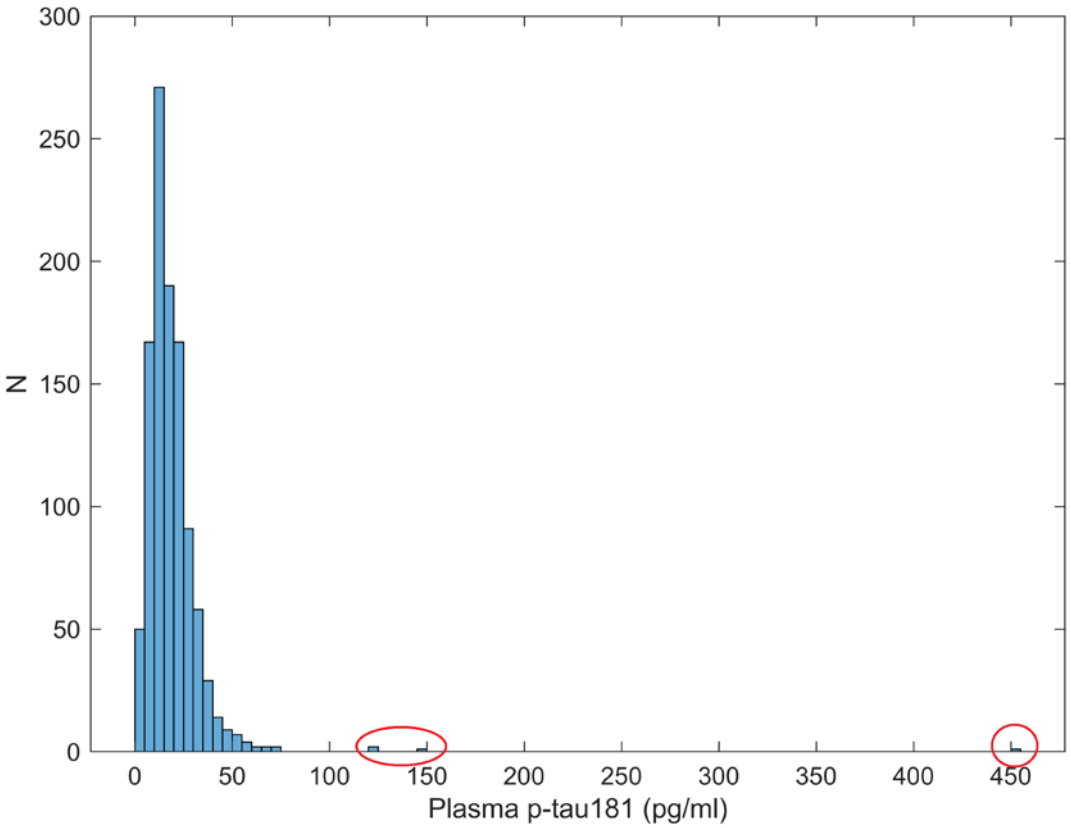
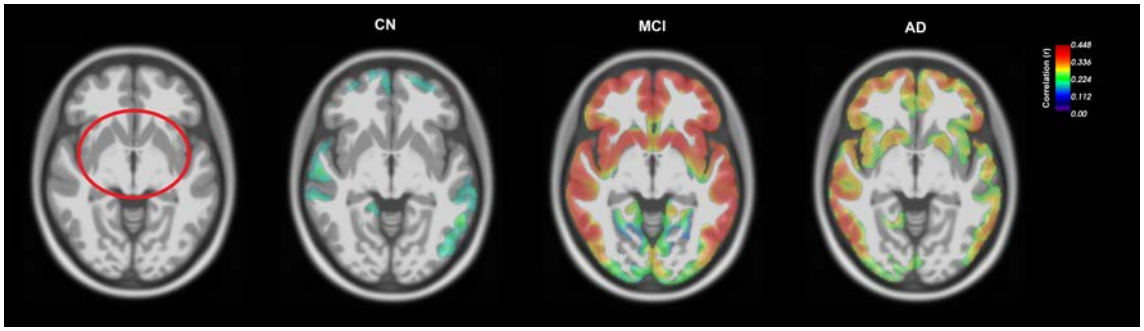
## Supplementary Material

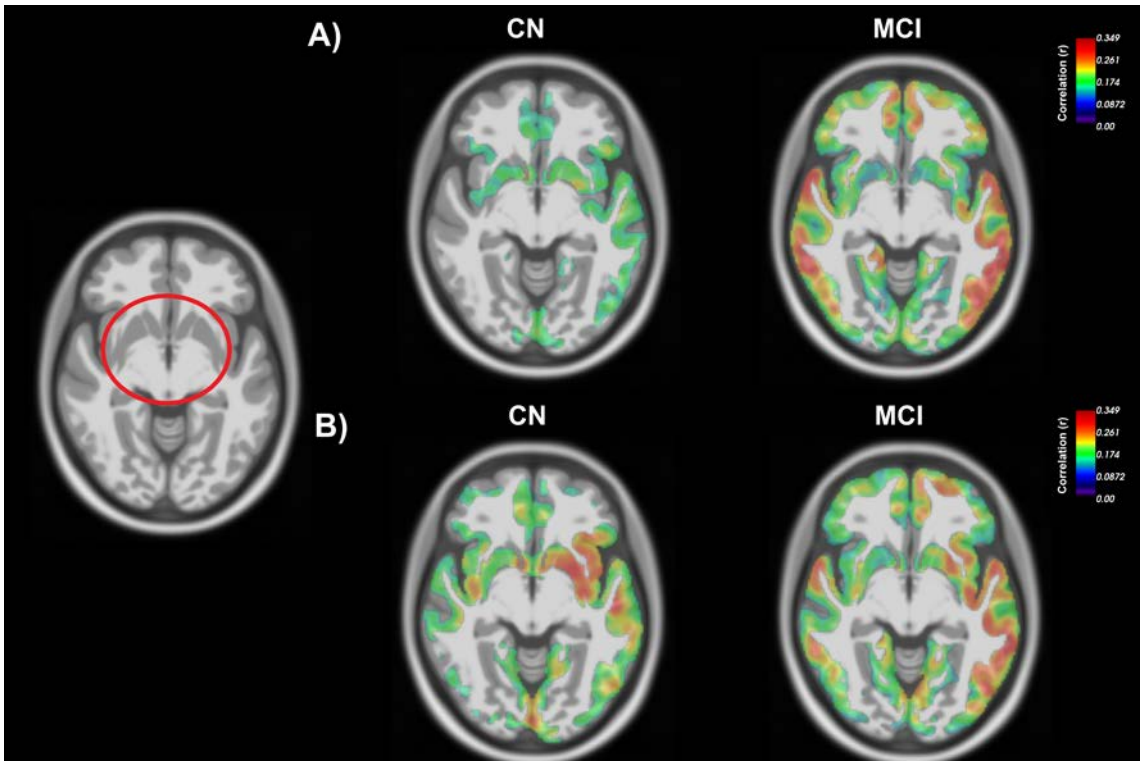
**Supplementary Figure 1.** Distribution of baseline plasma p-tau181 levels. Enclosed in red circles are the four outlier measurements (121, 124, 148, and 451 pg/ml) that were excluded from analyses.



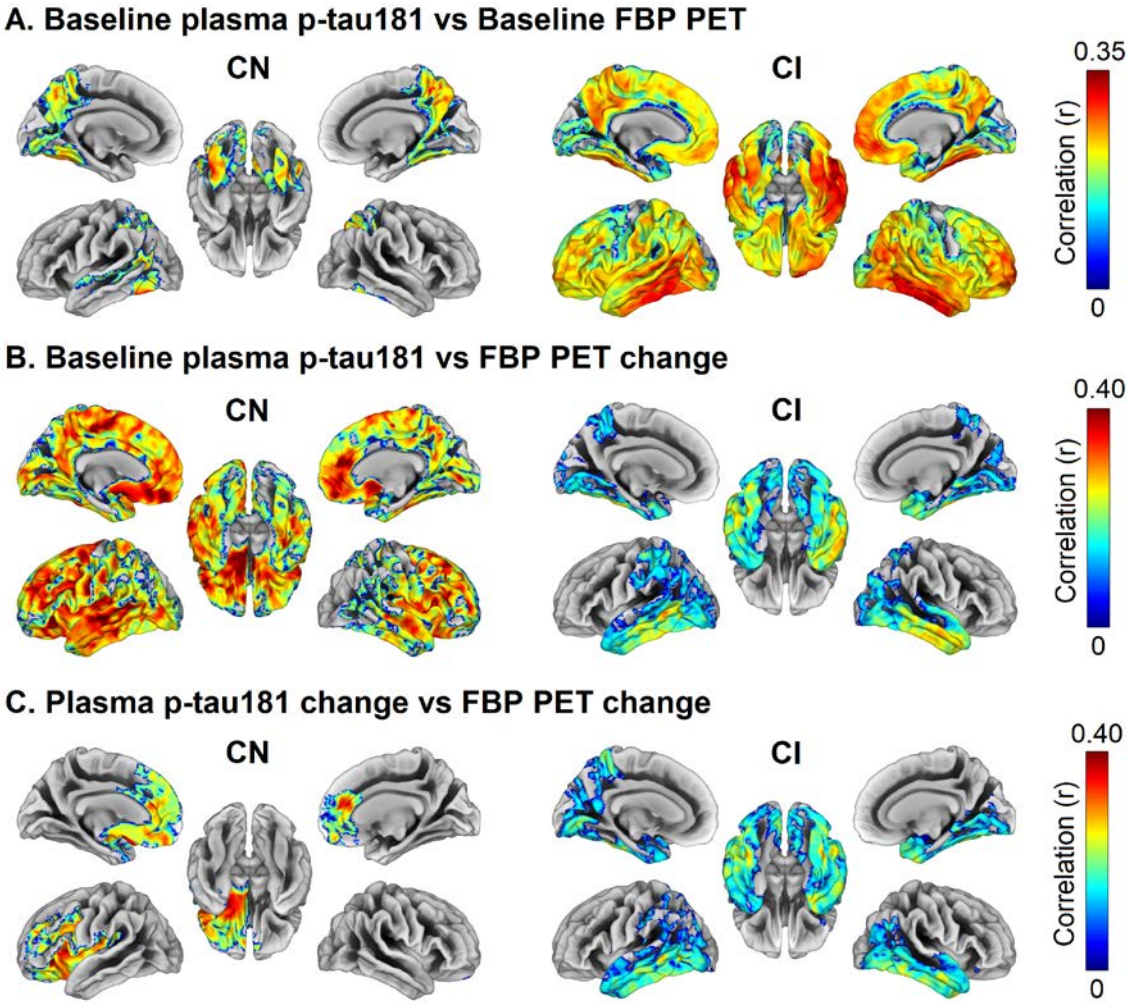
**Supplementary Figure 2.** Axial slices showing association maps in the striatum between baseline plasma p-tau181 and baseline FBP SUVR for CN, MCI, and Alzheimer's disease dementia (AD) participants. Models were adjusted for age and sex.



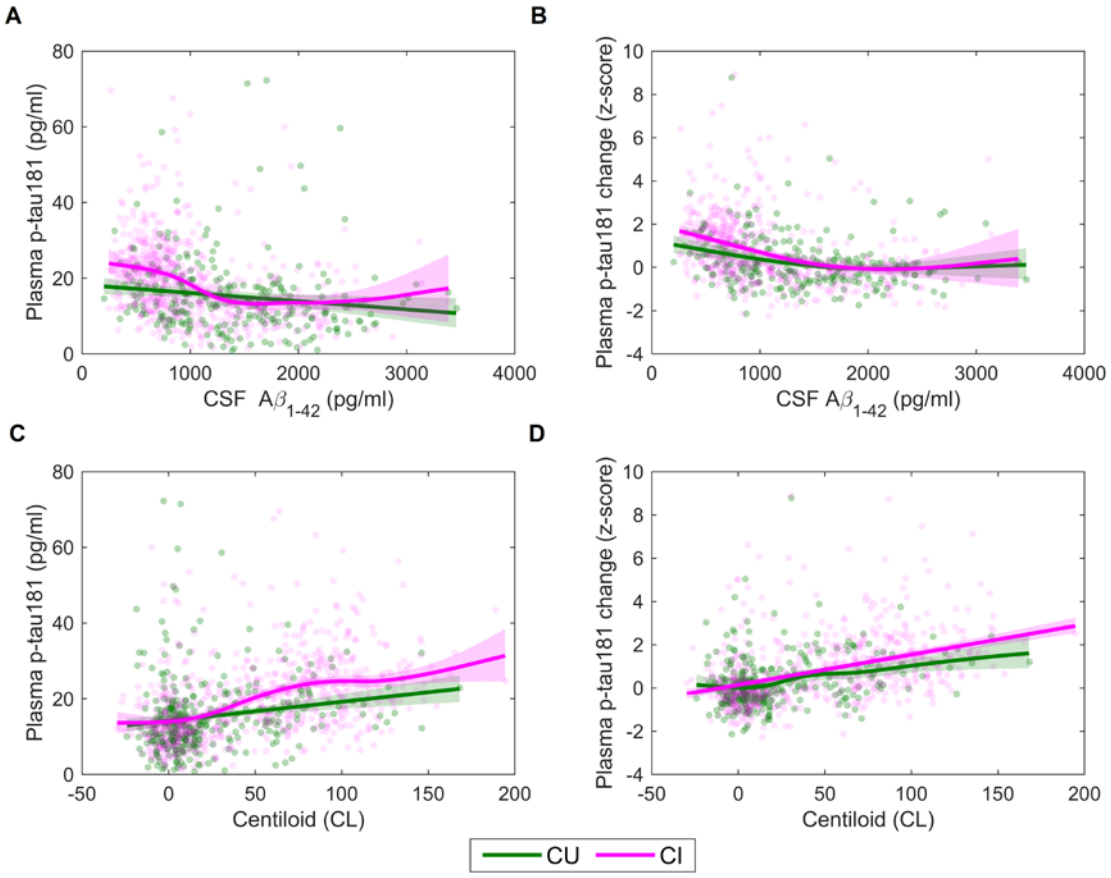

**Supplementary Figure 3.** Axial slices showing association maps in the striatum between FBP SUVR change and A) baseline plasma p-tau181, B) plasma p-tau181 change. Models were adjusted for age and sex.



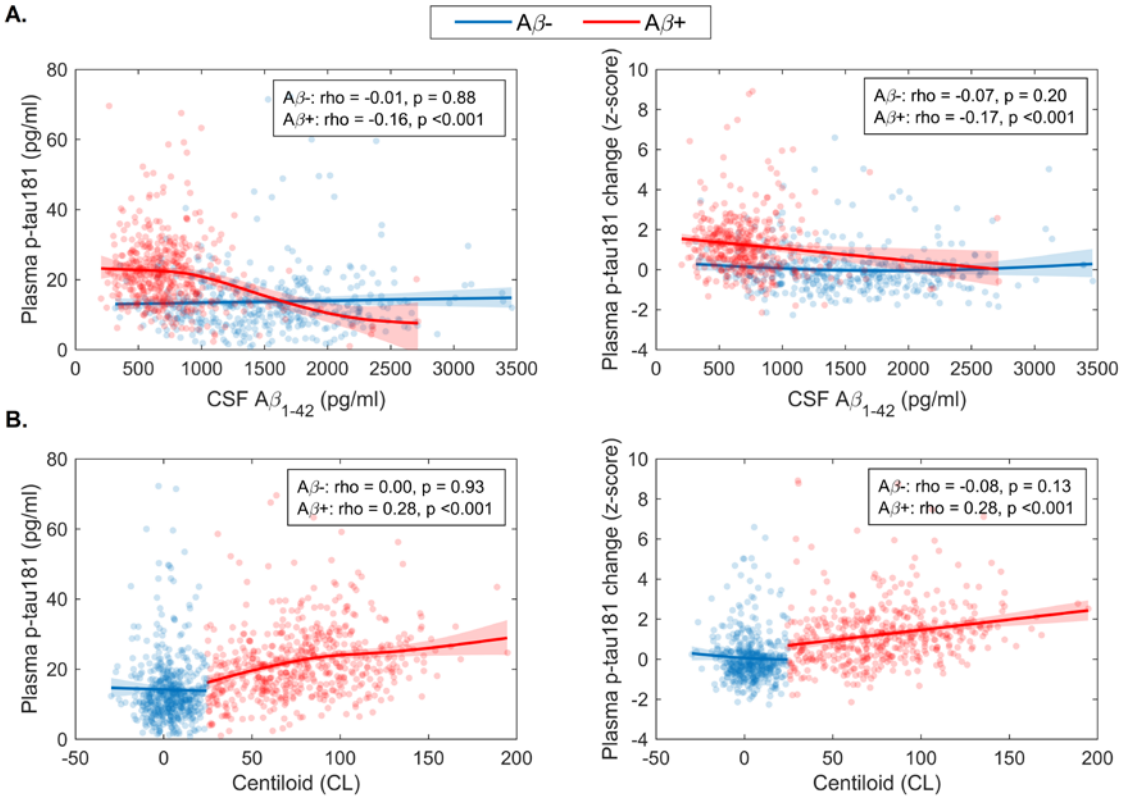
**Supplementary Figure 4.** Regional associations of plasma p-tau181 with PET-measured Aβ deposition and longitudinal accumulation among Aβ+ subjects. Voxel-wise analyses (adjusted for age and sex) assessing regional associations between (A) baseline plasma p-tau181 levels and baseline FBP SUVR, (B) baseline plasma p-tau181 levels and FBP SUVR change, and (C) plasma p-tau181 change and FBP SUVR change for both CN and cognitively impaired individuals. Significant associations in voxel-wise analyses were determined based on a family-wise error (FWE)-corrected threshold of $p<0.05$ at the cluster level, with initial voxel-level height thresholds of $p<0.05$. No significant associations were found among Aβ- subjects.
CI: Cognitively impaired.



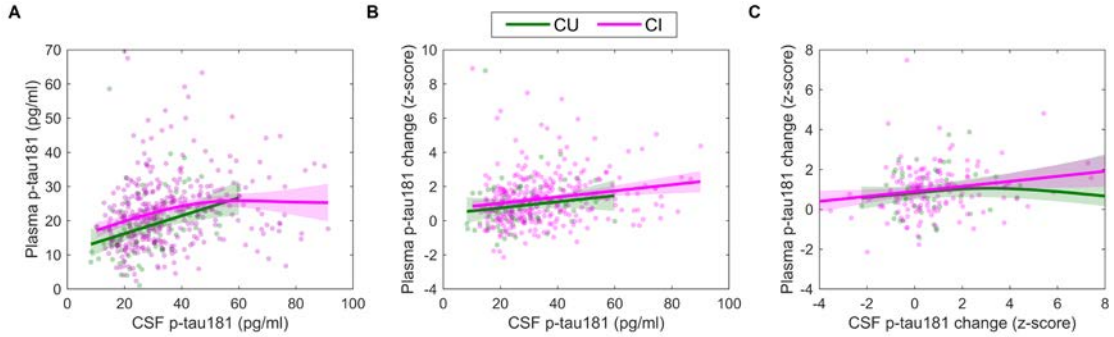
**Supplementary Figure 5.** Baseline and longitudinal associations of plasma p-tau181 with imaging and CSF biomarkers of global Aβ pathology, according to cognitive status. Spline regressions, fit separately for CU and CI individuals, describe the statistical dependence of baseline levels of plasma p-tau181 (A and C) and longitudinal change in plasma p-tau181 (B and D) on CSF Aβ1-42 levels (A and B) and Centiloids (C and D). Shaded areas are 95% confidence intervals for the fit. Spline fits suggest that the association of plasma p-tau181 with Aβ markers was stronger among CI individuals (non-overlapping 95% confidence bounds in the abnormal amyloid biomarker range). CU: Cognitively unimpaired, cognitively normal (CN). CI: Cognitively impaired (MCI+AD).



**Supplementary Figure 6.** Baseline and longitudinal associations of plasma p-tau181 with PET and CSF biomarkers of global Aβ pathology, according to Aβ status. Spline regressions, fit separately for Aβ+ and Aβ. individuals, describe the statistical dependence of baseline levels of plasma p-tau181 (A and C) and longitudinal change in plasma p-tau181 (B and D) on CSF Aβ1-42 levels and Centiloids (C and D). Shaded areas are 95% confidence intervals for the fit. Spline fits and Spearman rhos suggest that the association of plasma p-tau181 with Aβ markers was only present among Aβ+ subjects.



**Supplementary Figure 7.** Baseline and longitudinal associations between plasma p-tau181 and CSF p-tau181 among Aβ+ subjects, according to cognitive status. Spline regressions describing the statistical dependence of baseline levels of plasma p-tau181 (A) and plasma p-tau181 change (B) on CSF p-tau181 levels, as well as plasma p-tau181 change vs CSF p-tau181 change (C). Z-scores were computed using Aβ- CN levels as the reference. Shaded areas are 95% confidence intervals for the fit. Spline fits suggest that the relationship between p-tau181 in plasma and in CSF is not modified by cognitive status (overlapping 95% confidence intervals over the entire shared range). CU: Cognitively unimpaired, cognitively normal (CN). CI: Cognitively impaired (MCI+AD).



**Supplementary Figure 8.** Within-subject trajectories of plasma p-tau181 accumulation as a function of time from baseline. Regression lines were estimated using the mean slope as determined by the previously derived linear mixed model.