DOCUMENTATION

of

BRAIN MEASURES

in

MIDUS Refresher 1 Neuroscience Project (P5)

University of Wisconsin ♦ Institute on Aging
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INTRODUCTION

This document is an updated reference for the extracted structural and diffusion brain measures in the MIDUS Refresher 1 Neuroscience Project data sets and includes information regarding the Neuroscience Project's (P5) MIDUS Refresher 1 MRI data collection and processing protocols. This update includes both a correction to the original brainage documentation in regard to the Cole brainage estimates as described in https://github.com/james-cole/brainageR, and the addition of other brainage estimates from publicly shared algorithms and deep learning models trained on other external datasets. To match the data available for MIDUS 3, this update includes measures of cortical thickness, curvature, surface area, and volume calculated via FreeSurfer software using the Desikan-Killiany-Tourville (Klein & Tourville, 2012) brain atlas. Variables of self-reported neurological condition [RA5IN], radiologist flagged abnormality in MRI [RA5IF] and start time of the structural and functional MRI scans [RA5ITS] and [RA5ITF] were also added.

Partial variable names have been provided where appropriate. For more detailed information on variable names and data collection procedures, please see (*MR1_P5_VARIABLE_NAMES_20241015* and *MR1_P5_README_20241015*). Raw MRI data (including structural, task functional, resting functional, diffusion-weighted imaging, and resting perfusion) are available through a separate data sharing mechanism. Please see https://midus.wisc.edu/midus_neuro_data.php for instructions on how to access these data.

MRI scans typically began between 8:00 a.m. and 10:00 a.m. following the completion of our Psychophysiology protocol the preceding day (see RA5ITS and RA5ITF for the exact MRI start time and *MR1_P5_DOCUMENTATION_OF_PSYCHOPHYSIOLOGY_20241015* for details regarding psychophysiology procedures). Data collection took place at the Waisman Brain Imaging laboratory on the UW-Madison campus using a 3T MR750 GE Healthcare MRI scanner (Waukesha, WI) and an 8-channel head coil. In total, the scanning protocol had a duration of approximately 70 minutes and included the acquisition of a BRAVO T1-weighted scan, field map images, 3 task functional MRI (fMRI) scans/EPIs, a resting-state fMRI scan, a diffusion-weighted scan, an arterial spin labeling scan, as well as a second BRAVO T1-weighted scan when circumstances allowed. Questionnaire data, including PANAS-NOW and STAI-State, both prior to and after the scanning procedure, has been provided as well.

After the Psychophysiology protocol, most participants completed the MRI protocol. However, in some cases, data could not be collected due to claustrophobia, back problems, or other issues that prevented the participant from completing the MRI scan. A filter variable is provided, indicating whether participants completed a T1-weighted scan [RA5IC]. A small number of scans contained artifacts that made accurate structural measurements unfeasible. In all cases, the appropriate missing value was listed. A second filter indicates whether a radiologist flagged the scan for an abnormality during review [RA5IF]. Flags are commonly indicating small vessel ischemic disease, presence of meningiomas or other masses, and/or referrals to specialists. During the screening process, participants who self-reported neurological or other health conditions that could impact their data were excluded from the MIDUS Refresher 1 (MR1) Neuroscience project. However, in future waves, to maximize longitudinal data collection, participants were not excluded due to neurological or other health

conditions. Therefore, an additional variable of self-reported neurological condition has been provided [RA5IN]. The self-reported neurological conditions may include seizure disorders, Parkinson's, tremors, multiple sclerosis, Alzheimer's disease or related dementia, previous stroke/TIA, brain aneurysm, head/brain injury, cyst on the brain, or other condition (unclear if central or peripheral nervous system condition). Note that because MR1 participants were excluded if they reported a neurological condition, all MR1 participants have a value of 0 for RA5IN. Users of the data should review the images for themselves to determine whether any data should be included or excluded from an analysis.

T1w-Derived Structural Brain Measurements & Brain-Predicted Age

Measures derived from BRAVO T1-weighted (T1w) structural images with 1-mm^3 isotropic voxels (TR = 8.2 ms, TE = 3.2 ms, flip angle = 12°, FOV = 256 mm, 256 x 256 matrix, 160 axial slices, inversion time = 450 ms, total duration = 7.5 minutes) are described below. For details on processing procedures, see *MR1_P5_INSTRUMENTS_20241015*.

Measures of cortical thickness, curvature, surface area, and volume calculated via FreeSurfer software (v5.3.0; http://surfer.nmr.mgh.harvard.edu) using the Destrieux (Fischl *et al.,* 2004), Desikan-Killiany (Desikan *et al*., 2006), and Desikan-Killiany-Tourville (Klein & Tourville, 2012) brain atlases, as well as subcortical volumes derived via the FreeSurfer aseg atlas (Fischl *et al*., 2002), and the FreeSurfer segmentation of hippocampal subfields (Iglesias *et al.,* 2015) and nuclei of the amygdala (Saygin & Kliemann *et al.,* 2017) are provided for 127 participants.

Brain-predicted age was also calculated for the same 127 participants using multiple publicly shared algorithms and deep learning models which have been pretrained with cross-validation on of other external T1-weighted MRI datasets:

(1) Cole brainageR v1.0 [RA5EB] and (2) Cole brainageR v2.0 [RA5EBC] both using Gaussian Processes regression described in detail on https://github.com/james-cole/brainageR and according to the GitHub description using similar but not identical methods as Cole, J. H., Leech, R., Sharp, D. J., & Initiative, A. D. N. (2015). Prediction of brain age suggests accelerated atrophy after traumatic brain injury. *Annals of Neurology*, *77*(4), 571–581. doi: 10.1002/ana.24367.

(3) PMID: **34086565** [RA5EBT] Cheng, J., Liu, Z., Guan, H., Wu, Z., Zhu, H., Jiang, J., … Liu, T. (2021). Brain Age Estimation From MRI Using Cascade Networks With Ranking Loss. *IEEE Transactions on Medical Imaging*, *40*(12), 3400–3412. doi: 10.1109/tmi.2021.3085948

Liu, Z., Cheng, J., Zhu, H., Zhang, J., & Liu, T. (2020). Medical Image Computing and Computer Assisted Intervention – MICCAI 2020, 23rd International Conference, Lima, Peru, October 4–8, 2020, Proceedings, Part VII. *Lecture Notes in Computer Science*, 198–207. doi: 10.1007/978-3-030-59728-3_20

(4) PMID: **36595679** [RA5EBP] Yin, C., Imms, P., Cheng, M., Amgalan, A., Chowdhury, N. F., Massett, R. J., … Fernandez, D. (2023). Anatomically interpretable deep learning of brain age captures domain-specific cognitive impairment. *Proceedings of the National Academy of Sciences*, *120*(2), e2214634120. doi: 10.1073/pnas.2214634120

The Waisman Brain Imaging MRI scanner was updated between the MIDUS 2 and MIDUS Refresher 1 data collections. Due to limitations in scan quality at the time of MIDUS 2 data collection (which suffered a severe intensity bias that so far has not been able to be corrected with bias corrections), the MIDUS 2 structural data was of insufficient quality to provide these estimates from the structural MRI data. Therefore the MIDUS Refresher 1 wave represents the first instance of these "T1w-Derived Structural Brain Measurements & Brain-Predicted Age**"** measures in MIDUS.

Diffusion Weighted Imaging Measures

Measures derived from diffusion-weighted images are described below. A Stejskal-Tanner [J. Chem. Phys. 42, 288 (1965)] diffusion prepared spin echo EPI sequence was used with the following parameters: 65 x 2 mm axial slices, within plane field of view = 256mm x 256 mm, acquisition matrix 128 x 128 (readout R/L), partial Fourier encoding 62.5% and ASSET (SENSE) x 2. Additional parameters TR/TE = 7000ms/68.7ms. Four reference scans (b=0 s/mm^2) and two concentric shells (b=400 s/mm^2 and b=1200s/mm^2) were acquired with 6 and 70 directions respectively. For details on processing procedures, see *MR1_P5_INSTRUMENTS_20241015.*

The following measures were derived from the diffusion-weighted images:

DTI measures (Alexander et al., 2011) - The following metrics are widely used:

- **Fractional anisotropy (FA)** is the normalized standard deviation of the eigenvalues of the DTI. It is very sensitive to changes in white matter microstructure, but not very specific, as it can be influenced by changes in neurite density and dispersion among other factors. Lower FA is associated with aging.
- **Mean diffusivity (MD)** is the average diffusivity across the three principal directions. It is affected by both membrane density and fluid viscosity. Higher values of MD are associated with aging.
- **Radial diffusivity (RD)** measures diffusivity perpendicular to the axons. Higher values are associated with demyelination.
- **Axial diffusivity (AD)** measures diffusivity along the axons. AD is influenced by several factors, including axonal density, axonal diameter, and myelination, as well as the degree of water restriction along the fiber tract. Higher values of AD are associated with aging.

Global values for the four DTI-based metrics are provided for 118 participants, along with tract-specific measures extracted using both the JHU ICBM-DTI-81 v1.0 (http://cmrm.med.jhmi.edu/; Hua et al., 2008; Mori et al., 2008; Wakana et al., 2007) with FSL v5.0.11 (https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/Atlases), and IIT v4.1 (http://www.iit.edu/~mri/IITHumanBrainAtlas.html; Zhang & Arfanakis 2018) DTI-based white-matter atlases. Measures derived from population-based manual tractography are also provided. For publication of the DTI processing, see Pedersen et al., 2021. Diffusion-weighted

scanning was not performed at MIDUS 2, therefore the MIDUS Refresher 1 wave represents the first instance of these measures in MIDUS.

BRAIN MEASURES: VARIABLE NAMING

Scan type:

[RA5E]: T1-weighted (Extracted structural measures)

[RA5W]: Diffusion-weighted (Extracted diffusion weighted imaging measures)

Measurement type:

[RA5ET]: Cortical Thickness (mm)

[RA5EC]: Cortical Curvature (mm)

[RA5EA]: Cortical Surface Area (mm^2)

[RA5EV]: Cortical Volume (mm^3)

[RA5ES]: Subcortical Volume (mm^3)

[RA5WF]: Fractional Anisotropy (FA)

[RA5WM]: Mean Diffusivity (MD)

[RA5WR]: Radial Diffusivity (RD)

[RA5WA]: Axial Diffusivity (AD)

Hemisphere: Note that '*X*' represents any one of the measurement variables listed above.

[RA5*XX*G]: Measurement is global (encompasses entire brain)

[RA5*XX*L]: Measurement is specific to left hemisphere

[RA5*XX*R]: Measurement is specific to right hemisphere

[RA5*XX*N]: Not applicable; measurement is bilateral.

Atlas: Note that '*X*' represents any one of the measurement and hemisphere variables listed above.

[RA5E*XX*D]: Measurement calculated using Destrieux brain atlas (Fischl *et al.,* 2004).

[RA5E*XX*K]: Measurement calculated using Desikan-Killiany brain atlas (Desikan *et al*., 2006).

[RA5E*XX*T]: Measurement calculated using Desikan-Killiany-Tourville brain atlas (Klein & Tourville, 2012).

[RA5E*XX*A]: Measurement calculated using FreeSurfer aseg subcortical brain atlas (Fischl *et al*., 2002) or Hippocampal Subfield (Iglesias et al., 2015) and Amygdala Nuclei (Saygin & Kliemann et al., 2017) module.

[RA5W*XX*I]: Measurement calculated using IIT v4.1 white matter atlas (Zhang & Arfanakis, 2018).

[RA5W*XX*J]: Measurement calculated using JHU white matter atlas (Hua *et al*., 2008; Mori *et al*., 2008; and Wakana *et al*., 2007).

[RA5W*XX*T]: Measurement calculated using manual tractography.

Brain-Predicted Age:

[RA5EB]: Brain-Predicted Age (yrs) estimated using Cole brainageR v1.0 - https://github.com/james-cole/brainageR/tree/1.0

[RA5EBC]: Brain-Predicted Age (yrs) estimated using Cole brainageR v2.0 - https://github.com/james-cole/brainageR/tree/2.0

[RA5EBT]: Brain-Predicted Age (yrs) estimated using two-stage-age-network (TSAN) model from PMID: 34086565 - https://github.com/Milan-BUAA/TSAN-brain-age-estimation

[RA5EBP]: Brain-Predicted Age (yrs) estimated using 3D-CNN model from PMID: 36595679 - https://github.com/irimia-laboratory/USC_BA_estimator

FULL MEASUREMENT NAMES (DESTRIEUX CORTICAL ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
G_and_S_frontomargin	Fronto-marginal gyrus (of Wernicke) and sulcus	RA5E_ _D01
G_and_S_occipital_inf	Inferior occipital gyrus (O3) and sulcus	RA5E_ _D02
G_and_S_paracentral	Paracentral lobule and sulcus	RA5E_ _D03
G_and_S_subcentral	Subcentral gyrus (central operculum) and sulci	RA5E_ _D04
G_and_S_transv_frontopol	Transverse frontopolar gyri and sulci	RA5E_ _D05
G_and_S_cingul-Ant	Anterior part of the cingulate gyrus and sulcus (ACC)	RA5E_ _D06
G_and_S_cingul-Mid-Ant	Middle-anterior part of the cingulate gyrus and sulcus (aMCC)	RA5E_ _D07
G_and_S_cingul-Mid-Post	Middle-posterior part of the cingulate gyrus and sulcus (pMCC)	RA5E_ _D08
G_cingul-Post-dorsal	Posterior-dorsal part of the cingulate gyrus (dPCC)	RA5E_ _D09
G_cingul-Post-ventral	Posterior-ventral part of the cingulate gyrus (vPCC, isthmus of the cingulate gyrus)	RA5E_ _D10
G_cuneus	Cuneus (O6)	RA5E_ _D11
G_front_inf-Opercular	Opercular part of the inferior frontal gyrus	RA5E_ _D12
G_front_inf-Orbital	Orbital part of the inferior frontal gyrus	RA5E_ _D13
G_front_inf-Triangul	Triangular part of the inferior frontal gyrus	RA5E_ _D14
G_front_middle	Middle frontal gyrus (F2)	RA5E_ _D15
G_front_sup	Superior frontal gyrus (F1)	RA5E_ _D16
G_Ins_lg_and_S_cent_ins	Long insular gyrus and central sulcus of the insula	RA5E_ _D17
G_insular_short	Short insular gyri	RA5E_ _D18
G_occipital_middle	Middle occipital gyrus (O2, lateral occipital gyrus)	RA5E_ _D19
G_occipital_sup	Superior occipital gyrus (O1)	RA5E_ _D20
G_oc-temp_lat-fusifor	Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4)	RA5E_ _D21
G_oc-temp_med-Lingual	Lingual gyrus, ligual part of the medial occipito-temporal gyrus, (O5)	RA5E_ _D22
G_oc-temp_med-Parahip	Parahippocampal gyrus, parahippocampal part of the medial occipito-temporal gyrus, (T5)	RA5E_ _D23
G_orbital	Orbital gyri	RA5E_ _D24
G_pariet_inf-Angular	Angular gyrus	RA5E_ _D25
G_pariet_inf-Supramar	Supramarginal gyrus	RA5E_ _D26
G_parietal_sup	Superior parietal lobule (lateral part of P1)	RA5E_ _D27
G_postcentral	Postcentral gyrus	RA5E_ _D28
G_precentral	Precentral gyrus	RA5E_ _D29
G_precuneus	Precuneus (medial part of P1)	RA5E_ _D30
G_rectus	Straight gyrus, Gyrus rectus	RA5E_ _D31
G_subcallosal	Subcallosal area, subcallosal gyrus	RA5E_ _D32
G_temp_sup-G_T_transv	Anterior transverse temporal gyrus (of Heschl)	RA5E_ _D33
G_temp_sup-Lateral	Lateral aspect of the superior temporal gyrus	RA5E_ _D34
G_temp_sup-Plan_polar	Planum polare of the superior temporal gyrus	RA5E_ _D35
G_temp_sup-Plan_tempo	Planum temporale or temporal plane of the superior temporal gyrus	RA5E_ _D36

G_temporal_inf	Inferior temporal gyrus (T3)	RA5E_ _D37
G_temporal_middle	Middle temporal gyrus (T2)	RA5E_ _D38
Lat_Fis-ant-Horizon	Horizontal ramus of the anterior segment of the lateral sulcus (or fissure)	RA5E_ _D39
Lat_Fis-ant-Vertical	Vertical ramus of the anterior segment of the lateral sulcus (or fissure)	RA5E_ _D40
Lat_Fis-post	Posterior ramus (or segment) of the lateral sulcus (or fissure)	RA5E_ _D41
Pole_occipital	Occipital pole	RA5E_ _D42
Pole_temporal	Temporal pole	RA5E_ _D43
S_calcarine	Calcarine sulcus	RA5E_ _D44
S_central	Central sulcus (Rolando's fissure)	RA5E_ _D45
S_cingul-Marginalis	Marginal branch (or part) of the cingulate sulcus	RA5E_ _D46
S_circular_insula_ant	Anterior segment of the circular sulcus of the insula	RA5E_ _D47
S_circular_insula_inf	Inferior segment of the circular sulcus of the insula	RA5E_ _D48
S_circular_insula_sup	Superior segment of the circular sulcus of the insula	RA5E_ _D49
S_collat_transv_ant	Anterior transverse collateral sulcus	RA5E_ _D50
S_collat_transv_post	Posterior transverse collateral sulcus	RA5E_ _D51
S_front_inf	Inferior frontal sulcus	RA5E_ _D52
S_front_middle	Middle frontal sulcus	RA5E_ _D53
S_front_sup	Superior frontal sulcus	RA5E_ _D54
S_interm_prim-Jensen	Sulcus intermedius primus (of Jensen)	RA5E_ _D55
S_intrapariet_and_P_trans	Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci	RA5E_ _D56
S_oc_middle_and_Lunatus	Middle occipital sulcus and lunatus sulcus	RA5E_ _D57
S_oc_sup_and_transversal	Superior occipital sulcus and transverse occipital sulcus	RA5E_ _D58
S_occipital_ant	Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure)	RA5E_ _D59
S_oc-temp_lat	Lateral occipito-temporal sulcus	RA5E_ _D60
S_oc-temp_med_and_Lingual	Medial occipito-temporal sulcus (collateral sulcus) and lingual sulcus	RA5E_ _D61
S_orbital_lateral	Lateral orbital sulcus	RA5E_ _D62
S_orbital_med-olfact	Medial orbital sulcus (olfactory sulcus)	RA5E_ _D63
S_orbital-H_Shaped	Orbital sulci (H-shaped sulci)	RA5E_ _D64
S_parieto_occipital	Parieto-occipital sulcus (or fissure)	RA5E_ _D65
S_pericallosal	Pericallosal sulcus (S of corpus callosum)	RA5E_ _D66
S_postcentral	Postcentral sulcus	RA5E_ _D67
S_precentral-inf-part	Inferior part of the precentral sulcus	RA5E_ _D68
S_precentral-sup-part	Superior part of the precentral sulcus	RA5E_ _D69
S_suborbital	Suborbital sulcus (sulcus rostrales, supraorbital sulcus)	RA5E_ _D70
S_subparietal	Subparietal sulcus	RA5E_ _D71
S_temporal_inf	Inferior temporal sulcus	RA5E_ _D72
S_temporal_sup	Superior temporal sulcus (parallel sulcus)	RA5E_ _D73
S_temporal_transverse	Transverse temporal sulcus	RA5E_ _D74

FULL MEASUREMENT NAMES (DESIKAN-KILLIANY CORTICAL ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
bankssts	Banks superior temporal sulcus	RA5E_ _K01
caudalanteriorcingulate	Caudal anterior-cingulate cortex	RA5E_ _K02
caudalmiddlefrontal	Caudal middle frontal gyrus	RA5E_ _K03
cuneus	Cuneus cortex	RA5E_ _K04
entorhinal	Entorhinal cortex	RA5E_ _K05
fusiform	Fusiform gyrus	RA5E_ _K06
inferiorparietal	Inferior parietal cortex	RA5E_ _K07
inferiortemporal	Inferior temporal gyrus	RA5E_ _K08
isthmuscingulate	Isthmus– cingulate cortex	RA5E_ _K09
lateraloccipital	Lateral occipital cortex	RA5E_ _K10
lateralorbitofrontal	Lateral orbital frontal cortex	RA5E_ _K11
lingual	Lingual gyrus	RA5E_ _K12
medialorbitofrontal	Medial orbital frontal cortex	RA5E_ _K13
middletemporal	Middle temporal gyrus	RA5E_ _K14
parahippocampal	Parahippocampal gyrus	RA5E_ _K15
paracentral	Paracentral lobule	RA5E_ _K16
parsopercularis	Pars opercularis	RA5E_ _K17
parsorbitalis	Pars orbitalis	RA5E_ _K18
parstriangularis	Pars triangularis	RA5E_ _K19
pericalcarine	Pericalcarine cortex	RA5E_ _K20
postcentral	Postcentral gyrus	RA5E_ _K21
posteriorcingulate	Posterior-cingulate cortex	RA5E_ _K22
precentral	Precentral gyrus	RA5E_ _K23
precuneus	Precuneus cortex	RA5E_ _K24
rostralanteriorcingulate	Rostral anterior cingulate cortex	RA5E_ _K25
rostralmiddlefrontal	Rostral middle frontal gyrus	RA5E_ _K26
superiorfrontal	Superior frontal gyrus	RA5E_ _K27
superiorparietal	Superior parietal cortex	RA5E_ _K28
superiortemporal	Superior temporal gyrus	RA5E_ _K29
supramarginal	Supramarginal gyrus	RA5E_ _K30
frontalpole	Frontal pole	RA5E_ _K31
temporalpole	Temporal pole	RA5E_ _K32
transversetemporal	Transverse temporal cortex	RA5E_ _K33
insula	Insula	RA5E_ _K34

FULL MEASUREMENT NAMES (DESIKAN-KILLIANY-TOURVILLE – DKT - CORTICAL ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
caudalanteriorcingulate	Caudal anterior-cingulate cortex	RA5E_ _T01
caudalmiddlefrontal	Caudal middle frontal gyrus	RA5E_ _T02
cuneus	Cuneus cortex	RA5E_ _T03
entorhinal	Entorhinal cortex	RA5E_ _T04
fusiform	Fusiform gyrus	RA5E_ _T05
inferiorparietal	Inferior parietal cortex	RA5E_ _T06
inferiortemporal	Inferior temporal gyrus	RA5E_ _T07
isthmuscingulate	Isthmus– cingulate cortex	RA5E_ _T08
lateraloccipital	Lateral occipital cortex	RA5E_ _T09
lateralorbitofrontal	Lateral orbital frontal cortex	RA5E_ _T10
lingual	Lingual gyrus	RA5E_ _T11
medialorbitofrontal	Medial orbital frontal cortex	RA5E_ _T12
middletemporal	Middle temporal gyrus	RA5E_ _T13
parahippocampal	Parahippocampal gyrus	RA5E_ _T14
paracentral	Paracentral lobule	RA5E_ _T15
parsopercularis	Pars opercularis	RA5E_ _T16
parsorbitalis	Pars orbitalis	RA5E_ _T17
parstriangularis	Pars triangularis	RA5E_ _T18
pericalcarine	Pericalcarine cortex	RA5E_ _T19
postcentral	Postcentral gyrus	RA5E_ _T20
posteriorcingulate	Posterior-cingulate cortex	RA5E_ _T21
precentral	Precentral gyrus	RA5E_ _T22
precuneus	Precuneus cortex	RA5E_ _T23
rostralanteriorcingulate	Rostral anterior cingulate cortex	RA5E_ _T24
rostralmiddlefrontal	Rostral middle frontal gyrus	RA5E_ _T25
superiorfrontal	Superior frontal gyrus	RA5E_ _T26
superiorparietal	Superior parietal cortex	RA5E_ _T27
superiortemporal	Superior temporal gyrus	RA5E_ _T28
supramarginal	Supramarginal gyrus	RA5E_ _T29
transversetemporal	Transverse temporal cortex	RA5E_ _T30
insula	Insula	RA5E_ _T31

FULL MEASUREMENT NAMES (ASEG SUBCORTICAL ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
Lateral-Ventricle	Lateral Ventricle	RA5ES_A09
Inf-Lat-Vent	Inferior Lateral Ventricle	RA5ES_A08
Cerebellum-White-Matter	Cerebellum White Matter	RA5ES_A05

Cerebellum-Cortex	Cerebellum Cortex	RA5ES_A04
Thalamus-Proper	Thalamus	RA5ES_A12
Caudate	Caudate	RA5ES_A03
Putamen	Putamen	RA5ES_A11
Pallidum	Pallidum	RA5ES_A10
Hippocampus	Hippocampus	RA5ES_A07
Amygdala	Amygdala	RA5ES_A02
Accumbens-area	Accumbens Area	RA5ES_A01
VentralDC	Ventral Diencephalon	RA5ES_A13
vessel	vessel (non-specific)	RA5ES_A14
3rd-Ventricle	Third Ventricle	RA5ESNA01
4th-Ventricle	Fourth Ventricle	RA5ESNA02
Brain-Stem	Brain Stem	RA5ESNA03
CSF	Cerebrospinal Fluid	RA5ESNA15
choroid-plexus	Choroid Plexus	RA5ES_A06
CortexVol	Cortical Gray Matter Volume	RA5ES_A15 OR RA5ESNA13
CorticalWhiteMatterVol	Cortical White Matter Volume	RA5ES_A16 OR RA5ESNA14
SurfaceHoles	Number of defect holes in surfaces prior to fixing	RA5ES_A17 OR RA5ESNA24
BrainSegVol	Brain Segmentation Volume	RA5ESNA04
BrainSegVol-to-eTIV	Ratio of BrainSegVol to eTIV	RA5ESNA05
BrainSegVolNotVent	Brain Segmentation Volume Without Ventricles	RA5ESNA06
BrainSegVolNotVentSurf	Brain Segmentation Volume Without Ventricles from Surf	RA5ESNA07
CC_Anterior	Anterior Corpus Callosum	RA5ESNA08
CC_Central	Central Corpus Callosum	RA5ESNA09
CC_Mid_Anterior	Mid-Anterior Corpus Callosum	RA5ESNA10
CC_Mid_Posterior	Mid-Posterior Corpus Callosum	RA5ESNA11
CC_Posterior	Posterior Corpus Callosum	RA5ESNA12
EstimatedTotalIntraCranialVol	Estimated Total Intracranial Volume	RA5ESNA16
MaskVol	Mask Volume	RA5ESNA17
MaskVol-to-eTIV	Ratio of MaskVol to eTIV	RA5ESNA18
Optic-Chiasm	Optic Chiasm	RA5ESNA19
SubCortGrayVol	Subcortical Gray Matter Volume	RA5ESNA20
SupraTentorialVol	Supratentorial Volume	RA5ESNA21
SupraTentorialVolNotVent	Supratentorial Volume Without Ventricles	RA5ESNA22
SupraTentorialVolNotVentVox	Supratentorial Volume Voxel Count	RA5ESNA23
TotalGrayVol	Total Gray Matter Volume	RA5ESNA25

FULL MEASUREMENT NAMES (AMYGDALA ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
Lateral-nucleus	Lateral nucleus	RA5ES_A18
Basal-nucleus	Basal nucleus	RA5ES_A19
Accessory-basal-nucleus	Accessory basal nucleus	RA5ES_A20
Anterior-amygdaloid-area-AAA	Anterior amygdaloid area	RA5ES_A21
Central-nucleus	Central nucleus	RA5ES_A22
Medial-nucleus	Medial nucleus	RA5ES_A23
Cortical-nucleus	Cortical nucleus	RA5ES_A24
Corticoamygdaloid-transitio	Corticoamygdaloid transition area	RA5ES_A25
Paralaminar-nucleus	Paralaminar nucleus	RA5ES_A26
Whole_amygdala	Amygdala	RA5ES_A27

FULL MEASUREMENT NAMES (HIPPOCAMPUS ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
Hippocampal_tail	Hippocampal tail	RA5ES_A28
Subiculum-body	Subiculum (body)	RA5ES_A29
CA1-body	Cornu ammonis 1 (body)	RA5ES_A30
Subiculum-head	Subiculum (head)	RA5ES_A31
Hippocampal-fissure	Hippocampal fissure	RA5ES_A32
Presubiculum-head	Presubiculum (head)	RA5ES_A33
CA1-head	Cornu ammonis 1 (head)	RA5ES_A34
Presubiculum-body	Presubiculum (body)	RA5ES_A35
Parasubiculum	Parasubiculum	RA5ES_A36
Molecular_layer_HP-head	Molecular layer (head)	RA5ES_A37
Molecular_layer_HP-body	Molecular layer (body)	RA5ES_A38
GC-ML-DG-head	Granule cell (GC) and molecular layer (ML) of the dentate gyrus (DG) (head)	RA5ES_A39
CA3-body	Cornu ammonis 3 (body)	RA5ES_A40
GC-ML-DG-body	Granule cell (GC) and molecular layer (ML) of the dentate gyrus (DG) (body)	RA5ES_A41
CA4-head	Cornu ammonis 4 (head)	RA5ES_A42
CA4-body	Cornu ammonis 4 (body)	RA5ES_A43
Fimbria	Fimbria	RA5ES_A44
CA3-head	Cornu ammonis 3 (head)	RA5ES_A45
HATA	Hippocampus-amygdala-transition-area	RA5ES_A46
Whole_hippocampal_body	Hippocampal body	RA5ES_A47
Whole_hippocampal_head	Hippocampal head	RA5ES_A48
Whole_hippocampus	Hippocampus	RA5ES_A49

FULL MEASUREMENT NAMES (JHU WHITE MATTER BUNDLES ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
Anterior_corona_radiata	Anterior corona radiata	RA5W_ _J01
Anterior_limb_of_internal_capsule	Anterior limb of internal capsule	RA5W_ _J02
Cerebral_peduncle	Cerebral peduncle	RA5W_ _J03
Cingulum_(cingulate_gyrus)	Cingulum (cingulate gyrus)	RA5W_ _J04
Cingulum_(hippocampus)	Cingulum (hippocampus)	RA5W_ _J05
Corticospinal_tract	Corticospinal tract	RA5W_ _J06
External_capsule	External capsule	RA5W_ _J07
Fornix_(cres)_-_Stria_terminalis_ (can_not_be_resolved_with_current_resolution)	Fornix (cres) / Stria terminalis (cannot be resolved with current resolution)	RA5W_ _J08
Inferior_cerebellar_peduncle	Inferior cerebellar peduncle	RA5W_ _J09
Medial_lemniscus	Medial lemniscus	RA5W_ _J10
Posterior_corona_radiata	Posterior corona radiata	RA5W_ _J11
Posterior_limb_of_internal_capsule	Posterior limb of internal capsule	RA5W_ _J12
Posterior_thalamic_radiation_ (include_optic_radiation)	Posterior thalamic radiation (includes optic radiation)	RA5W_ _J13
Retrolenticular_part_of_internal_capsule	Retrolenticular part of internal capsule	RA5W_ _J14
Sagittal_stratum_(include_inferior_longitidinal_ fasciculus_and_inferior_fronto-occipital_fasciculus)	Sagittal stratum (includes inferior longitudinal fasciculus and inferior fronto-occipital fasciculus)	RA5W_ _J15
Superior_cerebellar_peduncle	Superior cerebellar peduncle	RA5W_ _J16
Superior_corona_radiata	Superior corona radiata	RA5W_ _J17
Superior_fronto-occipital_fasciculus_ (could_be_a_part_of_anterior_internal_capsule)	Superior fronto-occipital fasciculus (could be a part of anterior internal capsule)	RA5W_ _J18
Superior_longitudinal_fasciculus	Superior longitudinal fasciculus	RA5W_ _J19
Tapetum	Tapetum	RA5W_ _J20
Uncinate_fasciculus	Uncinate fasciculus	RA5W_ _J21
Body_of_corpus_callosum	Body of corpus callosum	RA5W_NJ01
Fornix_(column_and_body_of_fornix)	Fornix (column and body of fornix)	RA5W_NJ02
Genu_of_corpus_callosum	Genu of corpus callosum	RA5W_NJ03
Middle_cerebellar_peduncle	Middle cerebellar peduncle	RA5W_NJ04
Pontine_crossing_tract_(a_part_of_MCP)	Pontine crossing tract (a part of MCP)	RA5W_NJ05
Splenium_of_corpus_callosum	Splenium of corpus callosum	RA5W_NJ06

FULL MEASUREMENT NAMES (IIT V4.1 WHITE MATTER BUNDLES ATLAS)

VARIABLE LABEL (FROM SPSS FILE)	FULL NAME OF PARCELLATION	VARIABLE NAME
Lcing	Left cingulum (cingulate gyrus portion)	RA5W_L01
Lcing2	Left cingulum (hippocampal portion)	RA5W_L02
Lcst	Left corticospinal tract	RA5W_L03
Lifo	Left inferior fronto-occipital fasciculus	RA5W_L04
Lilf	Left inferior longitudinal fasciculus	RA5W_L05
Lslf	Left superior longitudinal fasciculus	RA5W_L06
Lunc	Left uncinate fasciculus	RA5W_L07
Rcing	Right cingulum (cingulate gyrus portion)	RA5W_R01
Rcing2	Right cingulum (hippocampal portion)	RA5W_R02
Rcst	Right corticospinal tract	RA5W_R03
Rifo	Right inferior fronto-occipital fasciculus	RA5W_R04
Rilf	Right inferior longitudinal fasciculus	RA5W_R05
Rslf	Right superior longitudinal fasciculus	RA5W_R06
Runc	Right uncinate fasciculus	RA5W_R07
Fmajor	Forceps major	RA5W_N01
Fminor	Forceps minor	RA5W_N02
Fornix	Fornix	RA5W_N03

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