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Cortical Thickness and Subcortical Volume Trajectories Across the Lifespan: Data From 14,600 Healthy Individuals Aged 6-90 Years

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Background: Age is a critical determinant of brain morphometry. We formed the Lifespan Working group of the Enhancing Neuroimaging Genetics through Meta-Analysis(ENIGMA) Consortium to perform a large-scale analysis of cortical thickness data across more than 79 samples and14,600 healthy individuals aged 6-90 years.

Methods: We used fractional polynomial (FP) regression to characterize age-related trajectories in brain morphometry. Normalized growth centiles were constructed using the para-metric Lambda, Mu, and Sigma (LMS) method. Inter-individual variability was analyzed using meta-analysis and one-way analysis of variance.

Results: The volume of subcortical regions followed an inverted U-shaped trajectory while cortical thickness in almost all regions decreased during the first two to three decades of life and showed an attenuated or plateaued slope afterwards. Exceptions were the entorhinal, anterior cingulate and temporopolar cortices that followed attenuated age-related U-shaped trajectories. Age and its FP combinations explained up to 48% variance in morphometry. Sample, strength of the MRI scanner magnetic field and FreeSurfer version jointly accounted for a median of 17% of the variance.

Conclusions: Our results could shed light on the uncertainties about age-related developmental trajectories of cortical thickness. The estimated centile values will provide scientists and clinicians with more efficient tools to detect brain morphological deviations and their association with behavioral, cognitive and clinical outcomes

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