

IMPACT OF COMMONLY USED ACQUISITION SEQUENCES ON AUTOMATED #1353 HIPPOCAMPAL SUBFIELD VOLUME ESTIMATES

AURÉLIE BUSSY^{1,2}, ERIC PLITMAN^{2,3}, VANESSA VALIQUETTE^{1,2}, CHRISTINA KAZAZAZIAN^{1,2}, GABRIEL A. DEVENYI^{2,3}, M. MALLAR CHAKRAVARTY^{1,2,3,4}



¹INTEGRATED PROGRAM IN NEUROSCIENCE, MCGILL UNIVERSITY, MONTREAL, CANADA
²COMPUTATIONAL BRAIN ANATOMY LABORATORY, CEREBRAL IMAGING CENTRE, DOUGLAS MENTAL HEALTH UNIVERSITY INSTITUTE, MONTREAL, CANADA
³DEPARTMENT OF PSYCHIATRY, MCGILL UNIVERSITY, MONTREAL, CANADA
⁴DEPARTMENT OF BIOMEDICAL ENGINEERING, MCGILL UNIVERSITY, MONTREAL, CANADA



INTRODUCTION

- Studies hippocampal subfields in healthy aging have been inconsistent.
- Many studies use differing magnetic resonance imaging (MRI) sequences.

GOAL : To compare the impact of MRI acquisition on automatically derived estimates of hippocampal subfield volumes!

METHODS

- **Participants:** 18 healthy subjects aged 20-42.
- **Acquisition:**
 - T1-weighted images (T1w), 1 mm isotropic, MPRAGE sequence.
 - T2-weighted images (T2w), 0.64 mm isotropic, SPACE sequence.
 - T2-weighted images slab (slab), 0.4x0.4x2mm, 2D turbo spin echo.
- **Processing:** minc-bpipe-library pipeline and MAGeT Brain algorithm^{2,3}.
- **Analyses:** A dependent 2-group Wilcoxon signed rank test to compare the volume estimates across acquisitions. Intraclass correlation coefficients to compare consistency between the volume estimates. Bonferroni correction was used across all 54 comparisons ($p < 0.00093$).

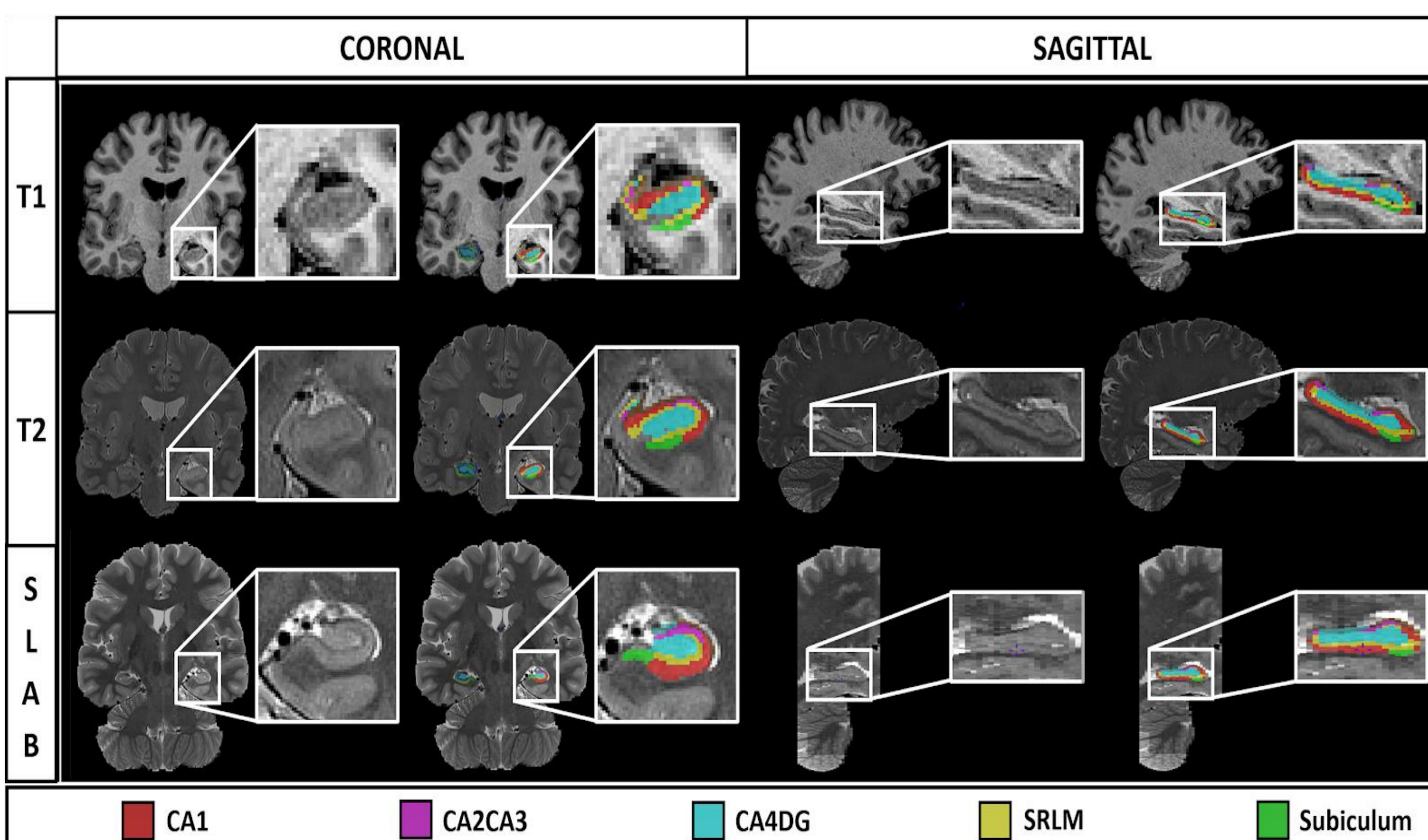


Figure 1: Example of coronal and sagittal views of a participant's scans using T1, T2 and slab sequences

RESULTS

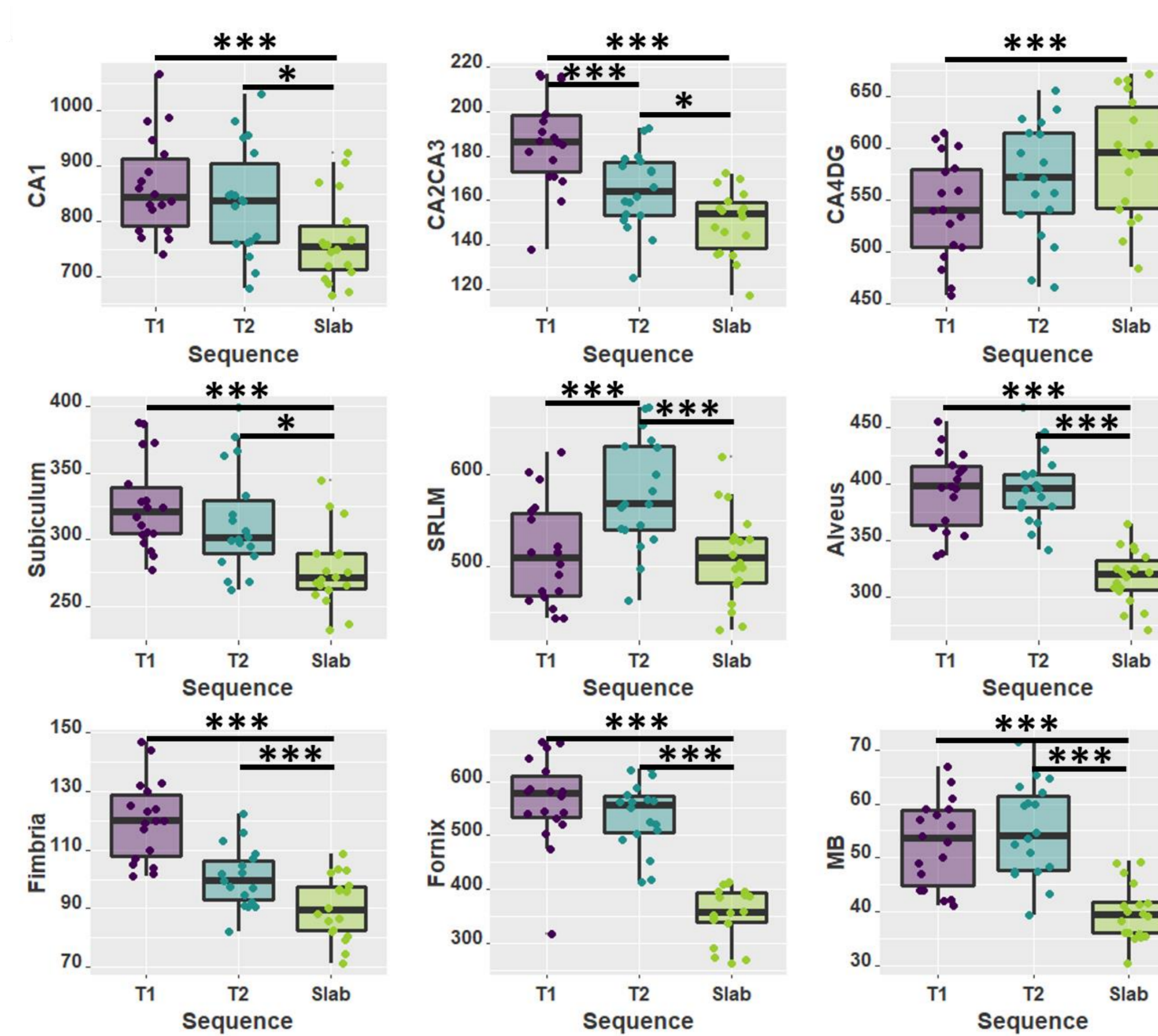


Figure 2: Boxplots comparing the right volume estimates across sequences from the same participants. Similar results were found in the left hemisphere. Corrected * $p < 0.05$; ** $p < 0.01$ and *** $p < 0.001$ shown.

T1w images give larger volume estimates than the slab sequence, on average by 11.2%. T2w images provide similar volumes compared to T1w images. T2w volumes estimate larger volumes than the slab sequences, on average by 8.1%. Slab images underestimate volumes compared to T1w and T2w sequences.

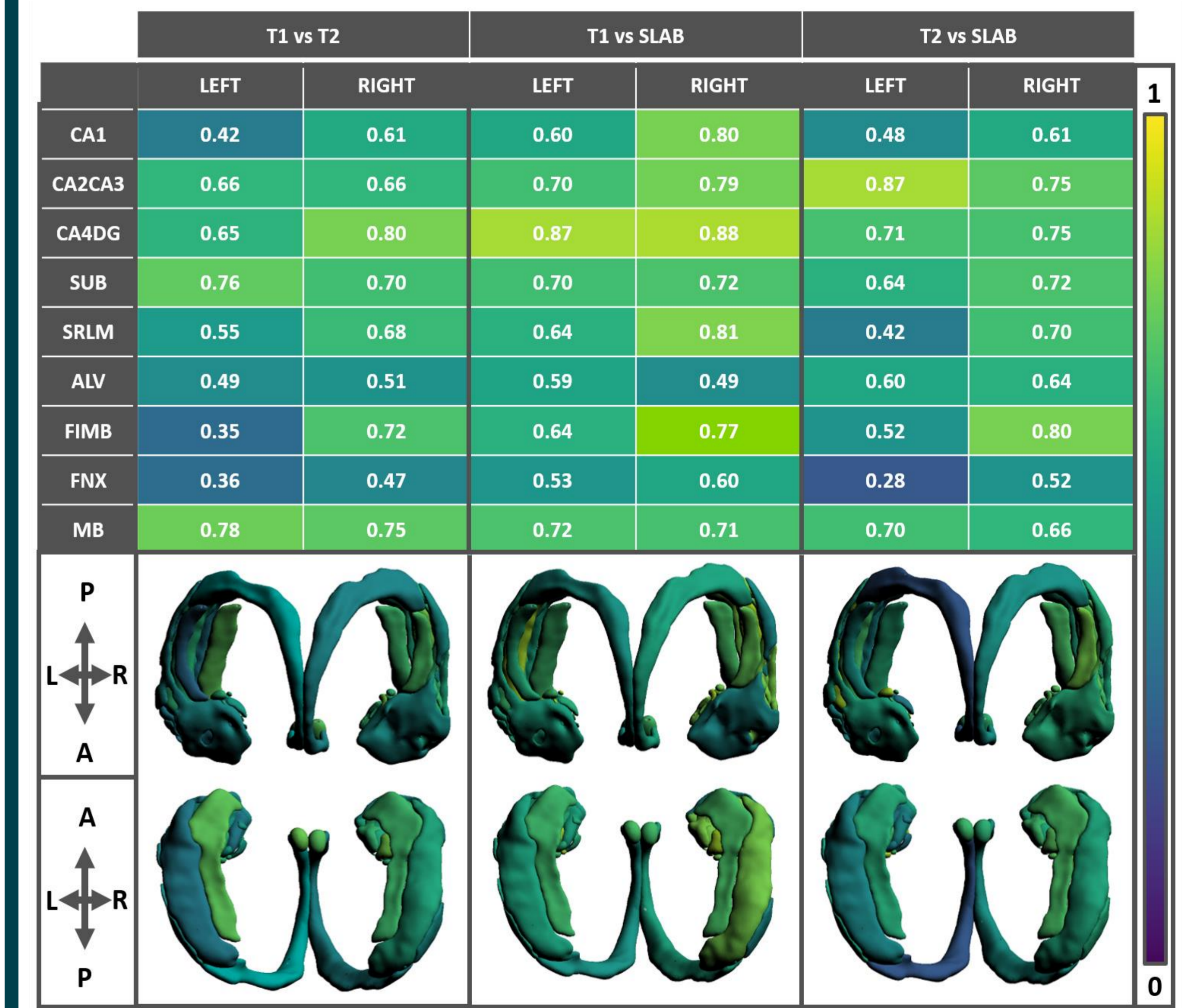


Figure 3: Representation of ICC consistency (3,1) of hippocampal subfields volume estimates from T1w, T2w, and slab images. Colour scale serves as an indicator of the ICC values: yellow for an ICC of 1 and dark blue for an ICC of 0.

High ICC was found between T1w and slab sequences in most subfields. The left hippocampus revealed lower ICC in most subfields across sequence. Subregions exhibiting poor consistency included left fimbria and fornix. Globally, hippocampal subfield volume estimations are consistent between acquisition type.

CONCLUSION

T1w and high-resolution T2w have demonstrated similar hippocampal subfield volumes estimation. In the contrary, slab images indicate consistently smaller volume compared to the volumes estimated from T1w and T2w. These volume estimation differences could explain certain result inconsistencies in healthy aging literature.

¹ Bussy et al, BioRxiv (2020); ² Pitipone et al, Neuroimage 101, 494-512 (2014); ³ Chakravarty et al. Human Brain Mapping 34(10), 2635-2654 (2013)

