

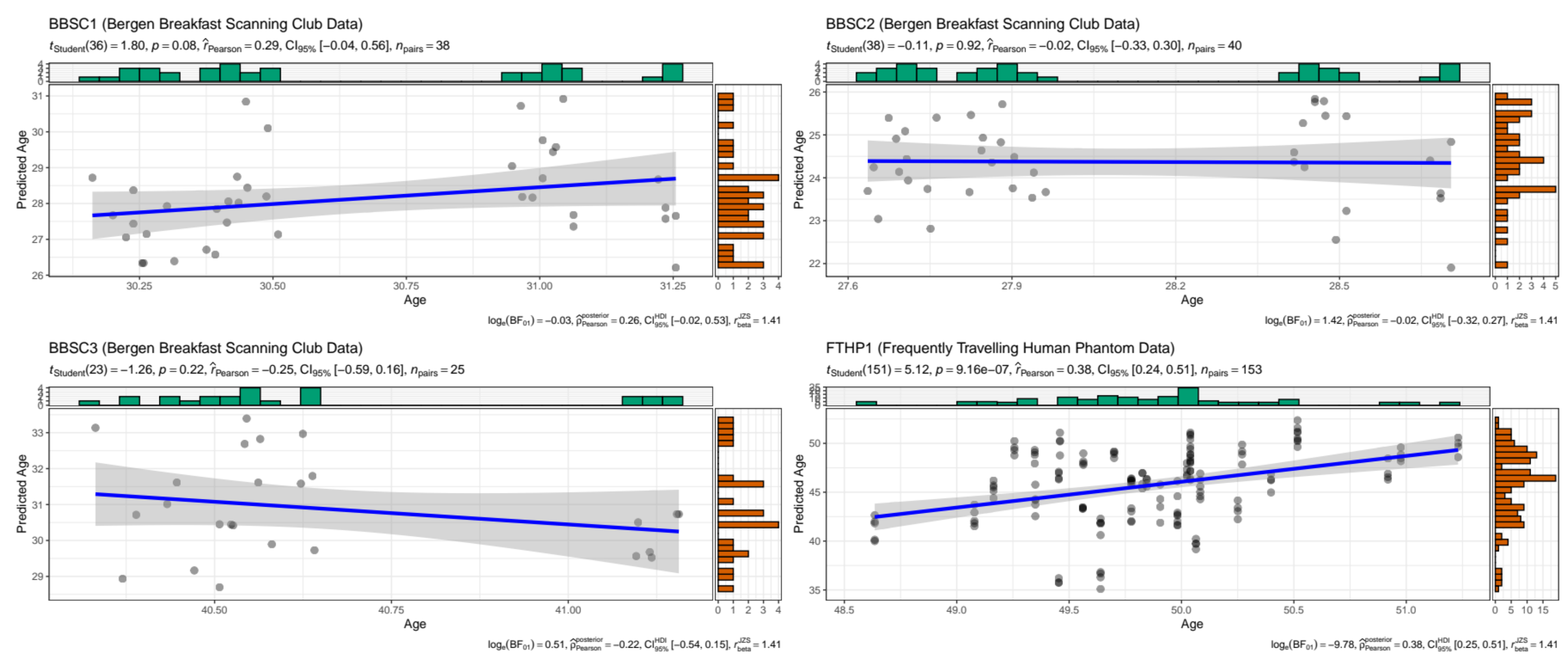
Field strength and potentially scan quality influence brain age estimates

Considerations on brain age predictions from repeatedly sampled data across time

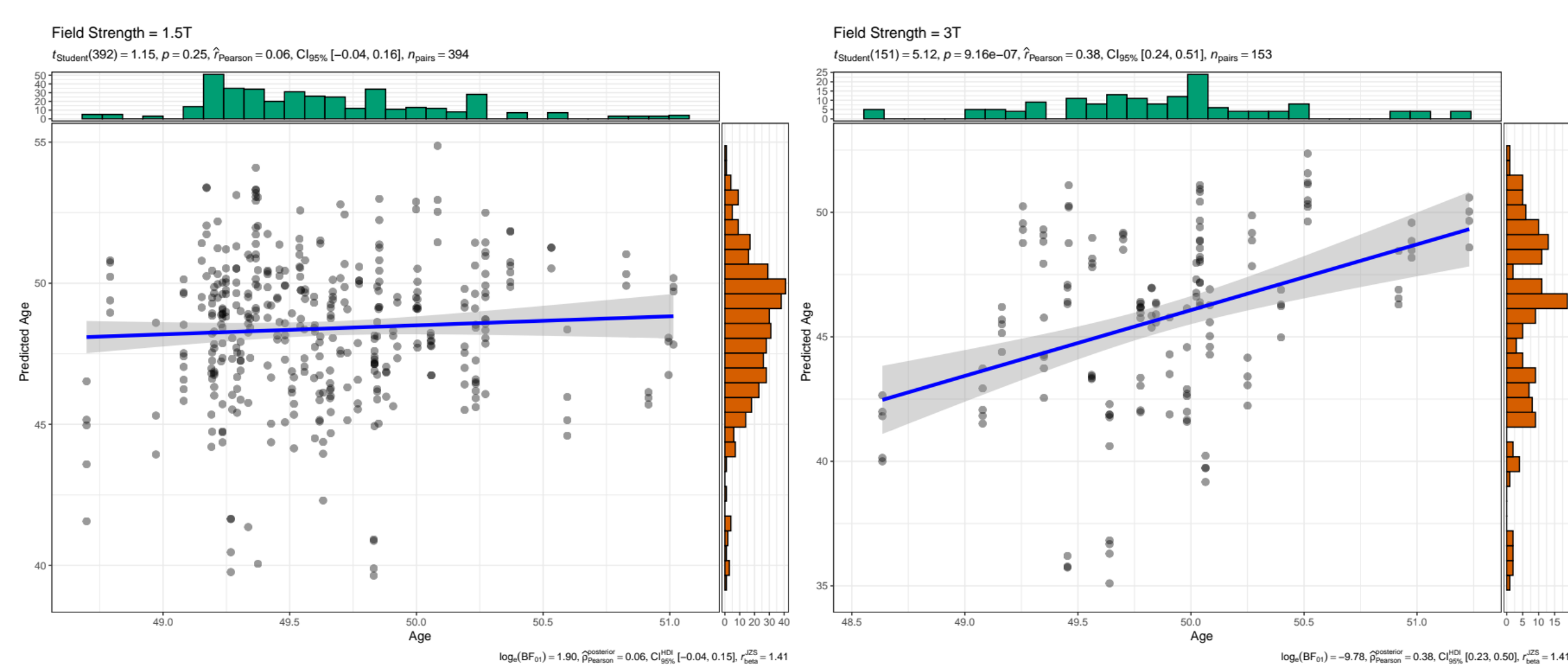
Background: Brain age is a promising biomarker of brain or general health. However, to extend the metric's clinical applications, the large intra-individual variability in age predictions needs addressing.

Method: We used the pre-trained deep neural network *pyment* to predict brain ages from densely sampled T1-weighted magnetic resonance imaging data from three individuals (BBSC1-3) scanned in total $N_{\text{BBSC}} = 103$ times over a one-year interval, and an independent data set including one individual (FTHP1) scanned $N_{\text{FTHP}} = 557$ times over a three-year interval.

Result 1: Crude within-subject correlations between age and brain age revealed differing directionalities of slopes across subjects, with the correlation being only statistically significant in FTHP1.



Result 2: Field strength was revealed as only significant effect on brain age in FTHP1 in a random intercept model ($\beta = -1.141, p_{\text{Holm}} < .001$).



Result 3: Quality control (QC) measures entropy-focus criterion (EFC, $\beta_{\text{std}} = -0.489, p_{\text{Holm}} < .001$) and the foreground-background energy ratio (FBER, $\beta_{\text{std}} = 0.456, p_{\text{Holm}} < .001$) were significant predictors of brain age in BBSC1-3 in a random intercept model at the participant level. No QC measures were associated with FTHP1's brain age.

Conclusion: Brain age estimates are potentially influenced by acquisition parameters and scan quality. An avenue for future brain age modelling could be to employ multiple, more specific models, tuned to developmental and individual differences and acquisition parameters.

