**DOCUMENTATION**

**of**

##### BRAIN MEASURES

**in**

**MIDUS 3**

**Neuroscience Project (P5)**

**University of Wisconsin ♦ Institute on Aging**

**March 2023**

**INTRODUCTION**

This document is a reference for the extracted structural and diffusion brain measures in the MIDUS 3 Neuroscience Project data sets and includes information regarding the Neuroscience Project’s (P5) MIDUS 3 MRI data collection and processing protocols. Partial variable names have been provided where appropriate. For more detailed information on variable names and data collection procedures, please see (*M3\_P5\_VARIABLE\_NAMES\_20230331.docx* and *M3\_P5\_MEMO\_README\_20230331.docx*). 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.

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 *M3\_P5\_DOCUMENTATION\_OF\_PSYCHOPHYSIOLOGY\_20230331.docx* 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 a 32-channel NOVA head coil. In total, the scanning protocol had a duration of approximately 90 minutes and included the acquisition of a BRAVO T1-weighted scan, field map images, 3 functional scans/EPIs, a resting-state scan, a diffusion-weighted scan, an arterial spin labeling scan. Additionally, part way through the study T2 Cube and T2 Cube Flair scans were added to the end of the protocol if time allowed. Questionnaire data, including PANAS-NOW and STAI-State, both prior to and after the scanning procedure, has been provided as well.

**T1w-Derived Structural Brain Measurements & Brain-Predicted Age**

Measures derived from BRAVO T1-weighted structural images with 1-mm 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 *M3\_P5\_INSTRUMENTS\_20230331.docx*.

Measures of cortical thickness, curvature, surface area, and volume calculated via FreeSurfer software (v. 6.0.0; 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), are provided for 159 participants. Brain-predicted age was calculated using algorithm from PMID: 28765056 for the same 159 participants (Cole *et al.,* 2018; Cole *et al.,* 2017; Cole & Franke, 2017; Cole *et al.,* 2015; <https://github.com/james-cole/brainageR>). In some cases, data could not be collected due to claustrophobia, back problems, or other issues that prevented the participant from completing the scan. Additionally, a small number of scans contained artifacts that made accurate structural measurements unfeasible. In these cases, the appropriate missing value was listed. (See *M3\_P5\_MEMO\_README\_20230331.docx* and *M3\_P5\_DOCUMENTATION\_OF\_SCALES\_20230331.docx* for further information on missing values).

**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: 74-75 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 = 8575ms/Minimum. Six reference scans (b=0 s/mm^2) and three concentric shells (b=500 s/mm^2, b=800 s/mm^2, and b=2000s/mm^2) were acquired with 9, 18, and 36 directions respectively. For details on processing procedures, see *M3\_P5\_INSTRUMENTS\_20230331.docx.*

The DWI data were used to estimate the diffusion kurtosis imaging (DKI) (Fieremans et al., 2011) model which was then used to extract the diffusion tensor imaging (DTI) (Alexander et al., 2011; Jones & Leemans, 2011; Le Bihan et al., 2001) as well as the white matter tract integrity (WMTI) (Fieremans et al., 2013; Jelescu et al., 2015) metrics. The DWI data were also used to fit the multi-tissue neurite orientation dispersion and density imaging (NODDI) (Adluru et al., 2014; Guerrero et al., 2019; H. Zhang et al., 2012) model and derive the corresponding metrics. Below is a brief summary of the different measures from these models.

**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.

**DKI measures** (Fieremans et al., 2011) - With higher diffusion weighting (b-values higher than 1000 s/mm2), non-gaussian diffusion effects arise that can be quantified using DKI with measures such as

* **mean kurtosis (MK)**
* **radial kurtosis (RK)**
* **axial kurtosis (AK)**

**WMTI measures** (Fieremans et al., 2013; Fieremans et al., 2011) - DTI and DKI are both model-independent metrics that are not necessarily specific to biological changes. To enable interpretation, WMTI uses a two-compartment model (intra-axonal and extra-axonal space, IAS and EAS) yielding the following metrics:

* **Axonal water fraction (AWF):** lower values suggest reduction in axons potentially due to Wallerian degeneration after distal cortical atrophy.
* **Intra-axonal diffusivity (ias\_Da):** intrinsic diffusivity within axons, may be a marker of axonal injury.
* **Extra-axonal radial diffusivity (eas\_de\_perp):** marker for changes in diffusion transverse to fibers due to myelin breakdown.
* **Extra-axonal tortuosity (eas\_tort):** indirect measure of myelinated axonal fraction/myelin density; higher values for lower EAS volume fraction

**NODDI measures** (Adluru et al., 2014; Fick et al., 2019; Guerrero et al., 2019; H. Zhang et al., 2012) - The NODDI approach uses a multi-compartment model and allows estimation of the following metrics:

* **Neurite density index (NDI)** is an indicator of myelination and axonal integrity (Nazeri et al., 2020). Lower NDI is suggestive of demyelinating processes, potentially including neuronal loss.
* **Orientation dispersion index (ODI)** indicates the spread of neurites (dendrites and axons). Higher ODI in white matter may reflect axonal disorganization with aging (Billiet et al., 2015).
* **Fraction of isotropic diffusion (FISO or CSF)** is indicative of free water or cerebrospinal fluid (CSF) content. Higher values are associated with aging (Billiet et al., 2015).

For 153 participants, DWI-based metrics are provided for global summary of the major tissue types (white matter, gray matter, and cerebro-spinal fluid), along with tract-specific measures extracted using both the JHU ICBM-DTI-81 (<http://cmrm.med.jhmi.edu/>; Hua et al., 2008; Mori et al., 2008; Wakana et al., 2007) with FSL v6.0.4 (<https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/Atlases>), and IIT v5.0 (https://www5.iit.edu/~mri/IITHumanBrainAtlas.html; Qi & Arfanakis, 2021; S. Zhang & Arfanakis, 2018) white-matter atlases. In some cases, data could not be collected due to claustrophobia, back problems, or other issues that prevented the participant from completing the scan. In these cases, the appropriate missing value was listed. (See *M3\_P5\_MEMO\_README\_20230331.docx* and *M3\_P5\_DOCUMENTATION\_OF\_SCALES\_20230331.docx* for further information on missing values).

**brain measures: Variable naming**

**Scan type:**

**[C5E]:** T1-weighted (Extracted structural measures)

**[C5W]:** Diffusion-weighted (Extracted diffusion weighted imaging measures)

**Measurement type:**

**[C5EB]:** Brain-Predicted Age (yrs).

**[C5ET]:** Cortical Thickness (mm).

**[C5EC]:** Cortical Curvature (mm).

**[C5EA]:** Cortical Surface Area (mm2).

**[C5EV]:** Cortical Volume (mm3)

**[C5ES]:** Subcortical Volume (mm3)

**[C5WF]:** Fractional Anisotropy (FA)

**[C5WM]:** Mean Diffusivity (MD)

**[C5WR]:** Radial Diffusivity (RD)

**[C5WA]:** Axial Diffusivity (AD)

**[C5WN]:** Mean Kurtosis (MK)

**[C5WS]:** Radial Kurtosis (RK)

**[C5WB]:** Axial Kurtosis (AK)

**[C5WX]:** Axonal Water Fraction (AWF)

**[C5WI]:** Intra-axonal diffusivity (ias\_Da)

**[C5WP]:** Extra-axonal radial diffusivity (eas\_de\_perp)

**[C5WT]:** Extra-axonal tortuosity (eas\_tort)

**[C5WD]:** Neurite density index (NDI)

**[C5WV]:** Orientation dispersion index (ODI)

**[C5WC]:** Fraction of isotropic diffusion (FISO or CSF)

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

**[C5*XX*G]:** Measurement is global (encompasses entire brain)

**[C5*XX*L]:** Measurement is specific to left hemisphere

**[C5*XX*R]:** Measurement is specific to right hemisphere

**[C5*XX*N]:** Not applicable; measurement is bilateral.

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

**[C5E*XX*D]:** Measurement calculated using Destrieux brain atlas (Fischl *et al.,* 2004).

**[C5E*XX*K]:** Measurement calculated using Desikan-Killiany brain atlas (Desikan *et al*., 2006).

**[C5E*XX*T]:** Measurement calculated using Desikan-Killiany-Tourville brain atlas (Klein & Tourville, 2012).

**[C5E*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.

**[C5W*XX*K]:** Measurement calculated using IIT v5.0 white matter atlas (Qi & Arfanakis, 2021; S. Zhang & Arfanakis, 2018). \*NOTE: only available for M3

**[C5W*XX*J]:** Measurement calculated using JHU white matter atlas (Hua *et al*., 2008; Mori *et al*., 2008; and Wakana *et al*., 2007).

**full measurement names (Destrieux Cortical atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| G\_and\_S\_frontomargin | Fronto-marginal gyrus (of Wernicke) and sulcus |
| G\_and\_S\_occipital\_inf | Inferior occipital gyrus (O3) and sulcus |
| G\_and\_S\_paracentral | Paracentral lobule and sulcus |
| G\_and\_S\_subcentral | Subcentral gyrus (central operculum) and sulci |
| G\_and\_S\_transv\_frontopol | Transverse frontopolar gyri and sulci |
| G\_and\_S\_cingul-Ant | Anterior part of the cingulate gyrus and sulcus (ACC) |
| G\_and\_S\_cingul-Mid-Ant | Middle-anterior part of the cingulate gyrus and sulcus (aMCC) |
| G\_and\_S\_cingul-Mid-Post | Middle-posterior part of the cingulate gyrus and sulcus (pMCC) |
| G\_cingul-Post-dorsal | Posterior-dorsal part of the cingulate gyrus (dPCC) |
| G\_cingul-Post-ventral | Posterior-ventral part of the cingulate gyrus (vPCC, isthmus of the cingulate gyrus) |
| G\_cuneus | Cuneus (O6) |
| G\_front\_inf-Opercular | Opercular part of the inferior frontal gyrus |
| G\_front\_inf-Orbital | Orbital part of the inferior frontal gyrus |
| G\_front\_inf-Triangul | Triangular part of the inferior frontal gyrus |
| G\_front\_middle | Middle frontal gyrus (F2) |
| G\_front\_sup | Superior frontal gyrus (F1) |
| G\_Ins\_lg\_and\_S\_cent\_ins | Long insular gyrus and central sulcus of the insula |
| G\_insular\_short | Short insular gyri |
| G\_occipital\_middle | Middle occipital gyrus (O2, lateral occipital gyrus) |
| G\_occipital\_sup | Superior occipital gyrus (O1) |
| G\_oc-temp\_lat-fusifor | Lateral occipito-temporal gyrus (fusiform gyrus, O4-T4) |
| G\_oc-temp\_med-Lingual | Lingual gyrus, ligual part of the medial occipito-temporal gyrus, (O5) |
| G\_oc-temp\_med-Parahip | Parahippocampal gyrus, parahippocampal part of the medial occipito-temporal gyrus, (T5) |
| G\_orbital | Orbital gyri |
| G\_pariet\_inf-Angular | Angular gyrus |
| G\_pariet\_inf-Supramar | Supramarginal gyrus |
| G\_parietal\_sup | Superior parietal lobule (lateral part of P1) |
| G\_postcentral | Postcentral gyrus |
| G\_precentral | Precentral gyrus |
| G\_precuneus | Precuneus (medial part of P1) |
| G\_rectus | Straight gyrus, Gyrus rectus |
| G\_subcallosal | Subcallosal area, subcallosal gyrus |
| G\_temp\_sup-G\_T\_transv | Anterior transverse temporal gyrus (of Heschl) |
| G\_temp\_sup-Lateral | Lateral aspect of the superior temporal gyrus |
| G\_temp\_sup-Plan\_polar | Planum polare of the superior temporal gyrus |
| G\_temp\_sup-Plan\_tempo | Planum temporale or temporal plane of the superior temporal gyrus |
| G\_temporal\_inf | Inferior temporal gyrus (T3) |
| G\_temporal\_middle | Middle temporal gyrus (T2) |
| Lat\_Fis-ant-Horizon | Horizontal ramus of the anterior segment of the lateral sulcus (or fissure) |
| Lat\_Fis-ant-Vertical | Vertical ramus of the anterior segment of the lateral sulcus (or fissure) |
| Lat\_Fis-post | Posterior ramus (or segment) of the lateral sulcus (or fissure) |
| Pole\_occipital | Occipital pole |
| Pole\_temporal | Temporal pole |
| S\_calcarine | Calcarine sulcus |
| S\_central | Central sulcus (Rolando’s fissure) |
| S\_cingul-Marginalis | Marginal branch (or part) of the cingulate sulcus |
| S\_circular\_insula\_ant | Anterior segment of the circular sulcus of the insula |
| S\_circular\_insula\_inf | Inferior segment of the circular sulcus of the insula |
| S\_circular\_insula\_sup | Superior segment of the circular sulcus of the insula |
| S\_collat\_transv\_ant | Anterior transverse collateral sulcus |
| S\_collat\_transv\_post | Posterior transverse collateral sulcus |
| S\_front\_inf | Inferior frontal sulcus |
| S\_front\_middle | Middle frontal sulcus |
| S\_front\_sup | Superior frontal sulcus |
| S\_interm\_prim-Jensen | Sulcus intermedius primus (of Jensen) |
| S\_intrapariet\_and\_P\_trans | Intraparietal sulcus (interparietal sulcus) and transverse parietal sulci |
| S\_oc\_middle\_and\_Lunatus | Middle occipital sulcus and lunatus sulcus |
| S\_oc\_sup\_and\_transversal | Superior occipital sulcus and transverse occipital sulcus |
| S\_occipital\_ant | Anterior occipital sulcus and preoccipital notch (temporo-occipital incisure) |
| S\_oc-temp\_lat | Lateral occipito-temporal sulcus |
| S\_oc-temp\_med\_and\_Lingual | Medial occipito-temporal sulcus (collateral sulcus) and lingual sulcus |
| S\_orbital\_lateral | Lateral orbital sulcus |
| S\_orbital\_med-olfact | Medial orbital sulcus (olfactory sulcus) |
| S\_orbital-H\_Shaped | Orbital sulci (H-shaped sulci) |
| S\_parieto\_occipital | Parieto-occipital sulcus (or fissure) |
| S\_pericallosal | Pericallosal sulcus (S of corpus callosum) |
| S\_postcentral | Postcentral sulcus |
| S\_precentral-inf-part | Inferior part of the precentral sulcus |
| S\_precentral-sup-part | Superior part of the precentral sulcus |
| S\_suborbital | Suborbital sulcus (sulcus rostrales, supraorbital sulcus) |
| S\_subparietal | Subparietal sulcus |
| S\_temporal\_inf | Inferior temporal sulcus |
| S\_temporal\_sup | Superior temporal sulcus (parallel sulcus) |
| S\_temporal\_transverse | Transverse temporal sulcus |

**full measurement names (Desikan-killiany Cortical atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| Bankssts | Banks superior temporal sulcus |
| caudalanteriorcingulate | Caudal anterior-cingulate cortex |
| caudalmiddlefrontal | Caudal middle frontal gyrus |
| Cuneus | Cuneus cortex |
| Entorhinal | Entorhinal cortex |
| Fusiform | Fusiform gyrus |
| inferiorparietal | Inferior parietal cortex |
| inferiortemporal | Inferior temporal gyrus |
| isthmuscingulate | Isthmus– cingulate cortex |
| lateraloccipital | Lateral occipital cortex |
| lateralorbitofrontal | Lateral orbital frontal cortex |
| lingual | Lingual gyrus |
| medialorbitofrontal | Medial orbital frontal cortex |
| middletemporal | Middle temporal gyrus |
| parahippocampal | Parahippocampal gyrus |
| paracentral | Paracentral lobule |
| parsopercularis | Pars opercularis |
| parsorbitalis | Pars orbitalis |
| parstriangularis | Pars triangularis |
| pericalcarine | Pericalcarine cortex |
| postcentral | Postcentral gyrus |
| posteriorcingulate | Posterior-cingulate cortex |
| precentral | Precentral gyrus |
| precuneus | Precuneus cortex |
| rostralanteriorcingulate | Rostral anterior cingulate cortex |
| rostralmiddlefrontal | Rostral middle frontal gyrus |
| superiorfrontal | Superior frontal gyrus |
| superiorparietal | Superior parietal cortex |
| superiortemporal | Superior temporal gyrus |
| supramarginal | Supramarginal gyrus |
| temporalpole | Temporal pole |
| transversetemporal | Transverse temporal cortex |
| insula | Insula |

**full measurement names (Desikan-Killiany-Tourville – DKT - Cortical atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| caudalanteriorcingulate | Caudal anterior-cingulate cortex |
| caudalmiddlefrontal | Caudal middle frontal gyrus |
| cuneus | Cuneus cortex |
| entorhinal | Entorhinal cortex |
| fusiform | Fusiform gyrus |
| inferiorparietal | Inferior parietal cortex |
| inferiortemporal | Inferior temporal gyrus |
| isthmuscingulate | Isthmus– cingulate cortex |
| lateraloccipital | Lateral occipital cortex |
| lateralorbitofrontal | Lateral orbital frontal cortex |
| lingual | Lingual gyrus |
| medialorbitofrontal | Medial orbital frontal cortex |
| middletemporal | Middle temporal gyrus |
| parahippocampal | Parahippocampal gyrus |
| paracentral | Paracentral lobule |
| parsopercularis | Pars opercularis |
| parsorbitalis | Pars orbitalis |
| parstriangularis | Pars triangularis |
| pericalcarine | Pericalcarine cortex |
| postcentral | Postcentral gyrus |
| posteriorcingulate | Posterior-cingulate cortex |
| precentral | Precentral gyrus |
| precuneus | Precuneus cortex |
| rostralanteriorcingulate | Rostral anterior cingulate cortex |
| rostralmiddlefrontal | Rostral middle frontal gyrus |
| superiorfrontal | Superior frontal gyrus |
| superiorparietal | Superior parietal cortex |
| superiortemporal | Superior temporal gyrus |
| supramarginal | Supramarginal gyrus |
| transversetemporal | Transverse temporal cortex |
| insula | Insula |

**full measurement names (aseg subCortical atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| Lateral-Ventricle | Lateral Ventricle |
| Inf-Lat-Vent | Inferior Lateral Ventricle |
| Cerebellum-White-Matter | Cerebellum White Matter |
| Cerebellum-Cortex | Cerebellum Cortex |
| Thalamus-Proper | Thalamus |
| Caudate | Caudate |
| Putamen | Putamen |
| Pallidum | Pallidum |
| Hippocampus | Hippocampus |
| Amygdala | Amygdala |
| Accumbens-area | Accumbens Area |
| VentralDC | Ventral Diencephalon |
| vessel | vessel (non-specific) |
| 3rd-Ventricle | Third Ventricle |
| 4th-Ventricle | Fourth Ventricle |
| Brain-Stem | Brain Stem |
| CSF | Cerebrospinal Fluid |
| choroid-plexus | Choroid Plexus |
| CortexVol | Cortical Gray Matter Volume |
| CorticalWhiteMatterVol | Cortical White Matter Volume |
| SurfaceHoles | Number of defect holes in surfaces prior to fixing |
| BrainSegVol | Brain Segmentation Volume |
| BrainSegVol-to-eTIV | Ratio of BrainSegVol to eTIV |
| BrainSegVolNotVent | Brain Segmentation Volume Without Ventricles |
| BrainSegVolNotVentSurf | Brain Segmentation Volume Without Ventricles from Surf |
| CC\_Anterior | Anterior Corpus Callosum |
| CC\_Central | Central Corpus Callosum |
| CC\_Mid\_Anterior | Mid-Anterior Corpus Callosum |
| CC\_Mid\_Posterior | Mid-Posterior Corpus Callosum |
| CC\_Posterior | Posterior Corpus Callosum |
| EstimatedTotalIntraCranialVol | Estimated Total Intracranial Volume |
| MaskVol | Mask Volume |
| MaskVol-to-eTIV | Ratio of MaskVol to eTIV |
| Optic-Chiasm | Optic Chiasm |
| SubCortGrayVol | Subcortical Gray Matter Volume |
| SupraTentorialVol | Supratentorial Volume |
| SupraTentorialVolNotVent | Supratentorial Volume Without Ventricles |
| SupraTentorialVolNotVentVox | Supratentorial Volume Voxel Count |
| TotalGrayVol | Total Gray Matter Volume |

**full measurement names (Amygdala atlas)**

|  |  |  |
| --- | --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation | |
| Lateral-nucleus | | Lateral nucleus |
| Basal-nucleus | | Basal nucleus |
| Accessory-basal-nucleus | | Accessory basal nucleus |
| Anterior-amygdaloid-area-AAA | | Anterior amygdaloid area |
| Central-nucleus | | Central nucleus |
| Medial-nucleus | | Medial nucleus |
| Cortical-nucleus | | Cortical nucleus |
| Corticoamygdaloid-transitio | | Corticoamygdaloid transition area |
| Paralaminar-nucleus | | Paralaminar nucleus |
| Whole\_amygdala | | Amygdala |

**FULL MEASUREMENT NAMES (HIPPOCAMPUS ATLAS)**

|  |  |  |
| --- | --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation | |
| Hippocampal\_tail | | Hippocampal tail | |
| Subiculum-body | | Subiculum (body) | |
| CA1-body | | Cornu ammonis 1 (body) | |
| Subiculum-head | | Subiculum (head) | |
| Hippocampal-fissure | | Hippocampal fissure | |
| Presubiculum-head | | Presubiculum (head) | |
| CA1-head | | Cornu ammonis 1 (head) | |
| Presubiculum-body | | Presubiculum (body) | |
| Parasubiculum | | Parasubiculum | |
| Molecular\_layer\_HP-head | | Molecular layer (head) | |
| Molecular\_layer\_HP-body | | Molecular layer (body) | |
| GC-ML-DG-head | | Granule cell (GC) and molecular layer (ML) of the dentate gyrus (DG) (head) | |
| CA3-body | | Cornu ammonis 3 (body) | |
| GC-ML-DG-body | | Granule cell (GC) and molecular layer (ML) of the dentate gyrus (DG) (body) | |
| CA4-head | | Cornu ammonis 4 (head) | |
| CA4-body | | Cornu ammonis 4 (body) | |
| Fimbria | | Fimbria | |
| CA3-head | | Cornu ammonis 3 (head) | |
| CA4-head | | Cornu ammonis 4 (head) | |
| CA4-body | | Cornu ammonis 4 (body) | |
| Fimbria | | Fimbria | |
| CA3-head | | Cornu ammonis 3 (head) | |
| HATA | | Hippocampus-amygdala-transition-area | |
| Whole\_hippocampal\_body | | Hippocampal body | |
| Whole\_hippocampal\_head | | Hippocampal head | |
| Whole\_hippocampus | | Hippocampus | |

**full measurement names (JHU WHITE MATTER BUNDLES atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| Anterior\_corona\_radiata | Anterior corona radiata |
| Anterior\_limb\_of\_internal\_capsule | Anterior limb of internal capsule |
| Cerebral\_peduncle | Cerebral peduncle |
| Cingulum\_(cingulate\_gyrus) | Cingulum (cingulate gyrus) |
| Cingulum\_(hippocampus) | Cingulum (hippocampus) |
| Corticospinal\_tract | Corticospinal tract |
| External\_capsule | External capsule |
| Fornix\_(cres)\_-\_Stria\_terminalis\_  (can\_not\_be\_resolved\_with\_current\_resolution) | Fornix (cres) / Stria terminalis  (cannot be resolved with current resolution) |
| Inferior\_cerebellar\_peduncle | Inferior cerebellar peduncle |
| Medial\_lemniscus | Medial lemniscus |
| Posterior\_corona\_radiata | Posterior corona radiata |
| Posterior\_limb\_of\_internal\_capsule | Posterior limb of internal capsule |
| Posterior\_thalamic\_radiation\_(include\_  optic\_radiation) | Posterior thalamic radiation  (includes optic radiation) |
| Retrolenticular\_part\_of\_internal\_capsule | Retrolenticular part of internal capsule |
| Sagittal\_stratum\_(include\_inferior\_longitidinal  \_fasciculus\_and\_inferior\_fronto-occipital\_fasciculus) | Sagittal stratum  (includes inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) |
| Superior\_cerebellar\_peduncle | Superior cerebellar peduncle |
| Superior\_corona\_radiata | Superior corona radiata |
| Superior\_fronto-occipital\_fasciculus\_  (could\_be\_a\_part\_of\_anterior\_internal\_capsule) | Superior fronto-occipital fasciculus  (could be a part of anterior internal capsule) |
| Superior\_longitudinal\_fasciculus | Superior longitudinal fasciculus |
| Tapetum | Tapetum |
| Uncinate\_fasciculus | Uncinate fasciculus |
| Body\_of\_corpus\_callosum | Body of corpus callosum |
| Fornix\_(column\_and\_body\_of\_fornix) | Fornix (column and body of fornix) |
| Genu\_of\_corpus\_callosum | Genu of corpus callosum |
| Middle\_cerebellar\_peduncle | Middle cerebellar peduncle |
| Pontine\_crossing\_tract\_(a\_part\_of\_MCP) | Pontine crossing tract (a part of MCP) |
| Splenium\_of\_corpus\_callosum | Splenium of corpus callosum |

**full measurement names (IIT v5.0 WHITE MATTER BUNDLES atlas)**

|  |  |
| --- | --- |
| Variable Label (from SPSS file) | Full Name of Parcellation |
| Anterior\_commissure | Anterior commissure |
| Arcuate\_fasciculus | Arcuate fasciculus |
| Frontal\_aslant\_tract | Frontal aslant tract |
| Cingulum | Cingulum |
| Corpus\_callosum | Corpus callosum |
| Forceps\_major | Forceps major |
| Forceps\_minor | Forceps minor |
| Middle\_corpus\_callosum | Middle corpus callosum |
| Corticospinal\_tract | Corticospinal tract |
| Fornix | Fornix |
| Frontopontine | Frontopontine |
| Inferior\_cerebellar\_peduncle | Inferior cerebellar peduncle |
| Inferior\_frontooccipital\_fasciculus | Inferior frontooccipital fasciculus |
| Inferior\_longitudinal\_fasciculus | Inferior longitudinal fasciculus |
| Middle\_cerebellar\_peduncle | Middle cerebellar peduncle |
| Middle\_longitudinal\_fasciculus | Middle longitudinal fasciculus |
| Medial\_lemniscus | Medial lemniscus |
| Occipitopontine\_tract | Occipitopontine tract |
| Optic\_radiation | Optic radiation |
| Parietopontine\_tract | Parietopontine tract |
| Superior\_cerebellar\_peduncle | Superior cerebellar peduncle |
| Superior\_longitudinal\_fasciculus | Superior longitudinal fasciculus |
| Spinothalamic\_tract | Spinothalamic tract |
| Uncinate\_fasciculus | Uncinate fasciculus |
| Vertical\_occipital\_fasciculus | Vertical occipital fasciculus |

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