Neuroscientists show adversities permanently change our brains

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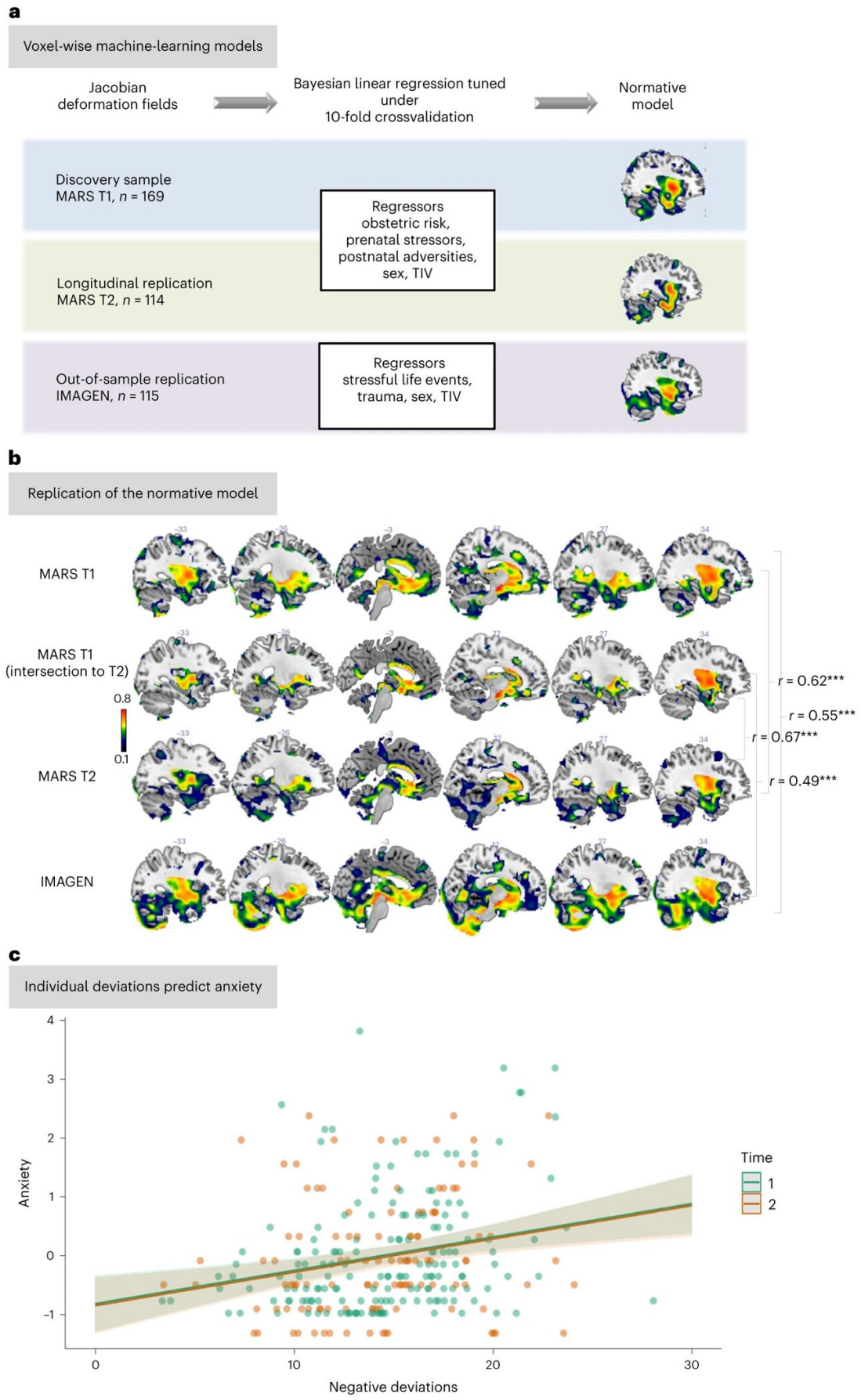
a
Voxel-wise machine-learning models
Jacobian deformation fields
Bayesian linear regression tuned under 10-fold crossvalidation
Normative model
Discovery sample
MARS T1, n = 169
Longitudinal replication
MARS T2, n = 114
Out-of-sample replication
IMAGEN, n = 115
Regressors obstetric risk, prenatal stressors, postnatal adversities, sex, TIV
Regressors stressful life events, trauma, sex, TIV
b
Replication of the normative model
MARS T1
MARS T1 (intersection to T2)
MARS T2
IMAGEN
0.8
0.1
r = 0.62***
r = 0.55***
r = 0.67***
r = 0.49***
c
Individual deviations predict anxiety
Anxiety
Negative deviations
Time
1
2

Normative models based on adversity. **a**, Methodological approach—we estimated a voxel-wise normative model of the development of JDs of the deformation fields, which quantifies the degree of volumetric expansion or contraction required to match each sample to the template used in registration (outcome), based on lifetime adversities, TIV and sex as predictors in the MARS sample when participants were 25 years old. Therefore, we performed a Bayesian linear regression under tenfold cross-validation. We replicated this normative model in the MARS sample at the age of 33–34 years and using the sociodemographically similar IMAGEN subsample aged 22 years with comparable adversity measures. **b**, Spatial representation of the voxel-wise Pearson correlations (two-sided) between the true morphometric changes of the JDs and the predicted values in the normative models built on adversities, sex and TIV. First panel: normative model of MARS participants (n = 169) at the age of 25 years (T1; brain regions listed in Supplementary Table 1); second panel: normative model of MARS participants (n = 114) at the age of 25 years (intersection of participants from the 25-year and 33-year assessments); third panel: replication of the normative model of MARS individuals (n = 114) scanned again at the age of 33–34 years (T2, brain regions listed in Supplementary Table 3); fourth panel: replication of this model in a subsample (n = 115) of the IMAGEN cohort (22 years, brain regions listed in Supplementary Table 5). **c**, Negative deviations per subject, that is, more volume contractions than expected from the normative model, predicted anxiety at 25 years (T1, β coefficient = 0.07, standard error (s.e.) = 0.02, P = 0.00006 (two-sided), η^2 = 0.10) and at 33 years (T1 and T2, β coefficient = 0.06, s.e. = 0.02, P = 0.0005 (two-sided), η^2 = 0.06). Triple asterisks indicate that the Pearson correlation was significant at P

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