

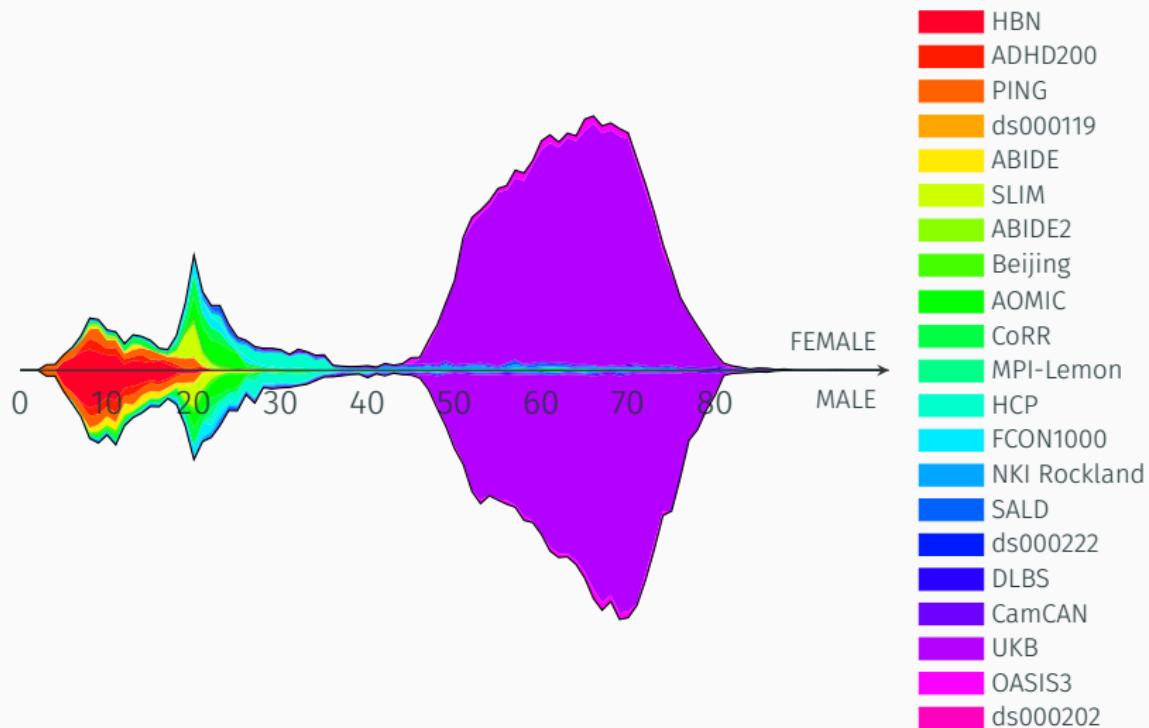
Brain age as a marker of overall brain health

Molecular foundations, associations and causal relationships

James M. Roe
07.09.23

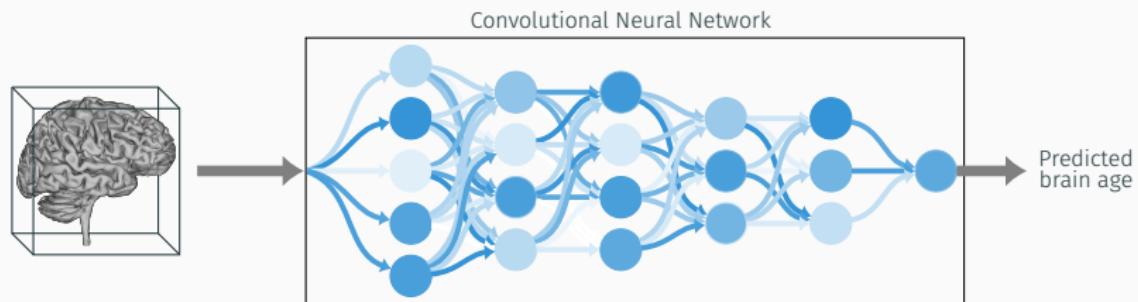


Brain age: Dataset



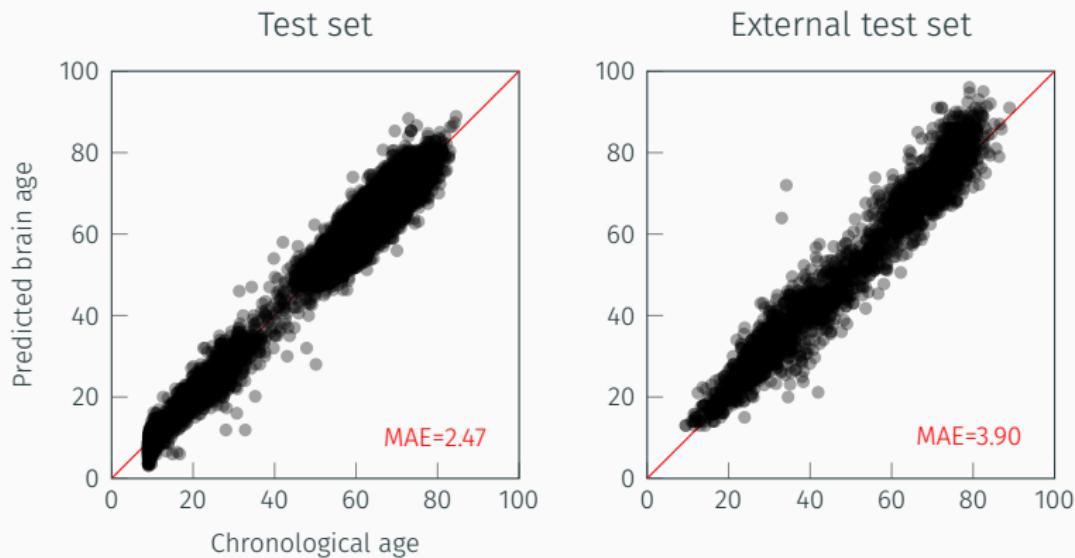
21 sources, 53542 subjects, 3-95 years old

Brain age: Model



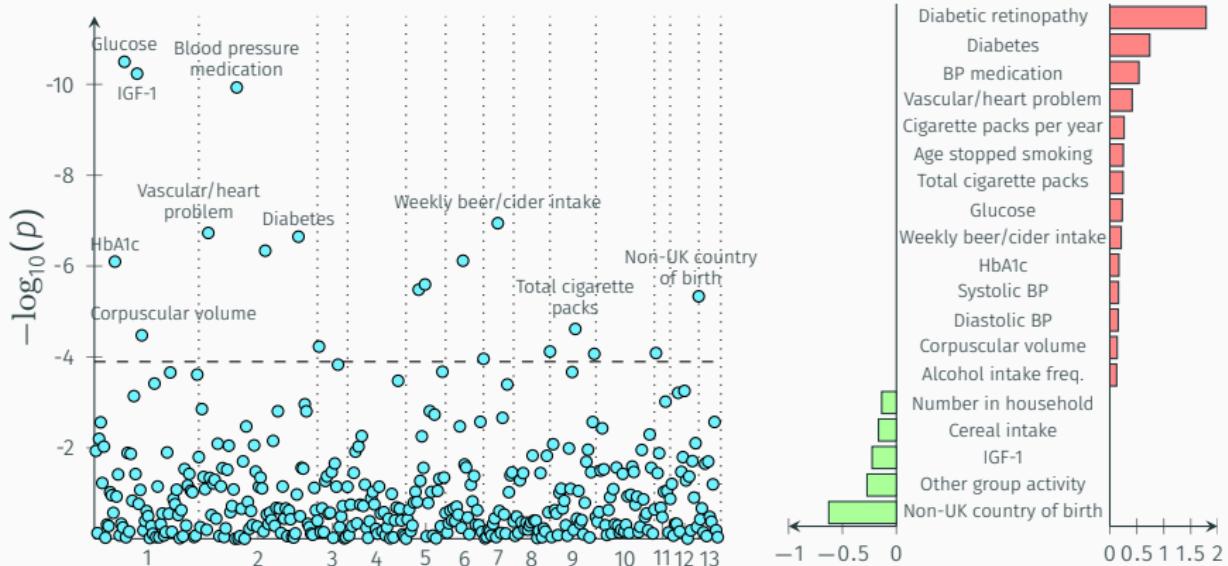
CNN with ~3m parameters predicting brain age from raw imaging data

Brain age: Predictions



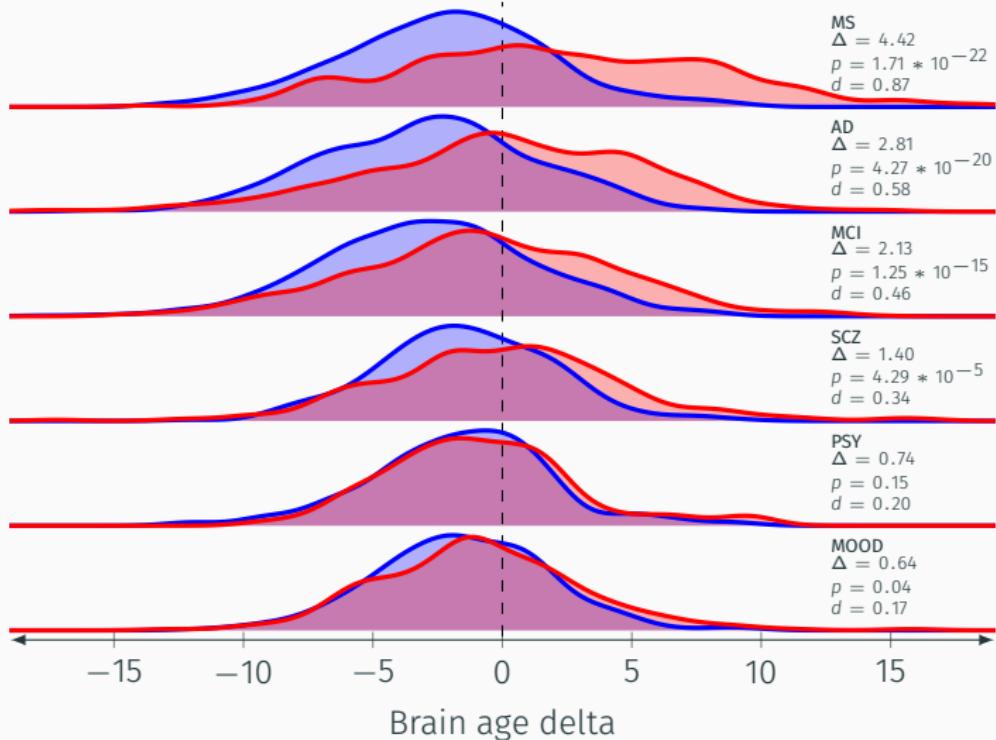
Mean absolute error of 3.9 years in data from unseen scanners

Brain age: Associations



Higher brain age associated with diabetes, vascular disease, smoking, alcohol

Brain age: Patient cohorts



Significantly higher brain age in patients with MS, AD, MCI, SCZ

Brain age: Code

The screenshot shows a GitHub repository page for 'payment-public'. The repository has 3 branches and 2 tags. It contains several files and folders: docker, notebooks, performance, payment, scripts, tests, .gitignore, README.md, requirements.txt, and setup.py. A merge pull request #12 from estenhl/dev was merged on Feb 17. The repository has 94 commits. The 'About' section notes 'No description, website, or topics provided.' It includes links to Readme, Activity, 17 stars, 3 watching, 7 forks, and 2 releases. The 'Releases' section shows v2.0.0 (Latest) on Feb 17 and + 1 release. The 'Packages' section indicates no packages published and encourages publishing. The 'Languages' section shows Python at 81.4% and Jupyter Notebook at 18.6%. The README.md file describes the repository as containing code, models, and tutorials for a paper on deep neural networks learning general and clinically relevant representations of the ageing brain. Installation instructions via terminal and Anaconda are provided, along with a command to clone the repo.

payment-public Public

main 3 branches 2 tags Go to file Add file Code About

estenhl Merge pull request #12 from estenhl/dev 1658741 on Feb 17 94 commits

docker Updated README structure 2 years ago

notebooks Merge branch 'main' into dev 6 months ago

performance More performance tests for augmentations last year

payment Updated unit tests 6 months ago

scripts Merge branch 'main' into dev 6 months ago

tests Updated unit tests 6 months ago

.gitignore Merge branch 'main' into dev 6 months ago

README.md Updated README structure 2 years ago

requirements.txt Typo in requirements.txt 6 months ago

setup.py Added script for generating setup.py 9 months ago

README.md

Repository containing code, models and tutorials for the paper Deep neural networks learn general and clinically relevant representations of the ageing brain

Installation (via terminal and Anaconda)

- Clone the github repo
git clone git@github.com:estenhl/payment-public.git

About

No description, website, or topics provided.

Readme Activity 17 stars 3 watching 7 forks

Releases 2

v2.0.0 (Latest) on Feb 17 + 1 release

Packages

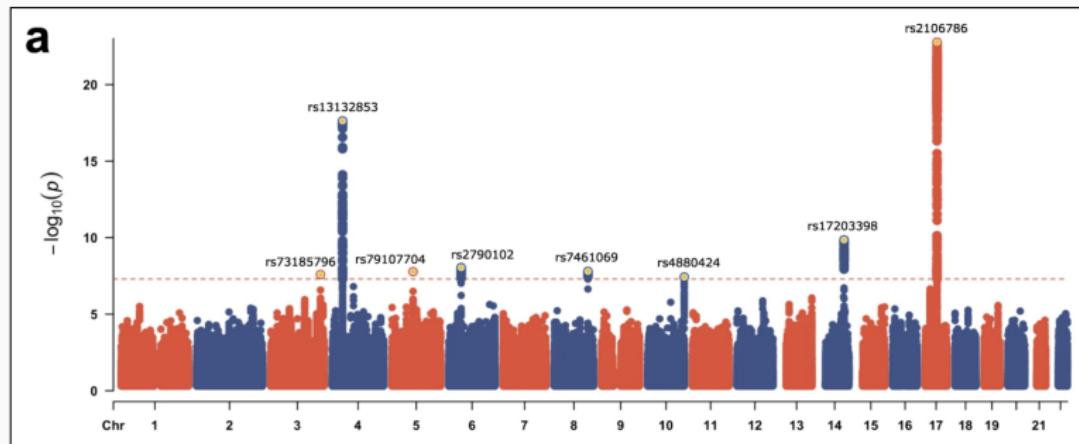
No packages published Publish your first package

Languages

Python 81.4% Jupyter Notebook 18.6%

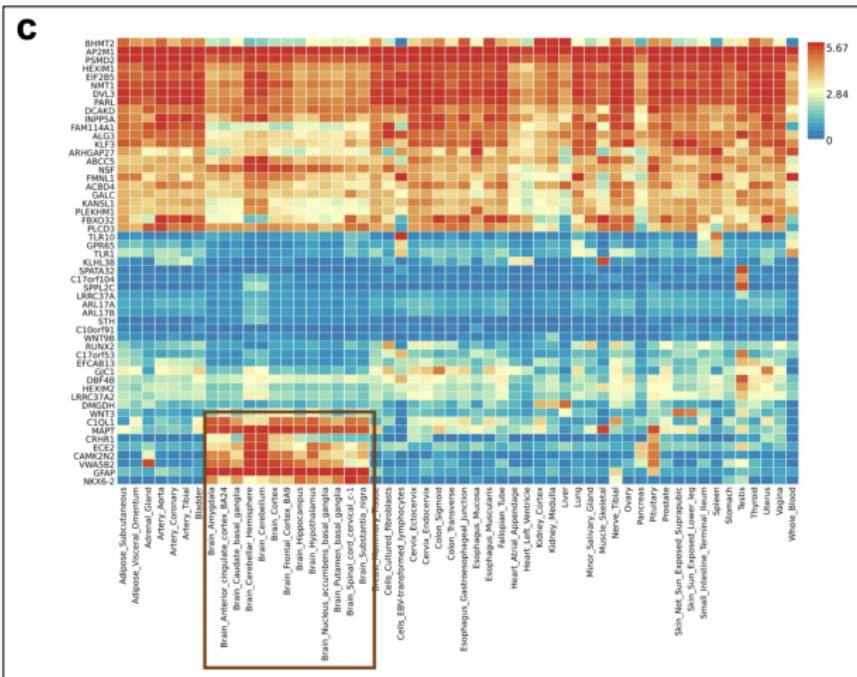
Model freely available online

Brain age: Associated SNPs



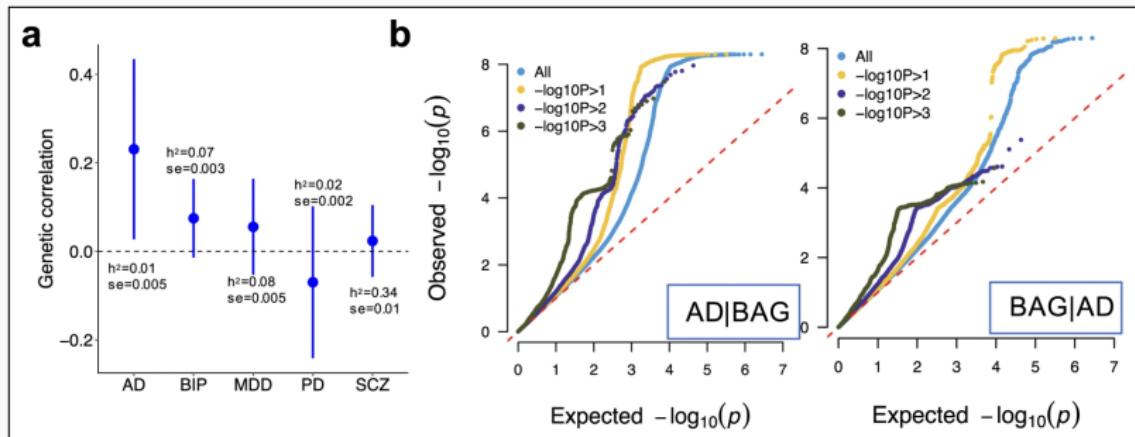
8 SNPs significantly associated with differences in BAG, 7 novel

Brain age: Associated genes



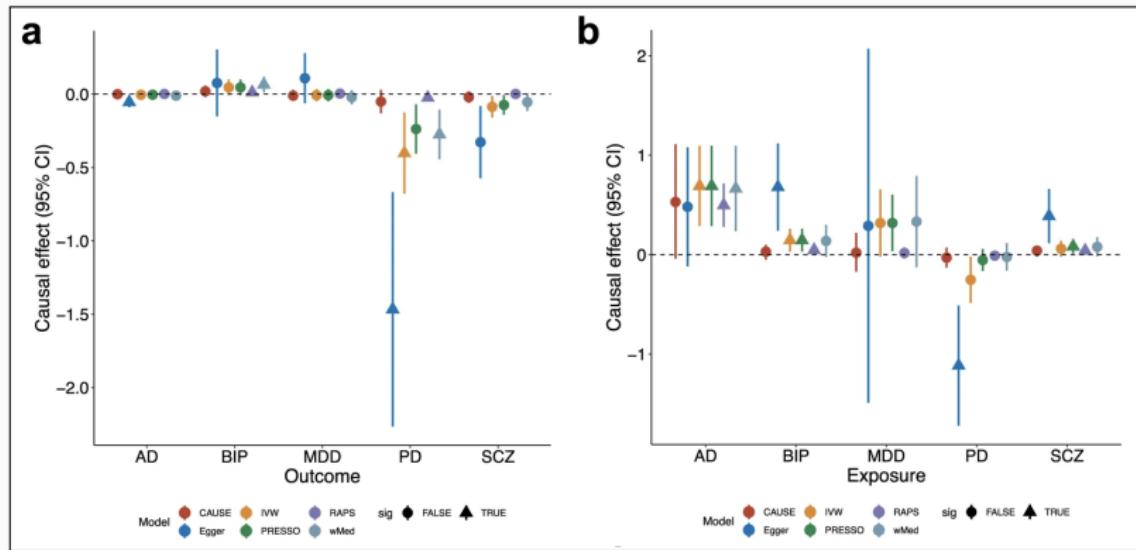
54 genes implicated, expressed in all tissue types

Brain age: Genetic correlations



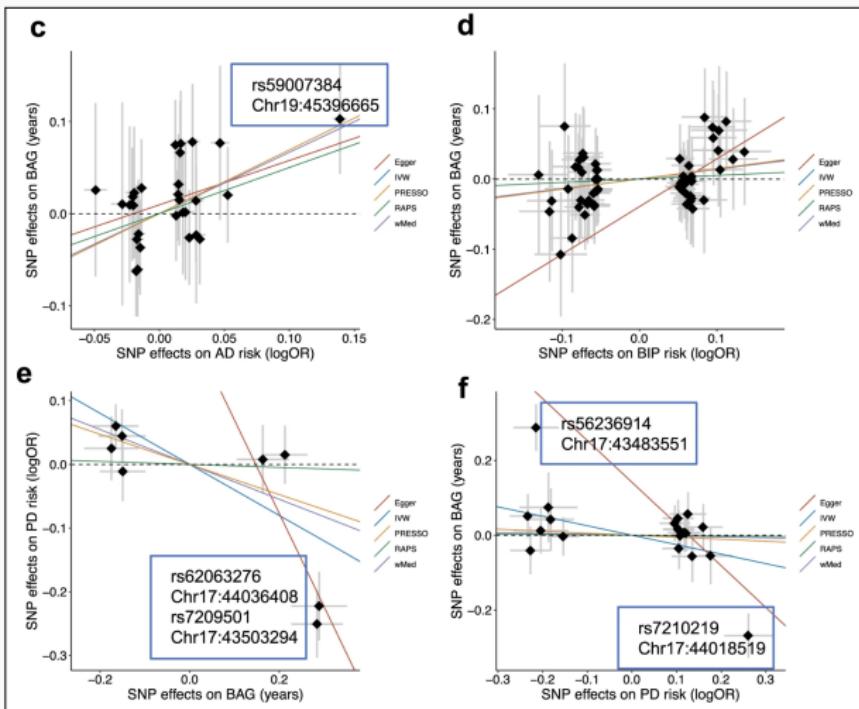
Brain age gap (BAG) nominally genetically correlated with AD, no others

Brain age: Causal effects



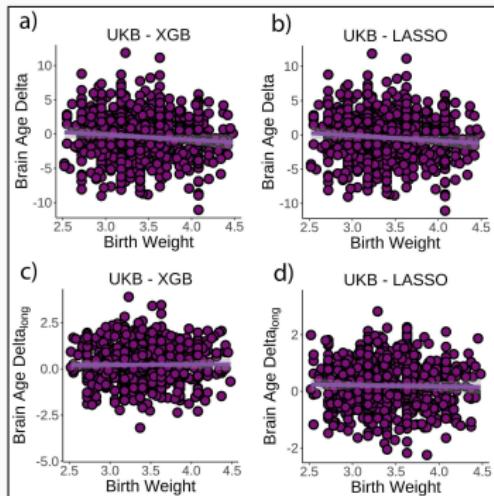
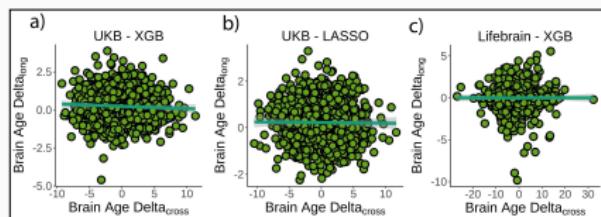
Evidence for causal effect of BAG on PD, BIP and AD on BAG

Brain age: Causal effects



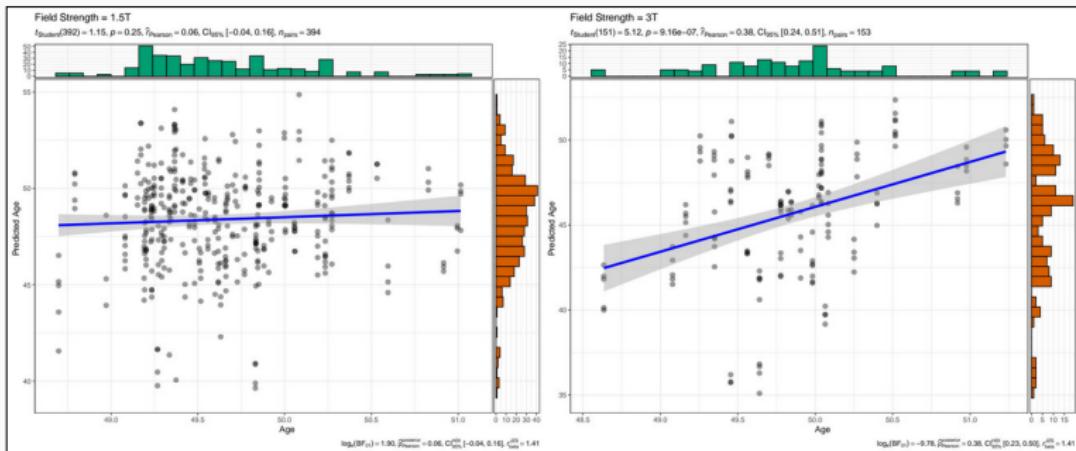
BAG->PD driven by 2 SNPs (chr17), AD->BAG 1 SNP (APOE), horizontal pleiotropy identified for BIP->BAG

Brain age: Issues with interpretation



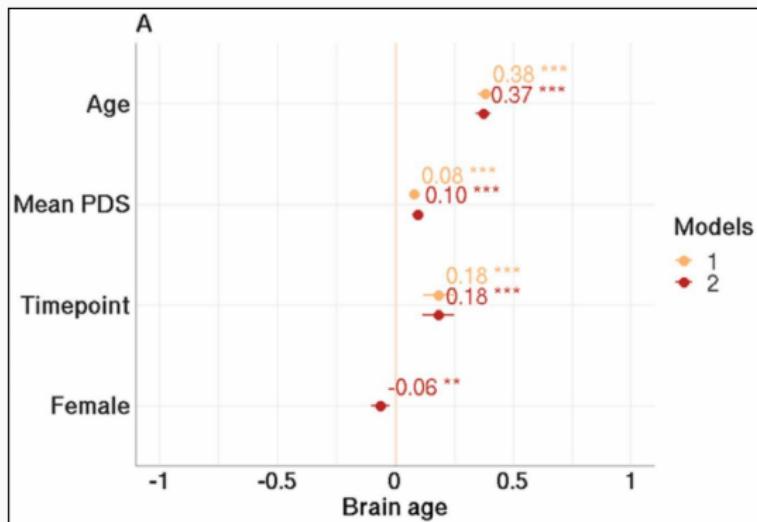
Cross-sectional BAG not associated with changes in BAG ($r^2 = 0.002$), but weakly with birth weight ($r^2 = 0.009$)

Brain age: Issues with interpretation



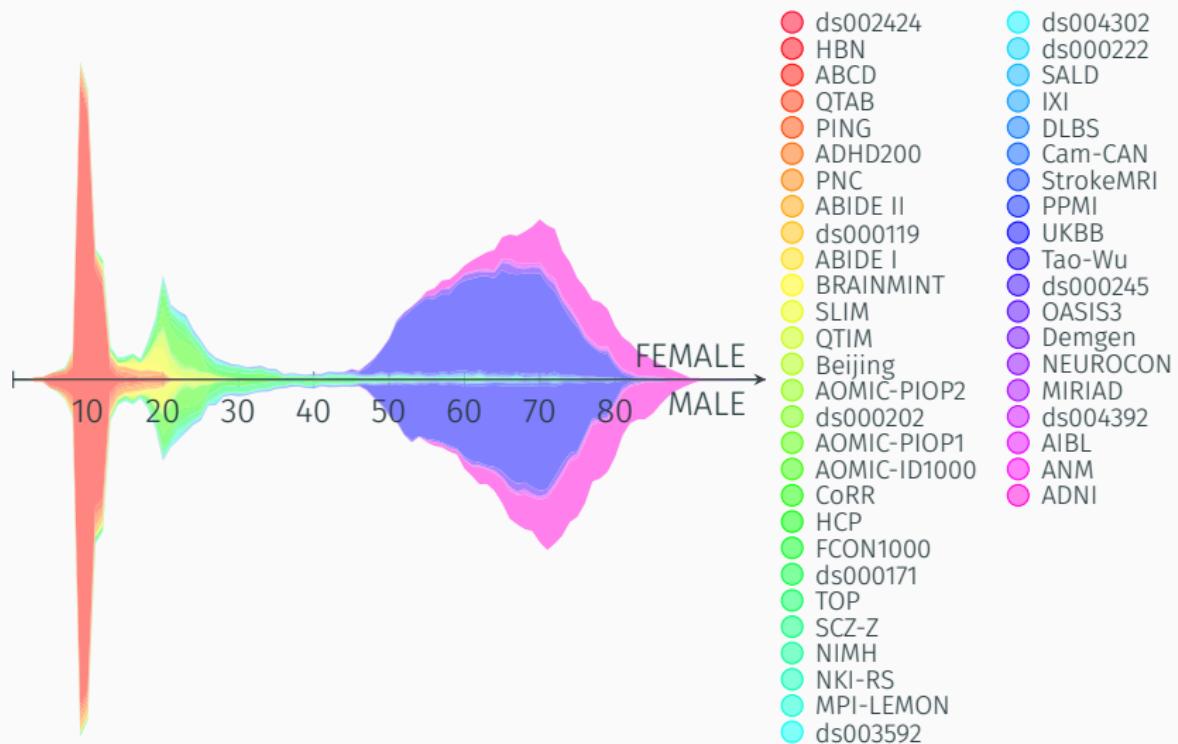
Within-subject variability in BAG associated with field strength (1.94 years mean difference)

Brain age: Association with pubertal development



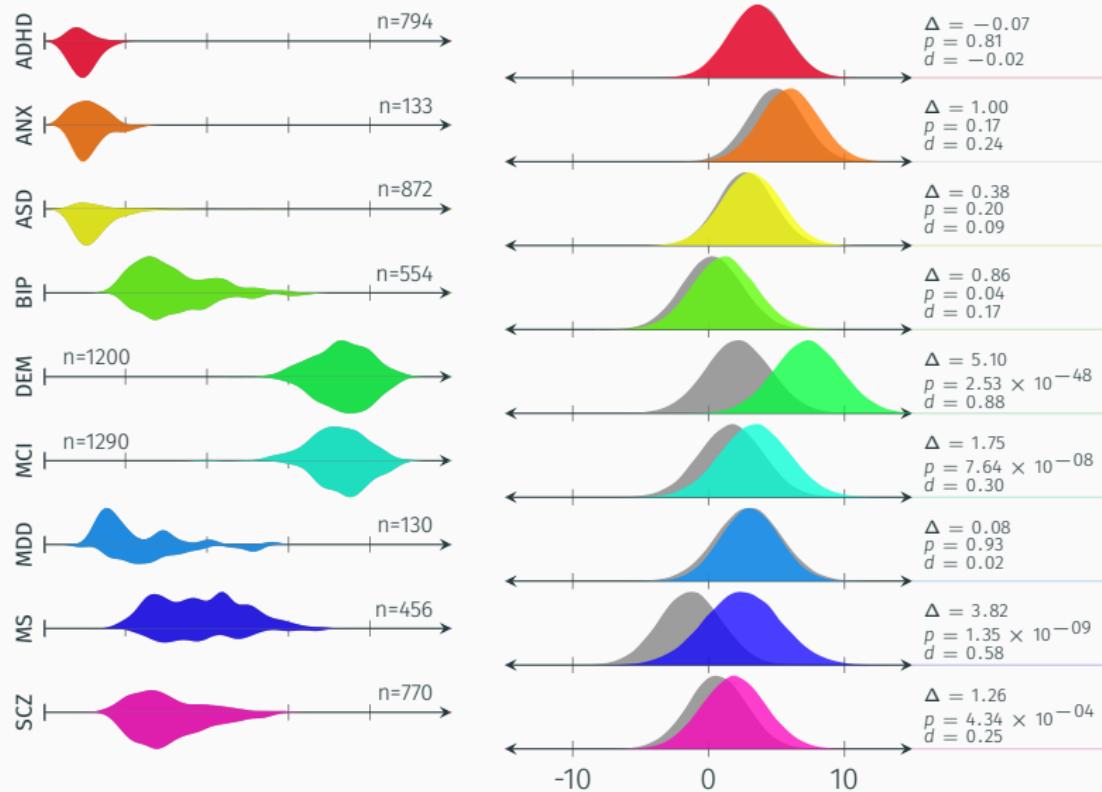
Higher brain age associated with advanced pubertal development

Brain age: Updated sample



47 sources, 83401 subjects, 114289 scans, 3-97 years old

Brain age: Updated patient cohorts



Significantly higher brain age in patients with MS, AD, MCI, SCZ, BIP