**Supplementary Figure 1.** Bootstrap analysis. Evolution of (A) mean perfusion, (B) perfusion variability (coefficient of variation), (C) mean tSNR and (D) between subfields effect size using the median across N=100 bootstrap samples. For each metric, heatmaps depict the percentage difference with respect to the final estimates as function of number of included runs and subjects for global hippocampal estimates. Line plots show the impact of number of included runs (across all subjects) and subject (across all runs) on global and subfield-specific estimates. Superimposed contours indicate the 0% level for A, B and C and *p*-value thresholds for D.
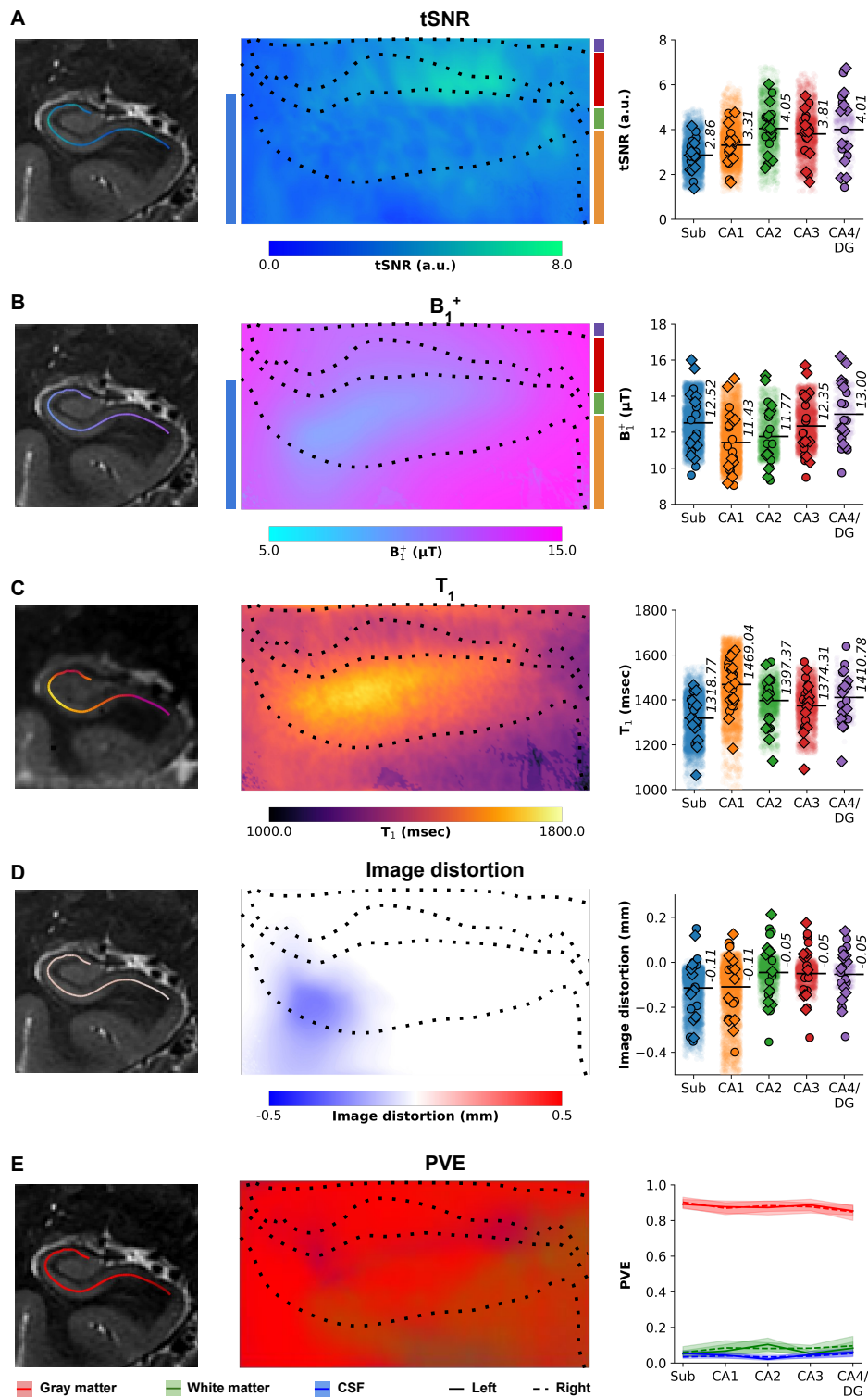
Supplementary Figure 2. MRI quality metrics. Average (A) perfusion tSNR (a.u.), (B) B_1^+ (μT), (C) T_1 (msec), (D) image distortion (mm) and (E) partial volume estimates (PVE) are mapped on the unfolded hippocampal surface. Dotted lines indicate subfield boundaries. The center plots show subfield averages for left (solid) and right (dashedline) hemispheres separately. Color-coded (as per subfield atlas overlaid on center images) subfield averages are shown for each subject and left (circles) and right (diamonds) hemisphere, as well as per vertex (i.e., averaged across subjects and hemispheres, semi-transparent dots, right plots). PVE estimates are displayed as line plots and color-coded based on tissue class.
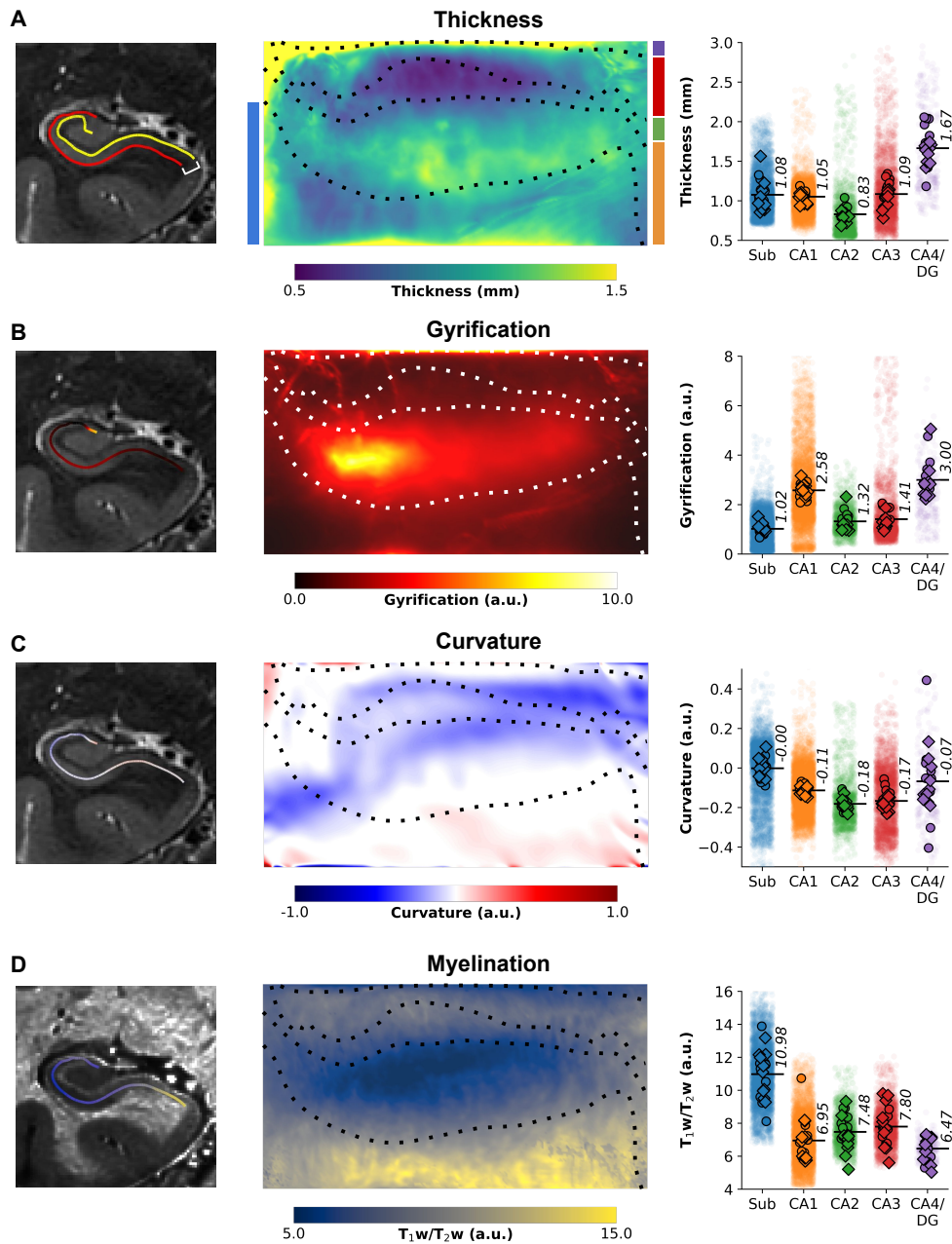
Supplementary Figure 3. Morphometric hippocampal tissue properties. (A) Thickness (mm), (B) gyrification (a.u.), (C) curvature (a.u.) and (D) myelination (i.e., T_1w/T_2w, a.u.) are displayed for an example subject with color-coded surface outlines superimposed onto a coronal slice (left). Center images show the respective averages mapped on the unfolded hippocampal surface with dotted lines delineating subfield boundaries. Color-coded (as per subfield atlas overlaid on center images) subfield averages are shown for each subject and left (circles) and right (diamonds) hemisphere, as well as per vertex (i.e., averaged across subjects and hemispheres, semi-transparent dots, right plots).
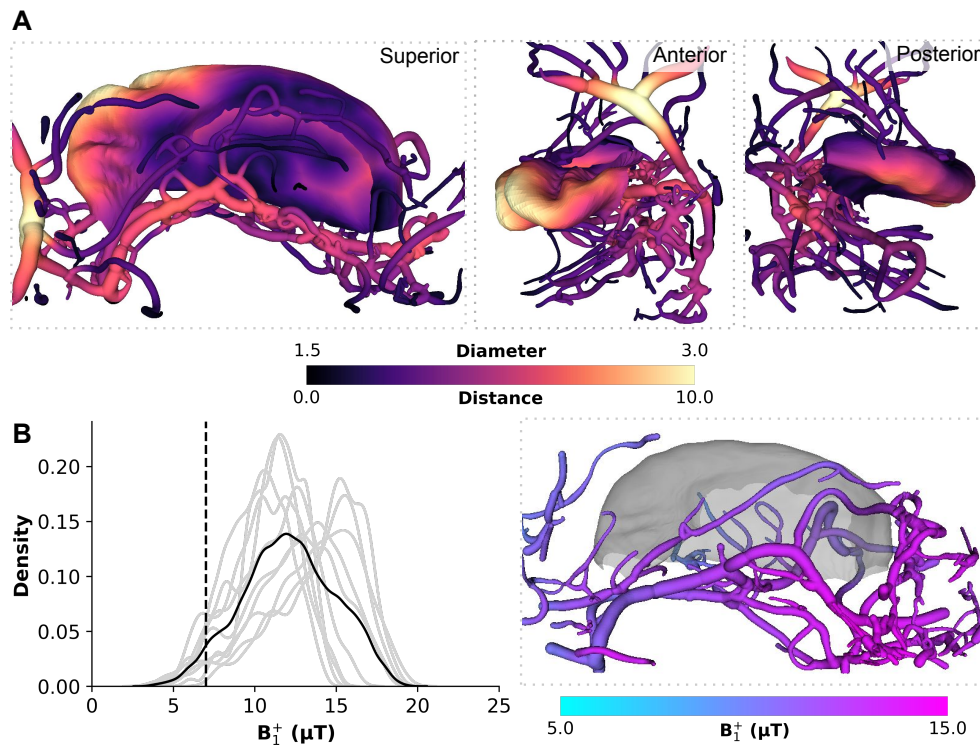
Supplementary Figure 4. Hippocampal vasculature and grey matter projections. Example of a three-dimensional reconstruction of a subject's macrovasculature near the right hippocampus color-coded for vessel diameter. Shortest distance between hippocampal vertices and the vessel tree is projected on the folded hippocampal surfaces. The colourmap on the vessels indicates local diameter (mm) while on the surface maps indicates the distance (mm) to closest vessel.
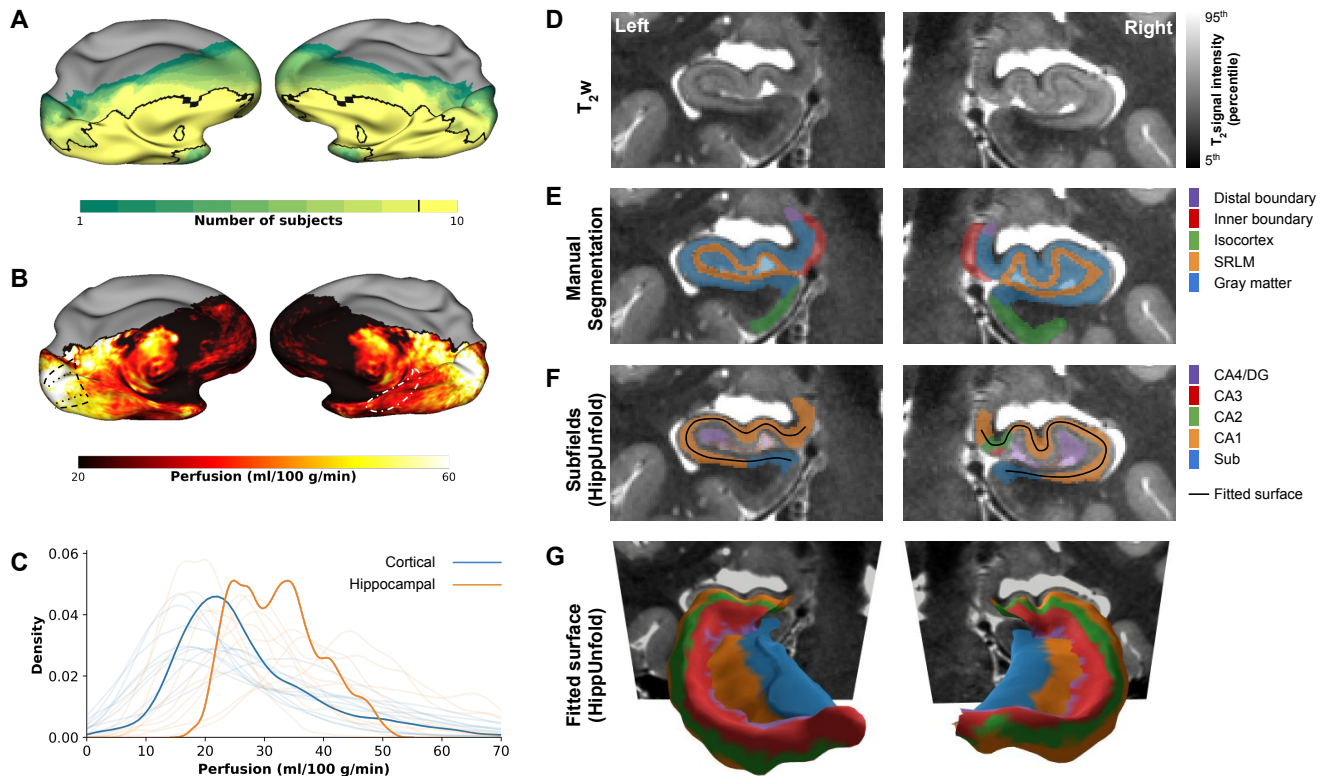
Supplementary Figure 5. Hippocampal perfusion imaging and subfield segmentation. (A) Cortical projections of the vertex-wise coverage, and (B) average perfusion across subjects, (C) average perfusion distribution in cortex and hippocampus. (D) Example T_2w data for a single subject's left and right hippocampus, (E) manual segmentation of hippocampal tissue, (F-G) HippUnfold subfield labelling and fitted surface.
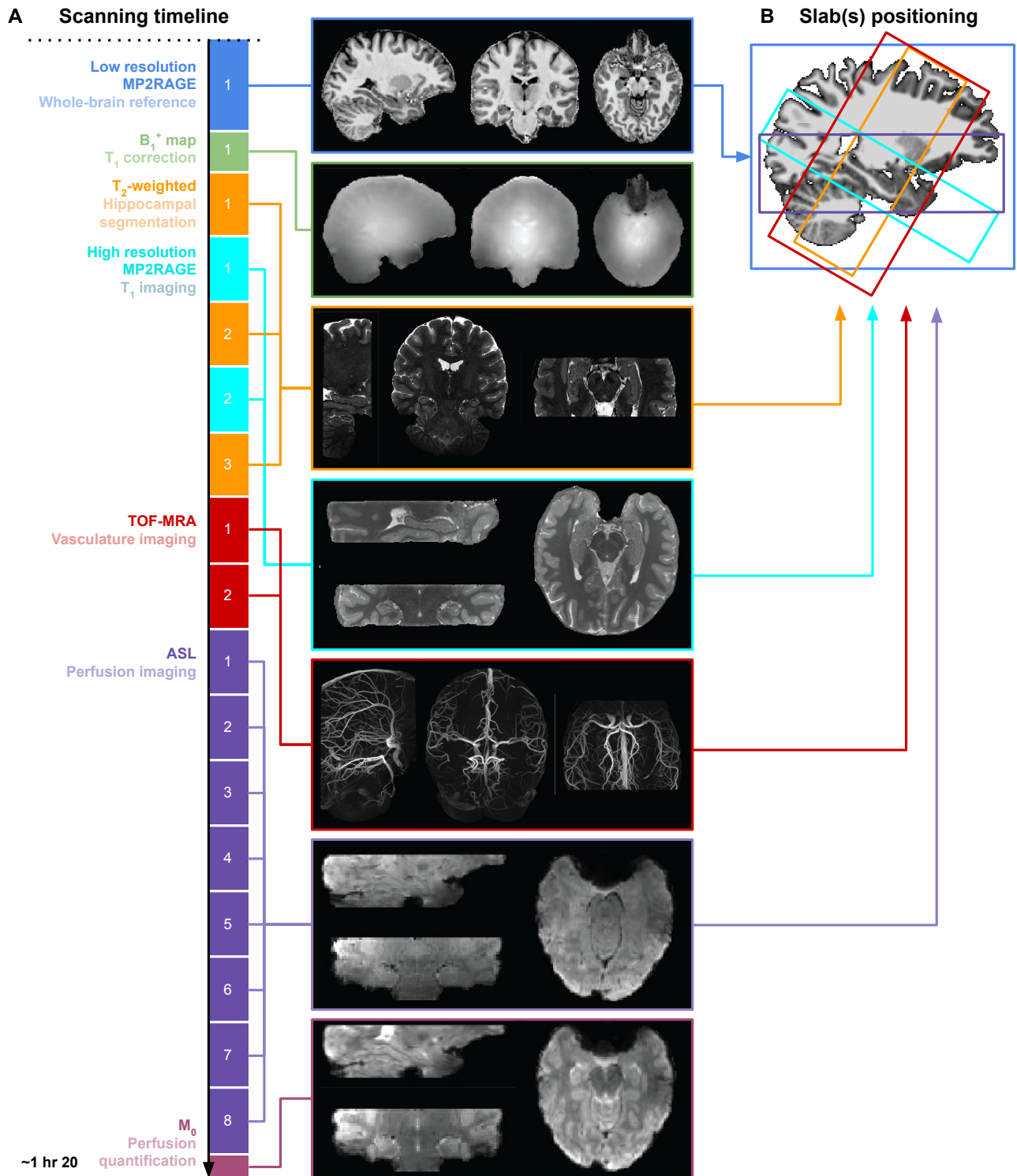
Supplementary Figure 6. MRI modalities in the present study. (A) Scanning timeline showing the order of acquisitions colored by MRI modality. (B) Positioning of each MRI modality with respect to the whole-brain reference.