## Neuroscientific Report on Quantitative MRI Volumetrics and Diffusion Tensor Imaging

**Client:** [redacted]
**DOB:** [redacted]
**Gender:** **Female**
**Date of Exam:** **11/19/2018**
**Date of Report:** **12/04/2018**
**Report By:** **Jeffrey David Lewine, Ph.D.**

### Background (from self-report notes):

[redacted] is a 27 year old female who self-reports involvement in a motor vehicle accident in July of 2018, with brief loss-of-consciousness. Currently, she self-reports numerous symptoms, including headaches, dizziness, confusion, visual difficulties, memory problems, changes in personality and behavior, sleeplessness, depression and fatigue.

### Technical Details:

Magnetic Resonance Imaging data were collected at Doctors Imaging in Metairie, LA. Data were collected using a Siemens 3.0 Tesla TRIO system. Employed imaging sequences included a T1-weighted 3D volumetric acquisition, T2 and FLAIR sequences, susceptibility weighted imaging (SWI) and diffusion tensor imaging (DTI).

Quantitative volumetric and DTI analyses were performed by Dr. Jeffrey David Lewine, Ph.D. and his colleagues at MINDSET. For quantitative volumetric analyses, Dr. Lewine and his team used standardized, objective, and automated procedures in which regional brain volumes were calculated for 112 brain regions defined by the TD-Brodmann and AAL Atlases. These volumetric measures were scaled by total intracranial volume to correct for head size. Fractional Anisotropy (FA) was used as the core metric for integrity of white matter axonal pathways in DTI analyses. Standardized, automated, and objective procedures were also use to extract DTI-based FA values from 48 fiber tract regions using the Johns Hopkins University white matter atlas.

Volumetric and FA values from [redacted] were statistically evaluated with respect to volumetric and FA values derived from all sex and age-range (+/- 10 years) matched neuro-typical control subjects within a larger database of >1000 subjects that is maintained by the MINDSET Consulting Group in Albuquerque, New Mexico. The MINDSET data were collected on a 3.0 Tesla system belonging to the Mind Research Network. All neurotypical subjects were without history of neurological or psychiatric disease or injury, TBI, substance abuse, learning disability or developmental disability. A total of **227** matched control datasets were identified for volumetric evaluation, with **227** datasets identified for FA evaluation. All datasets (control and [redacted]) were obtained on the same type of scanner (a Siemens 3T TRIO), using identical pulse sequences and parameters, and processed using identical software algorithms and procedures.

The appendix document **NOLA-Appendix-I-MRI** provides a brief overview of basic neurobiology, conceptual and technical details on MRI volumetric and diffusion tensor imaging procedures, and how this information is used in the forensic evaluation of traumatic brain injury cases.

## Volumetric Findings:

As shown in Figure 1, volumetric analyses conducted individually on 112 brain regions for [redacted] revealed 2 regions to show atypically low volumes ($p<0.05$). Three isolated regions revealed atypically increased brain volumes. Given the number of multiple comparisons (N=112), there is an expectation that even a subject without any history of neurological/psychiatric disease or injury will show a handful of brain regions with 'false positive' identification as abnormal. To address this issue of false positives during multiple comparisons, a Benjamini-Hochberg correction was applied with a False Discovery Rate of 25%. Following this correction, **NONE** of the brain regions that were identified as having abnormal volume upon isolated individual testing were still considered to be statistically abnormal.

Figure 2 provides a spatial display of the brain regions with abnormal volumes at the level of individual testing. Table 1 provides a description of the functions of evaluated brain regions.

## Diffusion Tensor Imaging Findings

As show in Figure 3, [redacted] demonstrates abnormal ($p<0.05$) FA values in 8 fiber tract regions as evaluated individually, in isolation. Five regions showed atypically low FA values (the pontine crossing tracts, the left corticospinal tract, the left medial lemniscus, the left posterior limb of the internal capsule, and the right cingulum [hippocampus]). Three tracts showed atypically high FA values (the fornix [column and body], right cingulum [cingulate gyrus], and the left tapetum). Table 2 provides information on the statistical evaluation of each individual tract. Scatter plots showing the data from [redacted] with respect to 454 neurotypical female subjects in the MRN database are provided in the appendix document: **NOLA-Appendix-II-Scatter-Plots-[redacted]**. Table 3 summarizes connectivity and functional information on the various fiber tract regions. Additional information on the various fiber tracts in provided in the appendix document: **NOLA-Appendix-I-MRI.**

Given the number of multiple comparisons (N=48), there is an expectation that some tracts may be falsely identified as abnormal even for neurotypical subjects. To address this issue, the data were additionally evaluated using a Benjamini-Hochberg correction for multiple comparisons, with a false discovery rate of 25%. Following correction for multiple comparisons, FA abnormalities for the pontine crossing tracts [low], right corticospinal tract [low], fornix [high], right cingulum [high] and left tapetum [high] were still considered to be statistically significant.

Low FA values are indicative of a disruption of the integrity of the white matter pathways, and are believed to be a reflection of extracellular edema, demyelination, and/or axonal fiber loss. Possible causes for high FA include a failure of developmental pruning, and/or disease/injury related intracellular cytogenic edema, neuro-inflammation with microglial activation, astrogliosis and/or compensatory reorganization. High FA is most

common during the sub-acute phase following traumatic brain injury (<6 months), whereas low FA is most common during the chronic period (>6 months) after injury. However, low FA values can be seen acutely, and in some cases, high FA persists into the chronic period.

**Impression and Conclusions:**

This is a mildly abnormal set of MRI evaluations.

Volumetric analyses are mostly within normal limits, despite a handful of brain regions with atypically high or low volume. Given the number of regions evaluated, none of the brain areas identified as atypical on individual, isolated evaluation were still considered to be statistically aberrant following correction for multiple comparisons. In considering these observations, it is important to note that the sensitivity of even quantitative volumetric assessment to mild TBI is only about 60%, even in the chronic period. In this particular case, it is important to additionally note that [redacted] is less than 6 months post-injury. Available research suggests that brain volume loss following mild TBI may not be detectable until more than 1 year after incident. Repeat MRI at a later date may therefore be of value, especially if clinical symptoms persist. Given the overall situation, whereas the present volumetric data do not explicitly support the presence of mild TBI, they also do not strongly weigh against the possibility that [redacted] has a mild TBI.

DTI data for [redacted] were somewhat more abnormal, with two fiber tracts showing significantly low FA and three showing high FA, even after correction for multiple comparisons. The data indicate white matter abnormalities and are of a spatial profile that could be TBI-related injury. In considering these observations, it is important to note that quantitative MRI and DTI analyses are not stand-alone diagnostic tests for traumatic brain injury. They are part of a multifactorial evaluation of possible neurobiological consequences of head trauma.

Careful review of these imaging findings in the context of [redacted]'s developmental profile, medical history, timeline of symptom development, and additional radiological, neurological, neuropsychological, and/or psychiatric evaluations may help to further clarify the etiology of her current clinical status.

This report has been prepared by:

Jeffrey David Lewine, Ph.D.
Principal Neuroscientific Consultant, MINDSET
Professor of Translational Neuroscience, Director of Business Development, the Mind Research Network
Director of Neuroscience, Lovelace Scientific Resources
Adjunct Associate Professor of Neurology and Psychology, University of New Mexico

Edward L. Soll, M.D. Radiologist, Director
Jeffrey D. Lewine, PhD Translational NeuroScience
Anne L. Foundas, M.D. FAAN, Cognitive Neurology
David D. Silvestri, M.D. Radiology
David J. Robinson, R.T. Technical Director

**Patient**
[redacted]
DOB:[redacted]
Gender: Female
Date of Exam: 11/19/2018

**Review and Comment**

I have supervised the DTI DiCOM data acquisition process performed onsite at Doctors Imaging and reviewed the Mindset Volumetric/DTI analysis; and confirm that the MRI protocols as well as the applied analytic tools were methodically utilized as designed. I accept the final DTI and Volumetric ZScores as statistically appropriate.

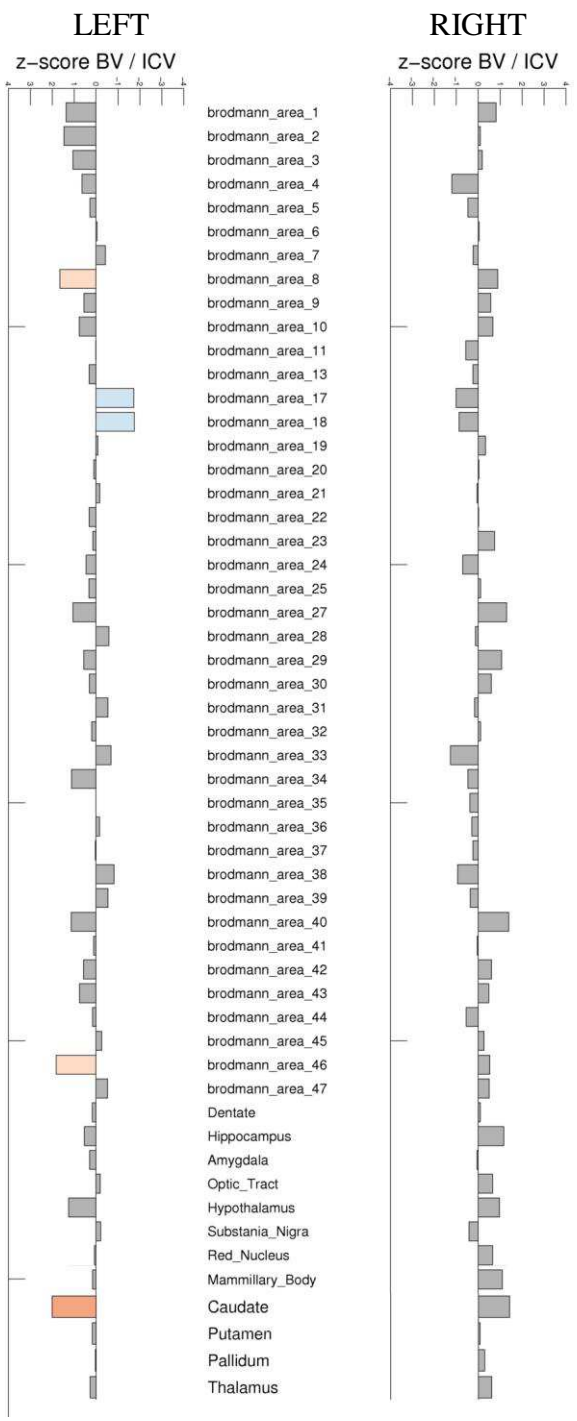
Edward L. Soll, M.D.
Certified, American Board of Radiology 1973 Radiologist, Doctors Imaging
Director, The Concussion Group

**Review and Comment**

I have reviewed the Mindset Volumetric/DTI analysis and accept the final DTI and Volumetric ZScores as statistically appropriate.

David D. Silvestri, M.D.
Certified, American Board of Radiology 1998
Medical Director, Doctors Imaging Radiologist,
The Concussion Group

**Figure 1: [redacted]**
**Z-scores for Regional Brain Volumes, Scaled by Total Intracranial Volume**




**Region-of-interest volumetric analyses**

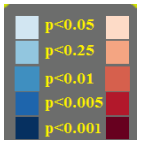
Data are shown as normalized Z-scores based on comparison with a sex and age-range (+/- 10 years) matched group of **227** neuro-typical subjects.

**At the level of individual isolated analyses:**

Gray bars show regions that do not deviate significantly from normal.

Regions where the bar is red have abnormally high volumes ($p<0.05$).

Regions where the bar is blue have abnormally low volumes ($p<0.05$).




For [redacted], isolated evaluation of individual brain regions reveals 2 regions with atypically low brain volumes, and 3 regions with atypically high volumes.

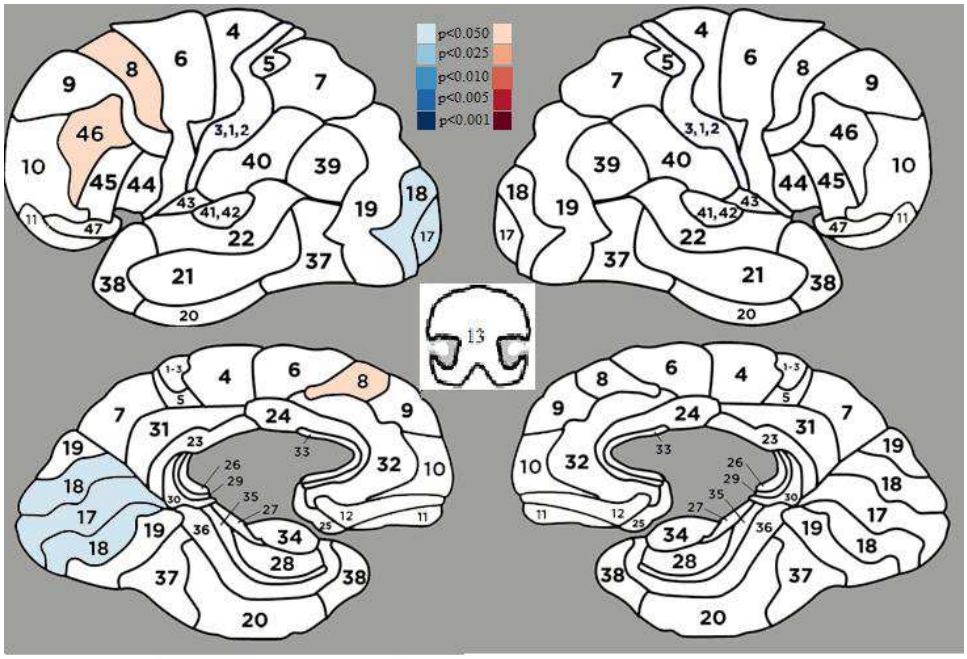
However, only observations with an * survive correction for multiple comparisons.

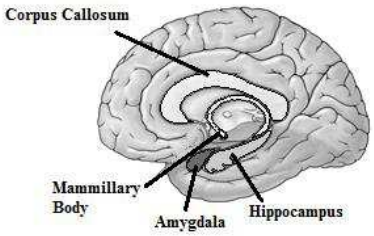
**Following correction for multiple comparisons, NONE of the regions identified as abnormal at the isolated individual level are still considered to be abnormal from a statistical perspective.**

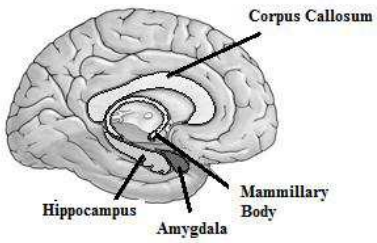
*MINDSET Consulting Group, 1101 Yale Blvd, NE, Albuquerque, NM, 87106; phone: 505-414-0414; www.mindsetconsultinggroup.com*
*Doctors Imaging, 4204 Teuton Street, Metairie, LA 70006; phone: 504-883-8111; www.doctorsimaging.com*

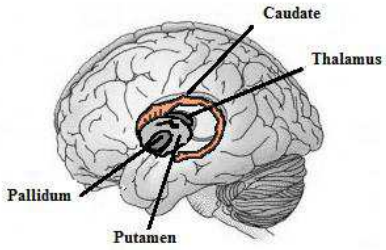
## Figure 2: [redacted]- Brain Regions with Abnormal Volumes on Individual Evaluation

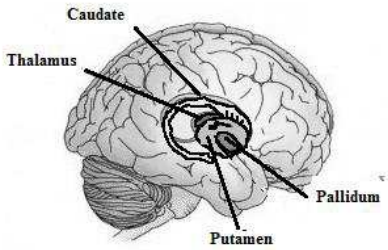
For [redacted], **NONE** of the regions are still considered to be statistically abnormal after correction for multiple comparisons.




**white/gray – volume within normal limits**
**red – high volume**
**blue – low volume**

## Table 1: [redacted]

## Regions-of-Interest with Abnormal Volumes on Individual Evaluation

For [redacted], **NONE** of the regions are still considered to be statistically abnormal after correction for multiple comparisons.

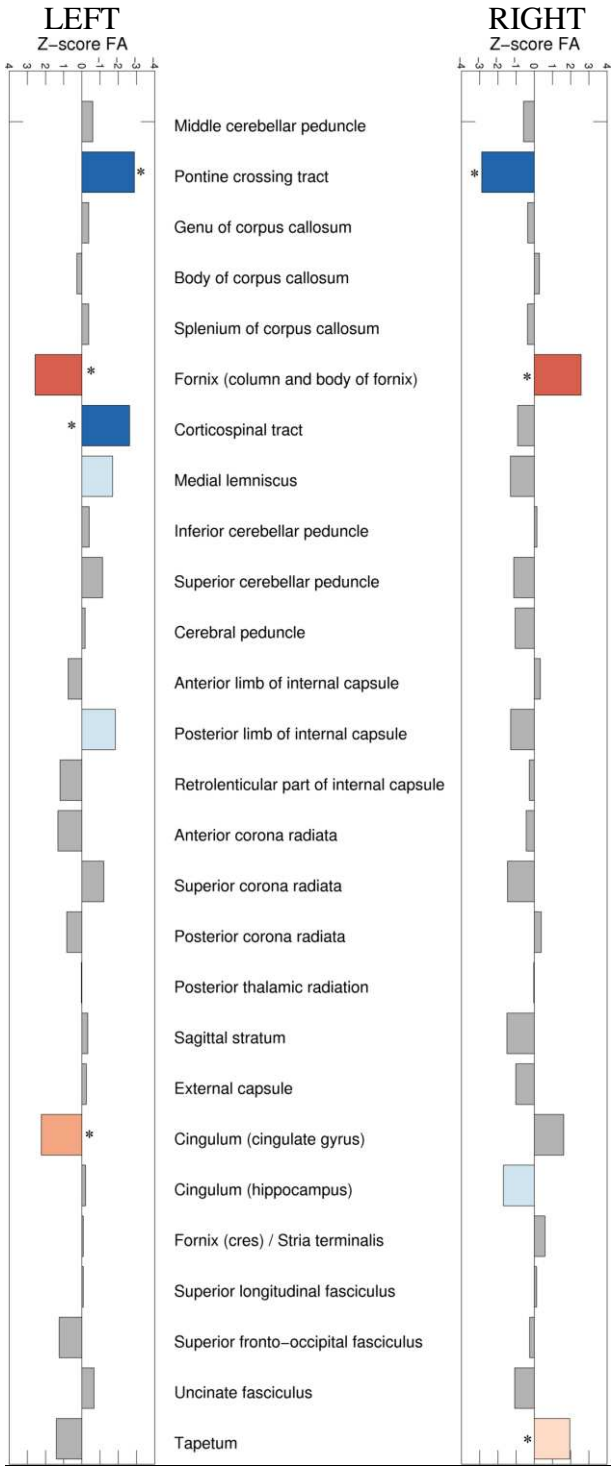
| Area | | General Location | Supported Functions |
|---|---|---|---|
| | | | |
| Brodmann 1,2,3 | L/R | Primary somatosensory cortex | Tactile sensation |
| Brodmann 4 | L/R | Primary motor cortex | Motor control |
| Brodmann 5 | L/R | Somatosensory association cortex | Tactile object recognition |
| Brodmann 6 | L/R | Premotor and Supplementary motor cortex | Control of proximal and trunk muscles; Motor sequencing |
| Brodmann 7 | L/R | Somatosensory association cortex | Visuo-spatial processing; Praxic abilities |
| Brodmann 8 | L | Frontal eye fields | Planning of complex movements, control of eye movements |
| Brodmann 9 | L/R | Dorsolateral Prefrontal Cortex | Executive Function, Working Memory |
| Brodmann 10 | L/R | Anterior Prefrontal Cortex | Strategic Planning, Cognitive Branching |
| Brodmann 11 | L/R | Orbital Frontal Cortex | Behavioral/Emotional Regulation, Behavioral Inhibition |
| Brodmann 13 | L/R | Insula | Social emotions, multimodal sensory processing, salience |
| Brodmann 17 | L | Primary Visual Cortex | Basic Vision |
| Brodmann 18 | L | Secondary Visual Cortex | Shape recognition, visual attention |
| Brodmann 19 | L/R | Association Visual Cortex | Visual-spatial processing, visual motion, face and word processing (R/L) |
| Brodmann 20 | L/R | Inferior Temporal Gyrus | High-level visual information processing and recognition memory |
| Brodmann 21 | L/R | Middle Temporal Gyrus | Complex auditory processing and language |
| Brodmann 22 | L/R | Superior Temporal Gyrus | Auditory processing, Receptive Language (Wernicke's area) |
| Brodmann 23 | L/R | Posterior Cingulate Cortex | Emotion and Memory, Intrinsic Control |
| Brodmann 24 | L/R | Anterior Cingulate Cortex | Behavioral Control, Reward Based Decision Making, Social Evaluation |
| Brodmann 25 | L/R | Subgenual Ventromedial Prefrontal Cortex | Decision making, emotion, social behavior |
| Brodmann 27 | L/R | Periform Cortex | Olfaction |
| Brodmann 28 | L/R | Ventral Entorhinal Cortex | Short-term memory |
| Brodmann 29 | L/R | Retrosplenial Cingulate Cortex | Emotion and Memory, Intrinsic Control |
| Brodmann 30 | L/R | Part of Cingulate Cortex | Emotion and Memory, Intrinsic Control |
| Brodmann 31 | L/R | Dorsal Posterior Cingulate Cortex | Emotion and Memory, Intrinsic Control |
| Brodmann 32 | L/R | Dorsal Anterior Cingulate Cortex | Behavioral Control, Reward Based Decision Making, Social Evaluation |
| Brodmann 33 | L/R | Part of the Anterior Cingulate Cortex | Behavioral Control, Reward Based Decision Making, Social Evaluation |
| Brodmann 34 | L/R | Dorsal Entorhinal Cortex/Parahippocampal Gyrus | Short-term memory |
| Brodmann 35 | L/R | Perirhinal Cortex | Short-term memory |
| Brodmann 36 | L/R | Ectorhinal Area | Short-term memory |
| Brodmann 37 | L/R | Fusiform Gyrus | Word recognition (L) / Face Processing (R) |
| Brodmann 38 | L/R | Temporopolar Regions | Memory, Language |
| Brodmann 39 | L/R | Angular Gyrus | Language, reading, mathematics, attention |
| Brodmann 40 | L/R | Supramarginal Gyrus | Spatial perception, phonological choices |
| Brodmann 41 | L/R | Primary Auditory Cortex | Basic Hearing |
| Brodmann 42 | L/R | Auditory Cortex | Auditory processing |
| Brodmann 43 | L/R | Primary Gustatory Cortex | Taste |
| Brodmann 44 | L/R | Pars opercularis, inferior frontal gyrus, part of Broca's area | Expressive Language |
| Brodmann 45 | L/R | Pars triangularis, inferior frontal gyrus, part of Broca's area | Expressive Language |
| Brodmann 46 | L | Dorsolateral Prefrontal Cortex | Executive Function, Working Memory |
| Brodmann 47 | L/R | Pars orbitalis, inferior frontal gyrus | Syntax |
| Dentate | L/R | Part of the Hippocampus | Short-term Memory |
| Hippocampus | L/R | Medial Temporal Lobe | Short-term Memory |
| Amygdala | L/R | Medial Temporal Lobe | Emotion |
| Optic Tract | L/R | | Post-chiasm Fibers, Contralateral Visual Field |
| Hypothalamus | L/R | | Regulates autonomic functions, pituitary, hunger, sleep |
| Substantia Nigra | L/R | | Dopaminergic motor control |
| Red Nucleus | L/R | | Motor Coordination |
| Mammillary Body | L/R | | Memory |
| Anterior Commissure | L/R | | Interconnects L/R temporal lobes |
| Corpus Callosum | L/R | | Interconnects L/R hemisphere |
| Caudate | L | Part of the Basal Ganglia | Regulates movement |
| Putamen | L/R | Part of the Basal Ganglia | Regulates movement |
| Pallidum | L/R | Part of the Basal Ganglia | Regulates movement |
| Thalamus | L/R | | Sensory, Motor, Emotional and Cognitive Functioning |

**Low volumes may reflect perturbation of early developmental processes, malnutrition, toxic stress, toxic exposures, or more commonly neurological/psychiatric disease and/or brain injury.**

**High volumes may reflect perturbation of early developmental pruning, enhanced skill development, brain injury related edema and/or compensatory reactions to damage in other areas.**

*MINDSET Consulting Group, 1101 Yale Blvd, NE, Albuquerque, NM, 87106; phone: 505-414-0414; www.mindsetconsultinggroup.com*
*Doctors Imaging, 4204 Teuton Street, Metairie, LA 70006; phone: 504-883-8111; www.doctorsimaging.com*

**Figure 3: [redacted]**
**Z-scores for FA Values**




The first 6 tracts are at the midline and without separable left/right components. Identical values are plotted on the left and right sides.

## FA Values for Fiber Tract Regions

Data are shown as normalized Z-scores based on comparison with a sex and age-range (+/- 10 years) matched group of **227** neuro-typical subjects.

**At the level of individual isolated analyses:**

Gray bars show tract regions that do not deviate significantly from normal.

Tract regions where the bar is red have abnormally high FA values ($p<0.05$).

Tract regions where the bar is blue have abnormally low FA values ($p<0.05$).


For [redacted], isolated evaluation of individual fiber tract regions reveals 3 tracts with atypically low FA, and 5 tracts with atypically high FA values.

However, only observations with an * survive correction for multiple comparisons.

**Following correction for multiple comparisons, there remain 2 tracts with significantly low FA and 3 with significantly high FA.**

*MINDSET Consulting Group, 1101 Yale Blvd, NE, Albuquerque, NM, 87106; phone: 505-414-0414; www.mindsetconsultinggroup.com*
*Doctors Imaging, 4204 Teuton Street, Metairie, LA 70006; phone: 504-883-8111; www.doctorsimaging.com*

## Table 2 – [redacted], FA Values

| # | Regions | Client | Database | Stdev | Z-score |
|---|---|---|---|---|---|
| 1 | Middle cerebellar peduncle | 0.438 | 0.447 | 0.016 | -0.593 |
| 2 * | Pontine crossing tract (a part of MCP) | 0.347 | 0.429 | 0.028 | -2.884 |
| 3 | Genu of corpus callosum | 0.636 | 0.643 | 0.019 | -0.367 |
| 4 | Body of corpus callosum | 0.692 | 0.683 | 0.029 | 0.279 |
| 5 | Splenium of corpus callosum | 0.746 | 0.753 | 0.017 | -0.373 |
| 6 * | Fornix (column and body of fornix) | 0.544 | 0.405 | 0.054 | 2.570 |
| 7 | Corticospinal tract R | 0.404 | 0.429 | 0.028 | -0.912 |
| 8 * | Corticospinal tract L | 0.373 | 0.445 | 0.027 | -2.613 |
| 9 | Medial lemniscus R | 0.509 | 0.539 | 0.023 | -1.304 |
| 10 | Medial lemniscus L | 0.502 | 0.544 | 0.025 | -1.681 |
| 11 | Inferior cerebellar peduncle R | 0.417 | 0.414 | 0.025 | 0.145 |
| 12 | Inferior cerebellar peduncle L | 0.404 | 0.414 | 0.025 | -0.400 |
| 13 | Superior cerebellar peduncle R | 0.502 | 0.533 | 0.027 | -1.128 |
| 14 | Superior cerebellar peduncle L | 0.484 | 0.513 | 0.025 | -1.131 |
| 15 | Cerebral peduncle R | 0.617 | 0.637 | 0.020 | -1.054 |
| 16 | Cerebral peduncle L | 0.648 | 0.651 | 0.019 | -0.173 |
| 17 | Anterior limb of internal capsule R | 0.532 | 0.526 | 0.018 | 0.335 |
| 18 | Anterior limb of internal capsule L | 0.541 | 0.527 | 0.018 | 0.764 |
| 19 | Posterior limb of internal capsule R | 0.570 | 0.592 | 0.017 | -1.294 |
| 20 | Posterior limb of internal capsule L | 0.575 | 0.607 | 0.017 | -1.831 |
| 21 | Retrolenticular part of internal capsule R | 0.546 | 0.552 | 0.022 | -0.275 |
| 22 | Retrolenticular part of internal capsule L | 0.614 | 0.587 | 0.023 | 1.206 |
| 23 | Anterior corona radiata R | 0.422 | 0.433 | 0.025 | -0.444 |
| 24 | Anterior corona radiata L | 0.456 | 0.424 | 0.024 | 1.316 |
| 25 | Superior corona radiata R | 0.428 | 0.458 | 0.021 | -1.471 |
| 26 | Superior corona radiata L | 0.447 | 0.473 | 0.021 | -1.202 |
| 27 | Posterior corona radiata R | 0.455 | 0.446 | 0.024 | 0.384 |
| 28 | Posterior corona radiata L | 0.461 | 0.441 | 0.024 | 0.841 |
| 29 | Posterior thalamic radiation R | 0.557 | 0.558 | 0.028 | -0.030 |
| 30 | Posterior thalamic radiation L | 0.543 | 0.542 | 0.026 | 0.033 |
| 31 | Sagittal stratum R | 0.470 | 0.504 | 0.023 | -1.501 |
| 32 | Sagittal stratum L | 0.476 | 0.483 | 0.022 | -0.322 |
| 33 | External capsule R | 0.368 | 0.386 | 0.017 | -1.023 |
| 34 | External capsule L | 0.412 | 0.417 | 0.020 | -0.241 |
| 35 | Cingulum (cingulate gyrus) R | 0.491 | 0.445 | 0.028 | 1.622 |
| 36 * | Cingulum (cingulate gyrus) L | 0.546 | 0.489 | 0.025 | 2.235 |
| 37 | Cingulum (hippocampus) R | 0.321 | 0.363 | 0.025 | -1.698 |
| 38 | Cingulum (hippocampus) L | 0.361 | 0.367 | 0.028 | -0.200 |
| 39 | Fornix (cres) / Stria terminalis R | 0.468 | 0.455 | 0.023 | 0.587 |
| 40 | Fornix (cres) / Stria terminalis L | 0.503 | 0.505 | 0.026 | -0.071 |
| 41 | Superior longitudinal fasciculus R | 0.440 | 0.437 | 0.021 | 0.124 |
| 42 | Superior longitudinal fasciculus L | 0.453 | 0.455 | 0.022 | -0.075 |
| 43 | Superior fronto-occipital fasciculus R | 0.450 | 0.456 | 0.026 | -0.253 |
| 44 | Superior fronto-occipital fasciculus L | 0.486 | 0.448 | 0.030 | 1.246 |
| 45 | Uncinate fasciculus R | 0.398 | 0.429 | 0.028 | -1.084 |
| 46 | Uncinate fasciculus L | 0.420 | 0.439 | 0.028 | -0.667 |
| 47 | Tapetum R | 0.443 | 0.379 | 0.032 | 1.949 |
| 48 | Tapetum L | 0.354 | 0.312 | 0.030 | 1.409 |

| |
|---|
| Client FA value abnormally high, p<0.05 (isolated, individual testing) |
| Client FA value abnormally low, p<0.05 (isolated, individual testing) |
| * indicates survival of correction for multiple comparisons |

## Table 3: [redacted]
## Fiber Tract Regions of Interest With Abnormal FA Values

| JHU White Matter Atlas Fiber Tract Regions | | Connections | Supported Functions |
|---|---|---|---|
| | | | |
| Middle Cerebral Peduncle | Midline | Interconnects Cerebellum and Pons | Initiation and Timing of Volitional Movement |
| Pontine Crossing Tracts * | Midline | Interconnects Pons and Contralateral Cerebellum | Coordination of Movement |
| Genu of the Corpus Callosum | Midline | Interconnects Right and Left Anterior Frontal Lobes | Interhemispheric Integration of Executive Functions |
| Body of the Corpus Callosum | Midline | Interconnects Right and Left Posterior Frontal Lobes Interconnects Right and Left Parietal Lobes | Interhemispheric integration of Motor and Somatosensory Functions |
| Splenium of the Corpus Callosum | Midline | Interconnects Right and Left Occipital Lobes | Interhemispheric Integration of Visual Functions |
| Fornix * | Midline | Interconnects the Hippocampus and Mammillary Bodies | Short-Term Memory |
| Corticospinal Tracts * | L | Connects Primary Motor Cortex with Contralateral Spinal Motor Neurons | Motor Control of the Contralateral Side of the Body |
| Medial Lemniscus | L | Connects Dorsal Column Nuclei with the Contralateral Thalamus (VPL) | Somatosensory Perception of the Contralateral Side of the Body |
| Inferior Cerebellar Peduncles | R/L | Connects Spinal Cord and the Medulla to the Cerebellum | Posture, Balance, and Coordination |
| Superior Cerebellar Peduncles | R/L | Interconnects Cerebellum to Pons and Midbrain | Motor Coordination and Balance |
| Cerebral Peduncles | R/L | Interconnects Cerebellum with the Thalamus and Motor Cortex | Motor Control |
| Anterior Limb of the Internal Capsule | R | Contains Fibers Interconnecting the Thalamus and Frontal Lobe; Lentiform and Caudate Nuclei; Cortex and Corpus Striatum | Motor Control; Higher Cognitive Function |
| Posterior Limb of the Internal Capsule | R/L | Contains Fibers Interconnecting Motor Areas with the Brainstem; Midbrain and the Thalamus, Occipital Lobes, and Temporal Lobes | Visual-Spatial Processing, Visual Motion, Face and Word Processing (R/L) |
| Retrolenticular Part of the Internal Capsule | R/L | Interconnects Thalamus and Occipital Cortex | Visual Processing |
| Anterior Corona Radiata | R/L | Contains Descending and Ascending Fibers Related to Cortex – especially for the Frontal Lobes | Higher Cognitive Function |
| Superior Corona Radiata | R/L | Contains Descending and Ascending Fibers Related to Cortex – especially for the Motor Cortex | Motor Control |
| Posterior Corona Radiata | R/L | Contains Descending and Ascending Fibers Related to Cortex – especially for the Parietal Lobes | Attentional Control, Somatosensory Function |
| Posterior Thalamic Radiation | R | Interconnects Thalamus and Cortex | Visual and Auditory Function |
| Sagittal Stratum | R/L | Interconnects Thalamus with Occipital, Parietal, Temporal and Cingulate Cortices | Visual, Auditory, and Cognitive Function |
| External Capsule | R/L | Contains Cortico-Cortical Association Fibers for Occipital, Temporal, Parietal, and Cingulate Cortices | Cognitive Processing |
| Cingulum (cingulate cortex) * | L | Interconnects Cingulate and Pre-Frontal Cortices | Cognitive Processing and Decision Making |
| Cingulum (hippocampus) | R | Interconnects Cingulate and Entorhinal Cortices | Memory, Emotional Processing |
| Fornix (cres) and Stria Terminalis | R/L | Interconnects Hippocampus and Mammillary Bodies; Amygdala with the Septal Region and Hypothalamus | Memory, Emotional Processing, Fear Response |
| Superior Longitudinal Fasciculus | R/L | Interconnects the Front and Back of the Cerebrum, Including Frontal, Parietal, Occipital, and Cingulate Areas | Higher Cortical Functions |
| Superior Fronto-Occipital Fasciculus | R | Interconnects the Frontal Lobe with the Occipital and Parietal Lobes | Spatial Awareness |
| Uncinate Fasciculus | R | Interconnects Hippocampus and Amygdala with Orbital Frontal Cortex | Memory, Emotional Processing |
| Tapetum * | R | Contains Commissural Fibers Interconnecting Right and Left Temporal Lobes | Interhemispheric Integration for Auditory Processing |

| |
|---|
| Client FA value abnormally high, $p<0.05$ (isolated, individual testing) |
| Client FA value abnormally low, $p<0.05$ (isolated, individual testing) |
| * indicates survival of correction for multiple comparisons |