**Supplementary Materials**

Table 1. Summary of sMRI studies correlating regional brain volumes with neurocognition/intelligence. Acronyms- ANCOVA: Analysis of Covariance, ABCD: Adolescent Brain Cognitive Development, NKI: Nathan S. Kline Institute for Psychiatric Research, NIH-TCB: NIH toolbox of neurocognitive battery, PCA: Principal Component Analysis, LASSO: Least Absolute Shrinkage and Selection Operator, SVM: Support Vector Machine, SVR: Support Vector Regression, RF: Random Forest, LR: linear regression, RR: ridge regression, MLP: multi-layer perceptron, CNN: Convolutional Neural Network, ROI: Region of Interest, KNN: K-Nearest Neighbors, MSE: Mean Square Error, RMSE: Root MSE, WASI: Weschler Abbreviated Scale of Intelligence, WISC: Wechsler Intelligence Scale for Children, WAIS: Wechsler Adult Intelligence Scale, FSIQ: Full-scale Intelligent Quotient, BOMAT: Bochum Matrices Test, T1-w: T1-weighted MRI, T2-w: T2-weighted MRI, P-FGR: Pre-term Fetal Growth Restricted, PT-AGA: Pre-term Appropriate Gestational Age, T-AGA: Term AGA, DTI: Diffusion Tensor Imaging, ICV: intracranial volume, WM: white matter, GM: gray matter, CSF: cerebrospinal fluid, N/A: not available, not mentioned. Probable BAs are not specified for either left or right hemisphere.

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro. Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Saha et al.70 | 2021 | 7709 | 9-10 | ABCD | T1-w | CNN learned features and volumes of manually identified brain regions | GM regions of left/right hippocampus, parahippocampal gyrus, thalamus, precentral gyrus and caudate nucleus; WM region of the pons. | 34, 4 | NIH-TCB | Normal | CNN and MLP | Correlation between the actual and predicted *gF* = 0.1 (p < 0.05) |
| Hilger et al.76  | 2020 | 380 | 18-60 | NKI-Rockland-Enhanced | T1-w | GM volume per voxel | Frontoparietal network, default mode network, Dorsal attention network, and cerebellum | 38, 25, 23, 31, 4, 17, 18, 19, 8, 7, 6, 9 | WASI | Normal | PCA | MSE and correlation between the actual and estimated FSIQ is 320 (p = 0.279) and 0.11, respectively (for true residual FSIQ in the range of [39, 136]) |
| Chiang et al.60 | 2019 | 8669 | 9-10 | ABCD | T1-w | Total volume, mean signal intensity, and entropy | Visual, frontoparietal, somatosensory, motor, default mode network, and cingulo opercular network. | 6, 8, 9, 22, 41, 42, 17, 18, 19, 1, 2, 3, 5, 7, 4 | NIH-TCB | Normal | CNN, and LASSO | Mean Square Error *(gF)* = 95.38 (for true residual *gF* in the range of [-40, 30]) |
| Shrivastava et al.61 | 2019 | 8669 | 9-10 | ABCD | T1-w | Volume, mean intensity, and count of GM voxels | Gyrus rectus, hippocampus, inferior frontal gyrus, middle frontal gyrus, postcentral gyrus, precentral gyrus, precuneus, superior frontal gyrus and supramarginal gyrus. | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | CNN, SVR, RF, gradient boosting, and XGBoost | Mean Square Error *(gF)* = 93.68 (for true residual *gF* in the range of [-40, 30]) |
| Ren et al.62 | 2019 | 8669 | 9-10 | ABCD | T1-w | ROI volumes | GM | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | Bagging and boosting of LR, RR, RF, envelope-based reduced-rank regression, LASSO, Elastic-Net regressor, and KNN | Mean Square Error *(gF)* = 92.99 (for true residual *gF* in the range of [-40, 30]) |
| Tamez-Pena et al.63 | 2019 | 8669 | 9-10 | ABCD | T1-w | ROI volumes  | GM, WM, CSF, and cerebellum | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | Ensemble of SVM, RF, and bootstrapped step wise model selection | Mean Square Error *(gF)* = 100.89 (for true residual *gF* in the range of [-40, 30]) |
| Brueggeman et al.64 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes | GM, WM, CSF | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | RF | Mean Square Error *(gF)* = 92.49 (for true residual *gF* in the range of [-40, 30]) |
| Mihalik et al.65 | 2019 | 8669 | 9-10 | ABCD | T1-w | Voxel intensities and probabilistic tissue-type labels | GM, WM | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | Kernel ridge regressor | Mean Square Error *(gF)* = 92.13 (for true residual *gF* in the range of [-40, 30]) |
| Ranjbar et al.66 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes | GM, WM, CSF | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | CNN and RF | Mean Square Error *(gF)* = 93.64 (for true residual *gF* in the range of [-40, 30]) |
| Wlaszczyk et al.67 | 2019 | 8669 | 9-10 | ABCD | T1-w | ROI volumes, signal intensity, anterior and posterior cross-sectional area from corpus callosum | GM and corpus callosum | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | RF | Mean Square Error *(gF)* = 92.93 (for true residual *gF* in the range of [-40, 30]) |
| Zhang-James et al.55 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes | GM, WM, CSF | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | Nu SVM | Mean Square Error *(gF)* = 95.63 (for true residual *gF* in the range of [-40, 30]) |
| Kao et al.68 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes | GM, WM, CSF | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | StackNet consisting of random forest, random tree, ridge regressor, and gradient boosting | Mean Square Error *(gF)* = 94.25 (for true residual *gF* in the range of [-40, 30]) |
| Li et al.69 | 2019 | 8669 | 9-10 | ABCD | T1-w | ROI volumes, # detected surface holes, the globus pallidus volume, the mean curvatures of precentral gyrus, postcentral gyrus, and banks of Superior Temporal Sulcus | Right posterior cingulate gyrus, left caudate nucleus, entorhinal white matter, globus pallidus, precentral gyrus, postcentral gyrus, and superior temporal sulcus | 23, 31, 28, 4, 1, 2, 3, 22 | NIH-TCB | Normal | BlockPC-XGBoost | Mean Square Error *(gF)* = 93.16 (for true residual *gF* in the range of [-40, 30]) |
| Morsing et al.74  | 2018 | 74 | 7-8 | Skane University Hospital in Lund, Sweden | T1-w | ROI volumes | ICV, GM, WM, CSF, and thalamus. | N/A | WISC-III | P-FGR, PT-AGA, and T-AGA | Chi-square and ANOVA  | The mean (SD) FSIQ was 80 (17) in the PT-FGR group and 103 (12) in the PT-AGA group |
| Ogawa et al.75 | 2018 | 232 | 21-69 | Advanced Telecommunication Research Institute International, Kyoto | T1-w | GM volume | Right insula, right middle cingulate cortex/precuneus | 13, 14, 16, 4 | Insight test battery (ITB) | Normal | Pearson correlation | ITB score was positively correlated with the GM volumes in the mentioned region (p < 0.001) |
| Paul et al.73 | 2016 | 211 | 18-44 | University of Illinois Urbana-Champaign | T2-w | Volume fractions across tissue types | GM, WM, CSF | 23, 31 | BOMAT, Number Series, and Letter Set | Normal | Bivariate correlation  | GM volume is found positively correlated with quantitative reasoning (r = 0.26; p < 0.01) and working memory (r = 0.21; p < 0.01), and *gF* (r = 0.16; p < 0.01) |
| Grazioplene et al.79 | 2015 | 517 | 18-40 | University of Minnesota, University of New Mexico in Albuquerque, Yale University | T1-w MPRAGE | Caudate volume | Caudate nucleus | N/A | WAIS-III, WAIS-IV, WASI | Normal | LR | Regression of IQ onto bilateral caudate volume indicated a signiﬁcant positive correlation between caudate volume and FSIQ (r = 0.24; p = 0.01) |

Table 2. Summary of sMRI studies correlating cortical surface metrices with neurocognition/intelligence. Acronyms- ABCD: Adolescent Brain Cognitive Development, NIH-TCB: NIH toolbox of neurocognitive battery, LASSO: Least Absolute Shrinkage and Selection Operator, SVM: Support Vector Machine, SVR: Support Vector Regression, CNN: Convolutional Neural Network, ROI: Region of Interest, KNN: K-Nearest Neighbors, MSEL: Mullen Scale of Early Learning, PMAT: Penn Progressive Matrices, RIAS: Reynolds Intellectual Assessment Scales, RPM: Raven’s Advanced Progressive Matrices Set, GM: Gross Motor, VR: Visual Reception, FM: Fine Motor, RL: Receptive Language, EL: Expressive Language, ELC: Early Learning Composite, CFT: Cluster Forming Threshold, RMSE: Root Mean Square Error, WISC: Wechsler Intelligence Scale for Children, WAIS: Wechsler Adult Intelligence Scale, ABIDE: Autism Brain Imaging Data Exchange, BOLD: Blood-oxygenation Level-dependent, T1-w: T1-weighted MRI, T2-w: T2-weighted MRI, DWI: Diffusion-weighted Imaging. Probable BAs are not specified for either left or right hemisphere.

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro.****Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Zhang et al.96 | 2020 | 23 | 0-4 | UNC Chapel Hill Early Brain Development Study | T1-w,T2-w | Cortical thickness, mean curvature, local gyrification index, vertex area, vertex volume, sulcal depth in string distance, and sulcal depth in Euclidean distance  | Parcellation of the cerebral cortex into 70 anatomically meaningful ROIs | Not specified | VR, FM, RL, EL, and ELC (MSEL) | Normal | CNN | RMSE between the predicted and actual VR, FM, RL, and EL scores is 0.067 |
| Li et al.90 | 2020 | 68 | 8 | Arkansas Children's Nutrition Center | T1-w | Gray matter volume, surface area, and cortical thickness | Orbitofrontal gyrus, transverse temporal gyri, left superior temporal gyrus, and right anterior cingulate gyrus | 11, 12, 41, 42, 22, 24, 32, 33 | RIAS | Normal | Spearman’s correlation test | RIAS scores showed significant correlations (r = [0.38-0.44], p = [0.005-0.046]) with cortical metrices |
| Tadayon et al.91 | 2020 | 740 | 21-35 | HCP | T1-w | Cortical thickness, cortical surface area, and cortical gyrification | Superior parietal, left supramarginal, left caudal middle frontal, left pars-opercularis, left inferior temporal, right inferior and middle temporal, right medial orbitofrontal, and right rostral middle frontal regions | 7, 40, 22, 44, 20, 21, 11, 12, 10 | PMAT and NIH-TCB | Normal | Linear regression | Correlation between the local gyrification, and surface area with *gF* and *gC* are 0.29 and 0.22 (p < 0.001), 0.28 and 0.28 (p < 0.001), respectively |
| Oxtoby et al.84 | 2019 | 8669 | 9-10 | ABCD | T1-w | Cortical morphology as graph | A structural co-variance network graph considers small cortical regions (3 voxels cubed) as nodes, and structural similarity (morphology) between nodes as edges. | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | Event-based model of progression, and SVR | Mean Square Error *(gF)* = 93.83 (for true residual *gF* in the range of [-40, 30]) |
| Rebsamen et al.85 | 2019 | 8669 | 9-10 | ABCD | T1-w | Subcortical volumes, cortical thicknesses, curvatures, and surface areas | Middle temporal gyrus, superior temporal gyrus | 21, 22 | NIH-TCB | Normal | SVR | Mean Square Error *(gF)* = 93.03 (for true residual *gF* in the range of [-40, 30]) |
| Valverde et al.86 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes in the gray matter, white matter, and cerebrospinal fluid, 78 contrast and 78 cortical thickness measures, gender, age, and scanner manufacturer | Gray matter, white matter, and cerebrospinal fluid | Not specified | NIH-TCB | Normal | Fully connected neural network | Mean Square Error *(gF)* = 94.02 (for true residual *gF* in the range of [-40, 30]) |
| Pölsterl et al.87 | 2019 | 8669 | 9-10 | ABCD | T1-w | Cortical thickness and volumes of 122 ROIs in the gray matter, white matter, and cerebrospinal fluid | Left/right parahippocampal gyrus, pons white matter,hippocampus,posterior cingulate gyrus, cuneus,left lingual gyrus, left middle frontal gyrus, supramarginal gyrus, right fusiform gyrus, superior temporal gyrus, right anterior cingulate gyrus, etc. | 34, 23, 31, 19, 10, 40, 37, 22, 24, 32, 33 | NIH-TCB | Normal | An ensemble of gradient boosted trees, and a linear ridge regressor. | Mean Square Error *(gF)* = 94.25 (for true residual *gF* in the range of [-40, 30]) |
| Pölsterl et al.88 | 2019 | 8669 | 9-10 | ABCD | T1-w | Cortical thickness and volumes of 122 ROIs in the gray matter, white matter, and cerebrospinal fluid | Left/right parahippocampal gyrus, pons white matter,hippocampus,posterior cingulate gyrus, cuneus,left lingual gyrus, left middle frontal gyrus, supramarginal gyrus, right fusiform gyrus, superior temporal gyrus, right anterior cingulate gyrus, etc. | 34, 23, 31, 19, 10, 40, 37, 22, 24, 32, 33 | NIH-TCB | Normal | AutoML ensembles of 14 classifiers | Mean Square Error *(gF)* = 94.25 (for true residual *gF* in the range of [-40, 30]) |
| Guerdan et al.89 | 2019 | 8669 | 9-10 | ABCD | T1-w | Volume, elongation, surface area, roundness, and flatness of grey matter ROIs. | Gray matter, white matter, and cerebrospinal fluid | Not specified | NIH-TCB | Normal | LASSO, ridge regressor, SVR, gradient boosting, and AdaBoost regressors. | Mean Square Error *(gF)* = 94.48 (for true residual *gF* in the range of [-40, 30]) |
| Girault et al.93 | 2019 | 487 | 1-2 | University of North Carolina (UNC) Chapel Hill Early Brain Development Study | T1-w,T2-w | Cortical thickness, and surface area | Bilateral superior frontal and middle frontal gyri, right medial superior frontal gyrus, right occipital superior gyrus, bilateral superior parietal cortices, left primary motor cortex, bilateral anterior cingulate and precuneus, and right superior and middle temporal cortices areas | 10, 19, 7, 4, 24, 32, 33. 22 | GM, VR, FM, RL, EL, and ELC (MSEL) | Normal | Pearson correlation, Linear mixed effect model | Correlations between average cortical thickness at age 1 and GM, FM, EL, and RL scores at age 1 (r = 0.137, p = 0.025; r = 0.186, p = 0.002; r = 0.147, p = 0.016; r = 0.120, p = 0.049, respectively), |
| Adeli et al.94 | 2019 | 24 | 0-4 | UNC Chapel Hill Early Brain Development Study | T1-w,T2-w,DWI | Cortical thickness, mean curvature, local gyrification index, vertex area, vertex volume, sulcal depth in string distance, and sulcal depth in Euclidean distance  | Parcellation of the cerebral cortex into 70 anatomically meaningful ROIs | Not specified | VR, FM, RL, EL, and ELC (MSEL) | Normal | Multi-task multi-linear regression | RMSE between the predicted and actual VR, FM, RL, and EL scores is 0.18.  |
| Zhang et al.95  | 2018 | 23 | 0-4 | UNC Chapel Hill Early Brain Development Study | T1-w,T2-w | Cortical thickness, mean curvature, local gyrification index, vertex area, vertex volume, sulcal depth in string distance, and sulcal depth in Euclidean distance  | Parcellation of the cerebral cortex into 70 anatomically meaningful ROIs | Not specified | VR, FM, RL, EL, and ELC (MSEL) | Normal | Multi-task multi-linear regression | RMSE between the predicted and actual VR, FM, RL, and EL score is 0.158.  |
| Bajaj et al.92 | 2018 | 56 | 18-45 | McLean Hospital and Partners Healthcare, and the U.S. Army Human Research Protections Office | T1-w | Cortical thickness, cortical surface area, cortical volume, and cortical gyrification | Posterior frontal, superior and inferior parietal lobes, left insula, and inferior frontal gyrus | 7, 39, 40, 13, 14, 16, 44, 45, 47 | WASI-II | Normal | Generalized linear model | Significant positive relationships between thicker cortex and higher IQ at a liberal CFT of p < 0.05 as well as at a strict CFT of p < 0.01 is observed. |
| Wang et al.99 | 2015 | 164 | 6-15 | ABIDE | T1-w | Cortical thickness, surface area, sulcal depth, curvature | Bilateral transverse temporal gyri, bilateral thalamus, left parahippocampal gyrus, left hippocampus,right opercular part of inferior frontal gyrus, left anterior cingulate gyrus, right amygdala, left lingual gyrus, left superior parietal lobule, right inferior parietal lobule, left angular gyrus, left paracentral lobule, and left caudate nucleus | 41, 42, 34, 44, 45, 47, 32, 7, 40, 39, 1, 2, 3, 4 | - | Normal | Multi/single kernel support vector regressor | Correlation between the actual and estimated IQ is 68.4% |
| Squeglia et al.97 | 2013 | 185 | 12-14 | San Diego area public middle schools | T1-w | Cortical thickness | Left and right inferior parietal cortices, and left and right superior parietal cortices | 39, 40, 7 | WISC-III, WAIS-IV | Normal | Hierarchical linear regressions | For both males and females, thinner parietal association cortices corresponded with better neurocognitive functioning above and beyond age alone. |
| Yang et al.98 | 2013 | 78 | 17-27 | Seoul National University, Catholic University of Korea | T1-w | Cortical thickness, surface area, sulcal depth and absolute mean curvature in 78 parcellated ROIs | Cerebral cortex | 34, 35, 37 | WAIS | Normal | Partial least square regression | Correlation between the Actual and predicted FSIQ is 30% (p < 0.01) |
| Choi et al.100 | 2008 | 225 | 20.9±2.9 | Seoul National University, Catholic University of Korea | T1-w | The thickness of the gray matter of the cerebral cortex | Gray matter of cerebral cortex | 38, 20, 21, 40 | WASI, RPM-II | Normal | Multivariate regression model | *gC* is correlated to cortical thickness and *gF* is related to BOLD signals. |

Table 3. Summary of sMRI study using brain morphometry in inferring/relating to human neurocognition and intelligence. Acronyms- COPD: Chronic Obstructive Pulmonary Disorder, OCD: Obsessive Compulsive Disorder, DD: Developmental Dyslexia, FA: fractional anisotropy, VBM: Voxels-based Morphometry, MDD: major Depressive Disorder, NCANDA: National Consortium on Alcohol and Neurodevelopment in Adolescence, WASI: Weschler Abbreviated Scale of Intelligence, WISC: Wechsler Intelligence Scale for Children, WAIS: Wechsler Adult Intelligence Scale, FSIQ: Full-scale Intelligent Quotient, VIQ: Verbal IQ, PIQ: Performance IQ, ANCOVA: Analysis of Covariance, T1-w: T1-weighted MRI.

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro.****Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Hidese et al.104 | 2020 | 266 | 45.6±12.9 | Volunteer data from Kodaira city, Tokyo | T1-w,DTI | Regional gray matter volumes in the VBM and the white matter FA values in the DTI | Left gyrus rectus and anterior cingulate gyrus, left posterior insula, left superior and middle frontal gyri | 11, 24, 32, 33, 13, 14, 16, 10 | WAIS-III | Normal | Pearson correlation | VIQ correlated positively with the specified brain regional volumes with p < 0.005. |
| McDermott et al.105 | 2019 | 623 | 5-25 | National Institute of Mental Health Intramural Research Program | T1-w | Surface-based shape | Left inferior and middle temporal, left inferior parietal, and left medial frontal regions | 20, 21, 39, 40, 25 | WASI, WISC, WAIS | Normal | Linear mixed-effect model | Positive associations (β > 100; p < 0.001) between FSIQ and cortical anatomy is observed. |
| Ramsden et al.106 | 2011 | 33 | 14.1±1.0 | Department of Psychological Sciences, Birkbeck College, University of London | T1-w | Changes in gray matter density | Motor speech area, and anterior cerebellum | 4, 6 | WISC, WAIS | Normal | Linear regression | Correlation between change in VIQ and change in grey matter density were 0.876 (p < 0.01) for high, 0.797 (p < 0.05) for average and 0.660 (p < 0.05) for low ability groups, respectively. For PIQ, correlation was 0.492 (p > 0.05) for high, 0.788 (p < 0.05) for average and 0.715 (p < 0.01) for low ability groups, respectively. |

Table 4. Summary of sMRI studies inferring/relating to human neurocognition and intelligence. Acronyms- ANCOVA: Analysis of Covariance, ABCD: Adolescent Brain Cognitive Development, NIH-TCB: NIH toolbox of neurocognitive battery, LASSO: Least Absolute Shrinkage and Selection Operator, SVM: Support Vector Machine, SVR: Support Vector Regression, CNN: Convolutional Neural Network, ROI: Region of Interest, KNN: K-Nearest Neighbors, WASI: Weschler Abbreviated Scale of Intelligence, WISC: Wechsler Intelligence Scale for Children, WAIS: Wechsler Adult Intelligence Scale, FSIQ: Full-scale Intelligent Quotient, ABIDE: Autism Brain Imaging Data Exchange, T1-w: T1-weighted MRI, T2-w: T2-weighted MRI, DWI: Diffusion-weighted Imaging, DTI: Diffusion Tensor Imaging, TRUST: T2-relaxation under spin tagging. Probable BAs are not specified for either left or right hemisphere.

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro.****Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Chiang et al.60 | 2019 | 8669 | 9-10 | ABCD | T1-w | Total volume, mean signal intensity, and entropy | Visual, fronto-parietal, somatosensory, motor, default mode network, and cingulo opercular network. | 6, 8, 9, 22, 41, 42, 17, 18, 19, 1, 2, 3, 5, 7, 4, 6 | NIH-TCB | Normal | CNN, and LASSO | Mean Square Error *(gF)* = 95.38 (for true residual *gF* in the range of [-40, 30]) |
| Ranjbar et al.66 | 2019 | 8669 | 9-10 | ABCD | T1-w | 122 ROI volumes in the gray matter, white matter, and cerebrospinal fluid | Gray matter, white matter, and cerebrospinal fluid | 11, 44, 45, 47, 4, 1, 2, 3, 10, 12, 40 | NIH-TCB | Normal | CNN and random forest | Mean Square Error *(gF)* = 93.64 (for true residual *gF* in the range of [-40, 30]) |
| Vang et al.107 | 2019 | 8669 | 9-10 | ABCD | T1-w | CNN-learned features | Gray matter, white matter, and cerebrospinal fluid | Not specified | NIH-TCB | Normal | CNN with gradient boosting machine | Mean Square Error *(gF)* = 96.18 (for true residual *gF* in the range of [-40, 30]) |
| Pominova et al.108 | 2019 | 8669 | 9-10 | ABCD | T1-w | CNN-learned features | Gray matter | Not specified | NIH-TCB | Normal | VoxCNN | Mean Square Error *(gF)* = 93.838 (for true residual *gF* in the range of [-40, 30]) |
| Zou et al.109 | 2019 | 8669 | 9-10 | ABCD | T1-w | CNN-learned features | Bilateral transverse temporal gyri, bilateral thalamus, left parahippocampal gyrus, left hippocampus, right opercular part of inferior frontal gyrus, left anterior cingulate gyrus, right amygdala, left lingual gyrus, left superior parietal lobule, right inferior parietal lobule, left angular gyrus, left paracentral lobule, and left caudate nucleus. | 41, 42, 34, 44, 45, 47, 24, 32, 33,19, 7, 39, 40, 1, 2, 3, 4 | NIH-TCB | Normal | 3D CNN | Mean Square Error *(gF)* = 92.74 (for true residual *gF* in the range of [-40, 30]) |
| Liu et al.110 | 2019 | 8669 | 9-10 | ABCD | T1-w | CNN-learned features | Skull-stripped whole brain | Not specified | NIH-TCB | Normal | UNet-like encoder/decoder | Mean Square Error *(gF)* = 102.25 (for true residual *gF* in the range of [-40, 30]) |

*Table 5. Summary of diffusion MRI studies inferring human neurocognition and intelligence. Acronyms- FA: Fractional Anisotropy, MD: Mean Diffusivity, RD: Radial Diffusivity, BSID: Bayley Scales of Infant Development, MSEL: Mullen Scale of Early Learning, MMSE: Mini-Mental Status Examination, VR: Visual Reception, FM: Fine Motor, RL: Receptive Language, EL: Expressive Language, ELC: Early Learning Composite, RMSE: Root Mean Square Error, HCP: Human Connectome Project, WASI: Weschler Abbreviated Scale of Intelligence, WISC: Wechsler Intelligence Scale for Children, WAIS: Wechsler Adult Intelligence Scale, FSIQ: Full-scale Intelligent Quotient, PIQ: Performance IQ, VIQ: Verbal IQ, T1-w: T1-weighted MRI, T2-w: T2-weighted MRI, DWI: Diffusion-weighted Imaging, DTI: Diffusion Tensor Imaging. Probable BAs are not specified for either left or right hemisphere.*

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro.****Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Malpas et al.114 | 2016 | 91 | 18-55 | Nathan Kline Institute/Rockland Sample | DTI | FA | 42 Brodmann regions were specified in each hemisphere | 1, 3, 4, 5, 6, 7, 8, 9, 11, 24, 25, 29, 32, 44, 45, 46, 47, 13, 22, 34, 35, 36, 38, 41, 42, 39, 40, 43, 17, 18 | WASI | Normal | *t* statistic regression analysis | FA was positively correlated with FSIQ with r = 0.53 (95% CI 0.35–0.66). |
| Konrad et al.116 | 2012 | 30 | 22.8±1.5 | Institute of Neuroradiology of the Johannes Gutenberg University Mainz, Germany | T1-w,DTI | FA, MD | Left-hemispheric Brocaʼs area | 44, 45, 22 | Hamburg–Wechsler Intelligenztest (HAWIE-R) - equivalent to WAIS-R | Normal | Voxel-wise *t* statistic regression analysis, Pearson correlation | VIQ performance is negatively correlated to the FA in the mentioned regions (r = - 0.73; p < 0.001). |
| Feng et al.115 | 2019 | 38 | 0-2 | Arkansas Children’s Nutrition Center | DTI | FA | White matter tracts | Not specified | BSID-III | Normal | Voxel-wise tract-based spatial statistics (TBSS) | Correlations between FA at 2 weeks of age and BSID subfields scores at 2 years of age are 0.35~0.48. |
| Casson et al.117 | 2014 | 45 | 30-60 | Wayne State University | T1-w, SWI, DTI | FA-based dysarthria, pyramidal system dysfunction, extrapyramidal system dysfunction, and cerebellar dysfunction | Gray matter, white matter, and cerebrospinal fluid | Not specified | MMSE | Normal/ abnormal | Chi-square test | The number of football-related concussions was associated with isolated neurocognitive abnormalities in 24% of population. |
| Adeli et al.94 | 2019 | 24 | 0-4 | UNC Chapel Hill Early Brain Development Study | T1-w,T2-w,DWI | Cortical thickness, mean curvature, local gyrification index, vertex area, vertex volume, sulcal depth in string distance, and sulcal depth in Euclidean distance  | Parcellation of the cerebral cortex into 70 anatomically meaningful ROIs | Not specified | VR, FM, RL, EL, and ELC (MSEL) | Normal | Multi-task multi-linear regression | Correlation between predicted and true ELC is 0.70 (p < 0.001) |
| Lee et al.118  | 2017 | 535 | 0-2 | UNC Chapel Hill Early Brain Development Study | DTI | Axial diffusivity (AD), radial diffusivity (RD), and FA | White matter | Not specified | MSEL: ELC | Normal | Distance correlation coefficient | Correlation between AD, RD and FA with ELC are 0.13~0.20 (p < 0.05) |
| Zhang et al.119 | 2019 | 1076 | - | HCP | DWI | Count of streamlines, connected surface area (CSA) and weighted CSA, mean and maximum values of FA and MD, cluster number, average length, and mean deviations from a template streamline | ROIs in the whole cortex | Not specified | Raven's Progressive Matrices | Normal | Tensor network principal components analysis | Correlation between actual and estimated *gF* is 24.11% (p < 0.001). |

*Table 6. Summary of functional MRI inferring human neurocognition and intelligence. Acronyms- OASIS: Open Access Series of Imaging Studies, KSHAP: Korean Social Life, Health, and Aging Project, ABCD: Adolescent Brain Cognitive Development, FC: Functional Connectivity, MMSE: Mini-Mental Status Examination, BOLD: Blood-oxygen-level-dependent, ABCD: Adolescent Brain Cognitive Development*, *NIH-TCB: NIH toolbox of neurocognitive battery, ANOVA: Analysis of Variance, FSIQ: Full-scale Intelligent Quotient, PIQ: Performance IQ, VIQ: Verbal IQ, LASSO: Least Absolute Shrinkage and Selection Operator, CNN: Convolutional Neural Network, HCP: Human Connectome Project, WAIS: Wechsler Adult Intelligence Scale, WASI: Wechsler Abbreviated Scale of Intelligence, MMSE: Mini-mental State Examination, CPM: Connectome-Based Predictive Modeling; T1-w: T1-weighted MRI, fMRI: functional MRI.*

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| **Study** | **Year** | **N** | **Age****(years)** | **Dataset** | **MRI type** | **MRI features** | **Regions** | **Probable BAs** | **IQ/****Neuro.****Test** | **Normal/****Abnormal** | **Method** | **Correlation/****Finding** |
| Song et al.122 | 2008 | 59 | 18.5–33.3 | Xuanwu Hospital of Capital Medical University | fMRI | Functional connectivity | bilateral dorsolateral prefrontal cortices | 9 | WAIS | Normal | Stepwise linear regression | FSIQ is correlated to the functional connectivity in bilateral dorsolateral prefrontal cortices (r = 0.47; p = 0.0002).  |
| Kwak et al.123  | 2021 | 795 | 46-96 | OASIS-3, KSHAP | T1-w,fMRI | Functional connectivity from BOLD signals  | Region of frontoparietal network and central brain | 9, 4, 39, 40, 46, 10, 13, 1, 2, 3 | MMSE | Normal | Ridge regression | Correlation between behavioral test scores and FC-predicted score is 0.12~0.44 (p < 0.001). |
| Finn et al.124 | 2015 | 126 | 22-35 | Human Connectome Project (HCP) | fMRI | Positive and negative edges, frontoparietal networks | Frontoparietal region | 9, 4, 39, 40, 46, 10, 13 | Raven's Progressive Matrices | Normal | CPM | Correlation between actual and estimated *gF* is 0.5 (p < 0.01) |
| Powell et al.125 | 2017 | 841 | 22-37 | HCP | fMRI | Voxel-wise local structural connectome | Region of frontoparietal network  | 9, 4, 39, 40, 46, 10, 13 | NIH-TCB | Normal | LASSO Principal Component Regressor | Correlation between the actual and predicted NIH picture sequence memory test is 0.097 (p < 0.001) |
| Sripada et al.126 | 2020 | 2013 | 9-10 | ABCD | fMRI | Resting-state functional connectivity pattern | Default mode network, frontoparietal network, salience network, dorsal attention network | 8, 9, 10, 21, 28, 36, 23, 24, 32, 29, 30, 31, 39, 40 | NIH-TCB | Normal | Brain basis set (BBS) modeling (combination of PCA and linear regression) | General neurocognitive ability score is highly correlated to the mentioned networks (r = 0.31; p < 0.0001) |
| Jiang et al.127 | 2017 | 360 | 17-24 | University of Electronic Science and Technology, China  | fMRI | Functional connectivity | Superior frontal gyrus, inferior and superior parietal lobules | 10, 11, 12, 39, 40, 7 | WAIS-RC | Normal | RelieF+LASSO | Correlation between actual and estimated FSIQ is 51% (p < 0.001) |
| Hart et al.128 | 2006 | 25 | 14-29 | UNC Pediatric Endocrinology Turner Syndrome Clinic | fMRI | Activated voxels in fMRI | Left and right middle frontal gyri, inferior frontal gyri, intraparietal sulci and inferior temporal gyri | 10, 44, 45, 47, 20 | WASI | Normal/abnormal | ANOVA | Individuals with Turner syndrome and controls had significantly different verbal IQs (p < 0.0001) |
| Greene et al.129 | 2018 | 1086 | 8-36 | HCP, Philadelphia Neurodevelopmental Cohort (PNC) | fMRI | Whole brain functional connectivity | Cortical and subcortical grey matter, cerebellum | Not specified | Raven's Progressive Matrices | Normal | CPM | Correlation between actual and estimated *gF* is 19% in resting state (p = 0.039) |
| He et al.131 | 2018 | 9821 | 22-69 | HCP, UK-Biobank | fMRI | Functional Connectivity Matrix | Whole-brain spatially independent components | Not specified | Raven's Progressive Matrices | Normal | Kernel Regression, Feedforward NN, CNN | Correlation between actual and estimated *gF* is 23.9% (p < 0.001) using the Kernel regression |
| Li et al.132 | 2018 | 100 | - | HCP | fMRI | Amplitude of low-frequency fluctuation of left anterior cingulate cortex | Right prefrontal cortex, left anterior cingulate cortex | 8, 24, 32, 33 | Raven's Progressive Matrices | Normal | Support vector regressor | Correlation between actual and estimated *gF* is 32.5% (p = 0.031) |
| Dubois et al.133 | 2018 | 884 | 22-36 | HCP | fMRI | Functional Connectivity Matrix | Cortical and subcortical grey matter | Not specified | Raven's Progressive Matrices | Normal | Univariate correlation filtering + Elastic net regression | Correlation between actual and estimated *gF* is 22% using the univariate model (p < 0.001) |
| Yoo et al.134 | 2019 | 575 | 22-56 | HCP | fMRI | Functional Connectivity Matrix | Regions of frontoparietal and default mode networks | 9, 4, 39, 40, 46, 10, 13, 38, 25, 23, 31 | Raven's Progressive Matrices | Normal | CPM-based Multivariate distance correlation | Correlation between actual and estimated cognitive ability is 9.5% (p < 0.01) |
| Noble et al.135 | 2017 | 618 | 22-56 | HCP | fMRI | 10 functionally coherent networks | Whole gray matter | Not specified | Raven's Progressive Matrices | Normal | CPM | Correlation between actual and estimated *gF* is 22% (p < 0.0001) |