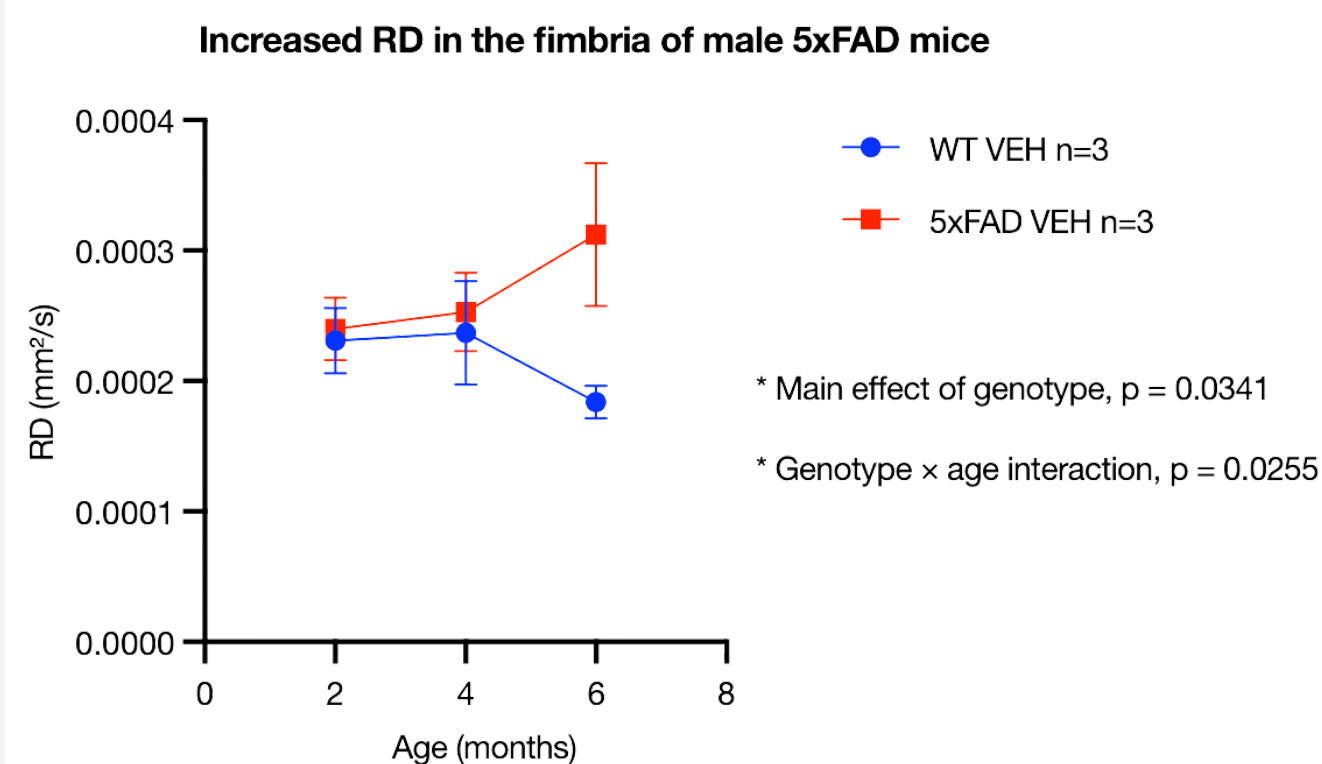
4. RESULTS

Y-maze performance is preserved across sex, genotype, and age

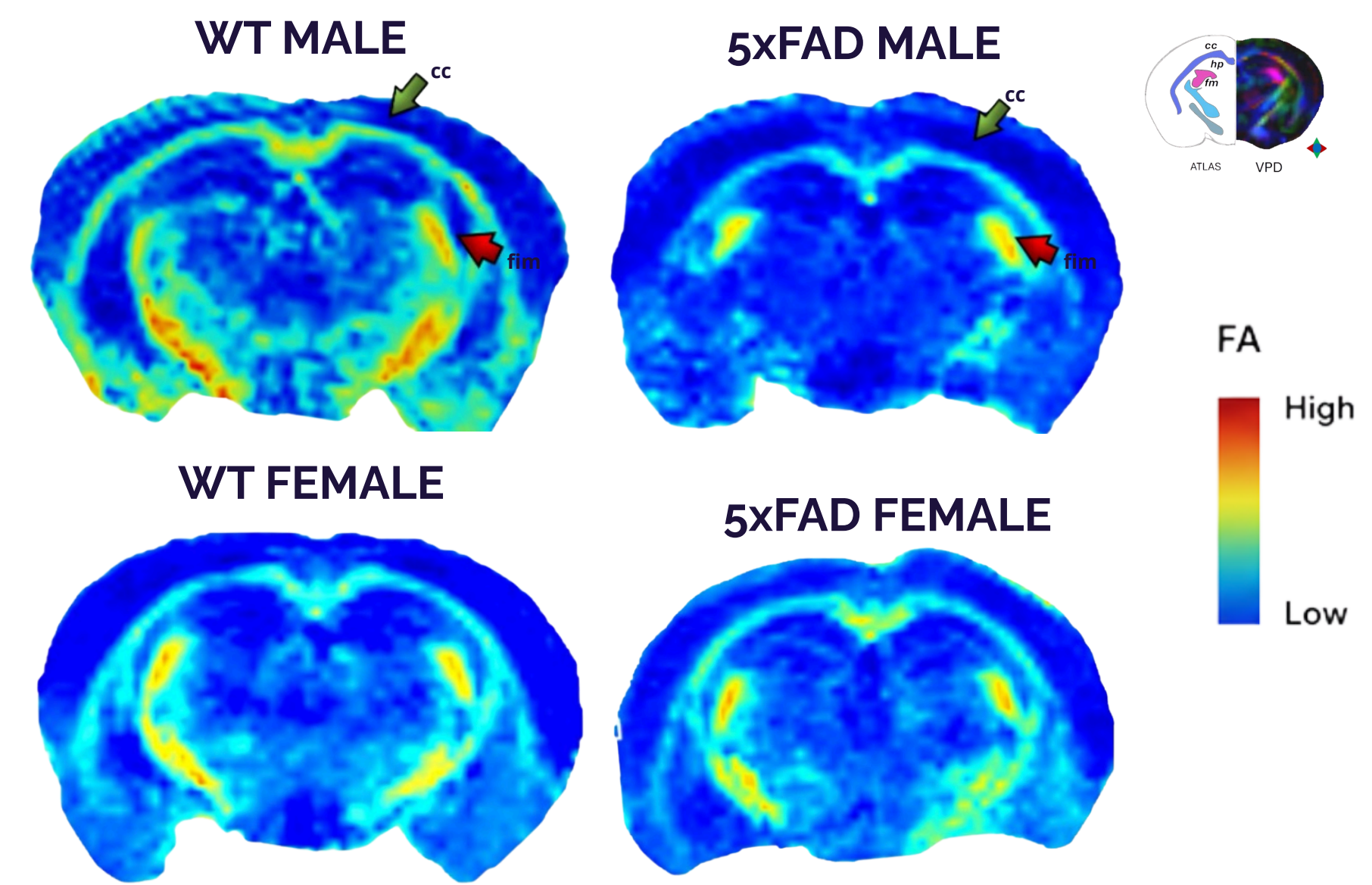


Spontaneous alternation reflects spatial working memory and exploratory behavior. WT and 5xFAD mice showed comparable performance at 4 and 6 months, suggesting preserved spatial working memory despite early white matter alterations.

DTI shows region and sex dependent WM alterations



Representative FA maps suggest sex-dependent white matter organization



Fractional anisotropy (FA) reflects the directional organization of water diffusion in white matter. Warmer colors indicate higher FA and more coherent fiber organization, whereas cooler colors suggest reduced microstructural organization. These maps illustrate sex-dependent patterns in callosal and fimbrial regions.

Key findings:

- DTI detected early WM vulnerability in 5xFAD mice.
- Frontal CC and fimbria showed selective susceptibility.
- Alterations were more evident in male 5xFAD mice.
- FA maps suggest sex-dependent WM organization.

6. References

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