Neuroscientific Report on Quantitative MRI Volumetrics and Diffusion Tensor Imaging

Client: **Lenzi, Mark**
Gender: **Male**
Date of Exam: **09/26/2019**
Date of Report: **10/23/2019**
Report By: **Jeffrey David Lewine, Ph.D.**

Background (from self-report notes):

Mark Lenzi is a 45 year-old male who experienced a change in his clinical and cognitive status while stationed in Guangzhou, China. Mr. Lenzi first noted odd auditory percepts in April of 2017. By December he began to experience low grade headaches, with subsequent development of memory and attention problems; problems in executive functioning, organization, and reading; and increased irritability and poor sleep. Neuropsychological testing in August of 2018 indicated some relative compromise of auditory and visual memory, an area of visual-motor construction, motor functioning, receptive language, confrontational naming, visual reasoning, and cognitive flexibility.

In May of 2018, Mr. Lenzi underwent MRI examinations including DTI and volumetric imaging at the University of Pennsylvania. Those data were provided to MINDSET and analyzed with respect to a control database maintained by MINDSET and collected at the Mind Research Network (MRN) in Albuquerque. Those analyses revealed both volumetric and DTI abnormalities, but a lack of scaling factors to harmonize UPENN data with MRN data warranted caution in the interpretation of those findings. Hence, data were now collected on the Doctors Imaging (DI) Scanner in New Orleans. This scanner is identical to the MRN scanner, and data were collected and analyzed for Mr. Lenzi using processes that were identical to those used in collection of the MRN normative data. In addition, we have previously generated scaling factors for data collected at DI site, and these were therefore applied to Mr. Lenzi's DI data prior to comparison with the MRN dataset.

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. Dr. Lewine is a neuroscientist. All opinions reported herein are from a neuroscientific perspective. For quantitative volumetric analyses, Dr. Lewine and his team used standardized, objective, and automated procedures in which regional brain volumes were calculated for 107 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 used to extract DTI-based FA values from 48 fiber tract regions using the Johns Hopkins University white matter atlas.

Volumetric and FA values from Mr. Lenzi were statistically evaluated with respect to volumetric and FA values derived from all gender 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 MRI 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 **89** matched control datasets were identified for volumetric evaluation, with **86** datasets identified for FA evaluation. All datasets (control and Mr. Lenzi) were 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 evaluation of brain injury.

Volumetric Findings:

As shown in Figure 1, volumetric analyses conducted individually on 107 brain regions for Mr. Lenzi showed 20 regions to have atypically low volumes ($p<0.05$). There were also 3 regions with atypically high volumes. 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.

Given the number of multiple comparisons (N=107), 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, ALL of the brain regions which showed abnormal volume on individual isolated evaluation are still considered to be abnormal from a statistical perspective.

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

Diffusion Tensor Imaging Findings

As shown in Figure 3, Mr. Lenzi demonstrates abnormally an abnormally low FA value ($p<0.05$) in one fiber tract region, and abnormally high FA values in 3 of 48 fiber tract regions as evaluated individually, in isolation. Low FA values are typically 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 developmental failure of axonal pruning, or disease/injury related intracellular cytogenic edema, neuro-inflammation with microglial activation, astrogliosis, loss of crossing fibers, and/or compensatory reorganization.

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, **only 2** of the tract regions with FA abnormalities on isolated, individual testing are still considered to be statistically abnormal, both with high FA – the left medial lemniscus, the right superior longitudinal fasciculus.

Table 2 provides information on the statistical evaluation of each individual tract. Scatter plots showing the data from Mr. Lenzi with respect to 583 neurotypical male subjects in the MRN database are provided in the appendix document: **Appendix-II-Scatter-Plots-Lenzi**. 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.**

Impression and Conclusions:

This set of quantitative MRI evaluations is considered to be abnormal.

Volumetric data were abnormal with 20 regions of abnormally low volume, and 3 regions of abnormally high volume, after correction for multiple comparisons. Low volumes may reflect perturbation of early developmental processes, malnutrition, toxic stress, toxic exposures, or more commonly neurological - psychiatric disease and/or brain injury. Low volumes were seen for brain regions supporting memory, emotional regulation and motor skills. 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. High volumes were seen for brain regions supporting complex visual information processing. For Mr. Lenzi, the regions of low volume likely reflect some type of brain injury, whereas regions of high volume most likely reflect compensatory mechanisms or baseline enhanced skill development. Relative to the prior 2018 evaluation at the University of Pennsylvania, the overall pattern of abnormities is mostly unchanged, although the present observations are somewhat less severe. At present it is not possible to determine if the minor differences between 2018 and 2019 evaluations reflects some degree of mild improvement in Mr. Lenzi's clinical status, or the lack of scaling factors for the initial evaluation.

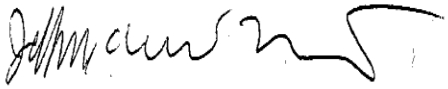
DTI data for Mr. Lenzi were abnormal. After correction for multiple comparisons, there were 2 fiber tract regions with abnormally high FA values. Possible causes for high FA include a developmental failure of axonal pruning, or disease/injury related intracellular cytogenic edema, neuro-inflammation with microglial activation, astrogliosis, a loss of crossing fibers and/or compensatory mechanisms. Fiber tracts with atypical high FA values normally support somatosensory perception and higher integrative functions including attention and executive functioning. Relative to the prior 2018 evaluation at the University of Pennsylvania, abnormalities are presently much reduced. At present it is not possible to determine if the differences between 2018 and 2019

evaluations reflects some degree of mild improvement in Mr. Lenzi's clinical status, or the lack of scaling factors for the initial evaluation.

Overall the data are consistent with a brain injury induced by external forces, but please note that quantitative MRI and DTI analyses are not stand-alone diagnostic tests for specific etiologies of brain injury. They are part of a multifactorial evaluation of the possible neurobiological consequences of traumatic or other forces. There are multiple conditions that can give rise to abnormalities in regional brain volumes and DTI metrics, so careful review of these imaging findings in the context of Mr. Lenzi' developmental profile, medical history, timeline of symptom development, and additional radiological, neurological, neuropsychological, and/or psychiatric evaluations is needed to further clarify the etiology of these findings and their relationship to past events and his current clinical status.

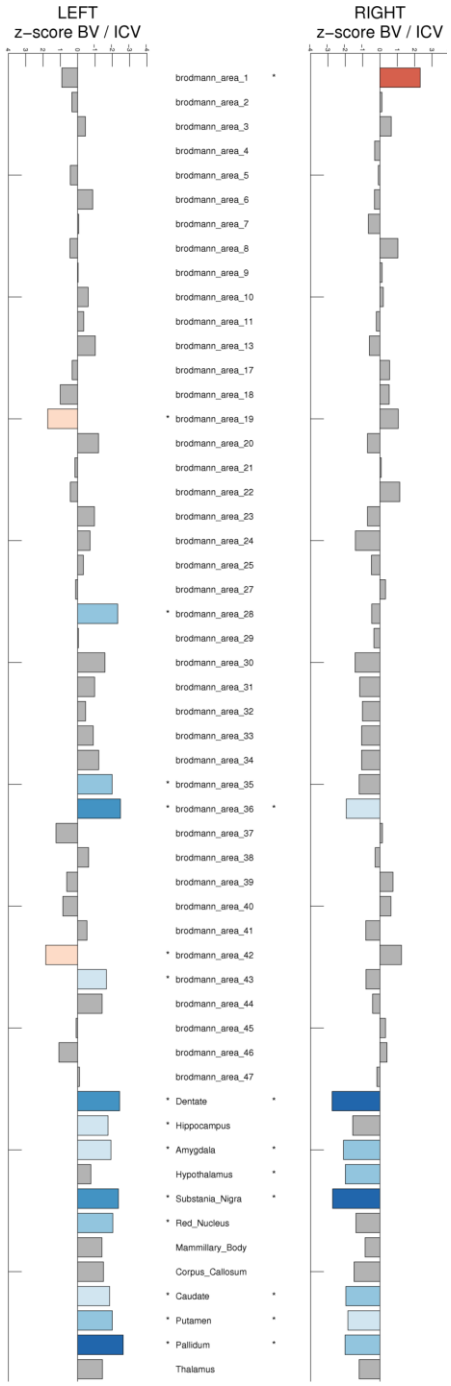
It is noteworthy that there remains good convergence between Mr. Lenzi's profile of brain anomalies and his self-reported and neuropsychologically documented profile of symptoms. That is, the brain regions which are compromised are those known to normally support the cognitive functions that are compromised.

This report has been prepared by:



Jeffrey David Lewine, Ph.D.
Principal Neuroscientific Consultant, MINDSET
Affiliate Professor of Translational Neuroscience, The Mind Research Network
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

Figure 1: Mr. Lenzi
Z-scores for Regional Brain Volumes, Scaled by Total Intracranial Volume



Region-of-interest volumetric analyses

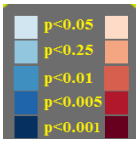
Data are shown as normalized Z-scores based on comparison with a gender and age-range (+/- 10 years) matched group of **89** neuro-typical subjects.

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 **Mr. Lenzi,** isolated evaluation of individual brain regions revealed 23 of 107 regions to show atypical volumes (20 low; 3 high).

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

Following correction for multiple comparisons, ALL 23 of the brain regions that showed atypical volumes on isolated, individual evaluation are still considered to be abnormal from a statistical perspective.

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Figure 2: Mr. Lenzi
Brain Regions with Abnormal Volumes on Isolated Evaluation

Following correction for multiple comparisons**, All** regions identified as abnormal on isolated individual testing are still considered to be abnormal from a statistical perspective.

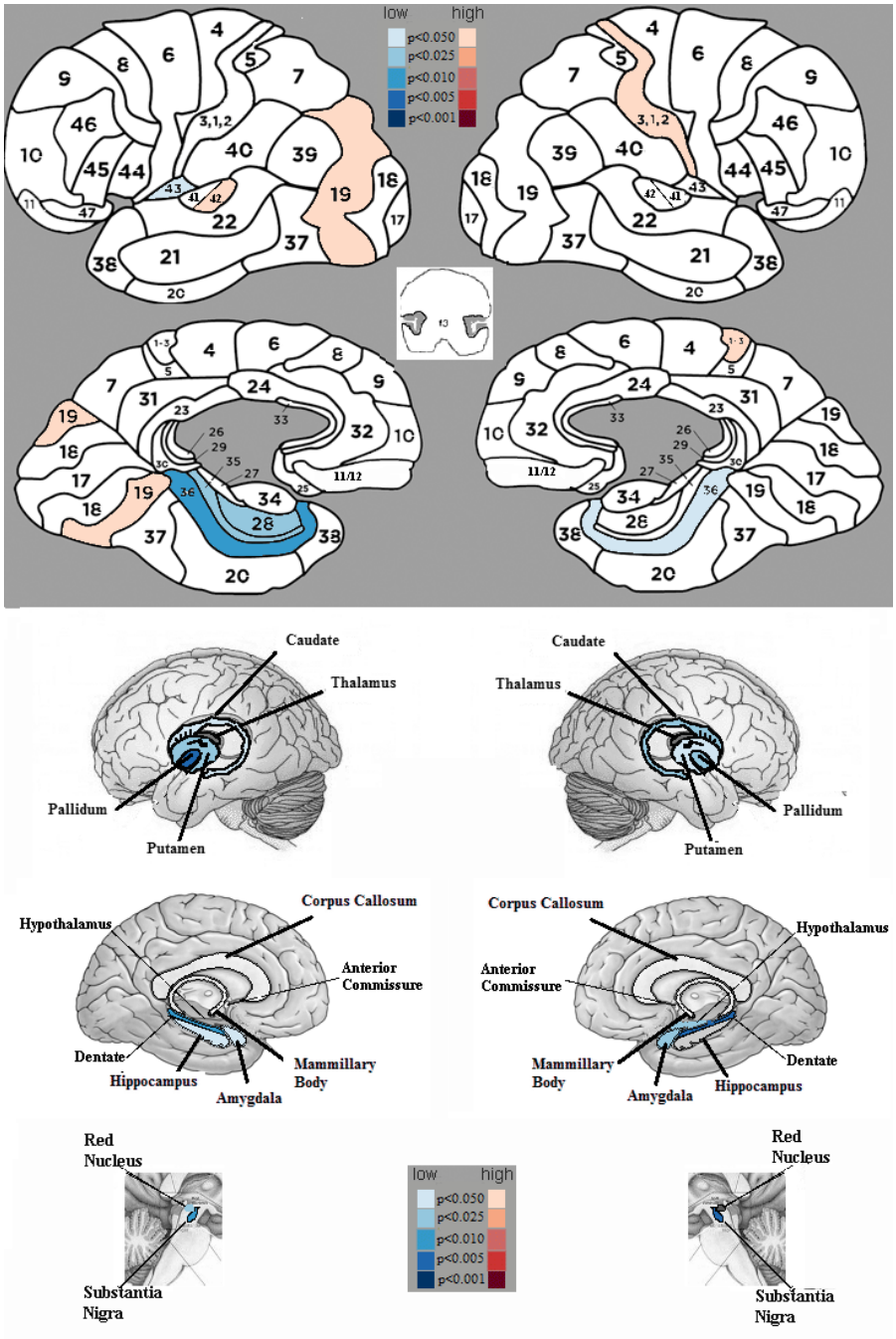

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Table 1: Mr. Lenzi
Regions-of-Interest with Abnormal Volumes on Individual Evaluation

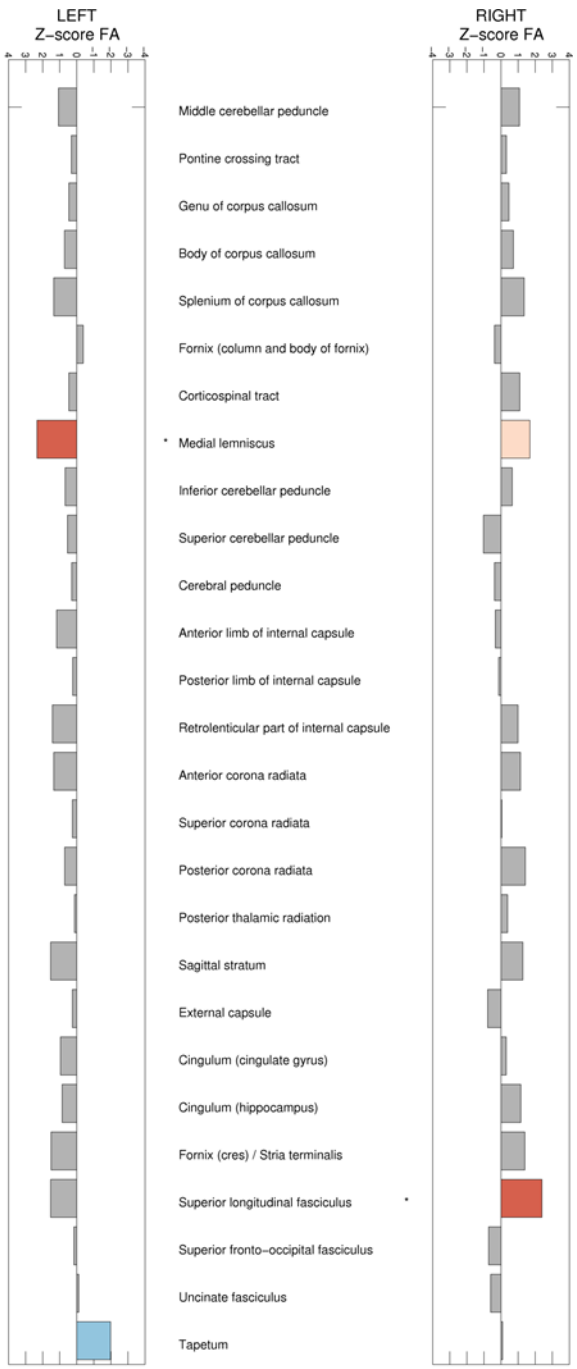
Following correction for multiple comparisons**, ALL** of the regions identified as abnormal on isolated individual testing are still considered to be abnormal from a statistical perspective.

Area		General Location	Supported Functions
Brodmann 1,2,3	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/R	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/R	Primary Visual Cortex	Basic Vision
Brodmann 18	L/R	Secondary Visual Cortex	Shape recognition, visual attention
Brodmann 19	R*	Association Visual Cortex	Visual-spatial processing, visual motion, face and word processing (L/R)
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*	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*	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	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/R	Dorsolateral Prefrontal Cortex	Executive Function, Working Memory
Brodmann 47	L/R	Pars orbitalis, inferior frontal gyrus	Syntax
Dentate	L*/R*	Part of the Hippocampal Formation	Short-term Memory
Hippocampus	L*	Medial Temporal Lobe	Short-term Memory
Amygdala	L*/R*	Medial Temporal Lobe	Emotion
Hypothalamus	R*		Regulates autonomic functions, pituitary, hunger, sleep
Substantia Nigra	L*/R*		Dopaminergic motor control
Red Nucleus	L*		Motor Coordination
Mammillary Body	L/R		Memory
Corpus Callosum	midline		Interconnects L/R hemisphere
Caudate	L*/R*	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.

Figure 3: Mr. Lenzi
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

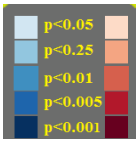
Data are shown as normalized Z-scores based on comparison with a gender and age-range (+/- 10 years) matched group of **86** neuro-typical subjects.

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 Mr. **Lenzi,** isolated evaluation of individual fiber tract regions revealed 4 of 48 regions to show atypical FA values (1 low; 3 high).

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

Following correction for multiple comparisons, only 2 of the fiber tract regions identified as abnormal at the isolated individual level are still considered to be abnormal from a statistical perspective:

High FA: **Left Medial Lemniscus**
Left Superior Longitudinal Fasciculus

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Table 2 – Mr. Lenzi
FA Values on Individual Isolated Evaluation

Following correction for multiple comparisons, **only 2** of the fiber tracts that were abnormal on isolated, individual evaluation are still considered to abnormal from a statistical perspective.

#	Regions	Client	Database	Stdev	Z-score
1	Middle cerebellar peduncle	0.462	0.440	0.020	1.078
2	Pontine crossing tract (a part of MCP)	0.439	0.429	0.030	0.317
3	Genu of corpus callosum	0.640	0.628	0.026	0.466
4	Body of corpus callosum	0.692	0.668	0.033	0.720
5	Splenium of corpus callosum	0.772	0.743	0.021	1.352
6	Fornix (column and body of fornix)	0.351	0.370	0.051	-0.378
7	Corticospinal tract R	0.470	0.429	0.038	1.096
8	Corticospinal tract L	0.461	0.444	0.038	0.459
9	Medial lemniscus R	0.588	0.544	0.026	1.684
10*	Medial lemniscus L	0.614	0.549	0.028	2.332
11	Inferior cerebellar peduncle R	0.430	0.411	0.030	0.656
12	Inferior cerebellar peduncle L	0.432	0.413	0.029	0.681
13	Superior cerebellar peduncle R	0.523	0.550	0.026	-1.025
14	Superior cerebellar peduncle L	0.541	0.528	0.024	0.541
15	Cerebral peduncle R	0.622	0.632	0.025	-0.384
16	Cerebral peduncle L	0.654	0.647	0.024	0.299
17	Anterior limb of internal capsule R	0.517	0.524	0.022	-0.336
18	Anterior limb of internal capsule L	0.553	0.527	0.022	1.181
19	Posterior limb of internal capsule R	0.579	0.582	0.022	-0.138
20	Posterior limb of internal capsule L	0.604	0.599	0.022	0.235
21	Retrolenticular part of internal capsule R	0.569	0.541	0.027	0.994
22	Retrolenticular part of internal capsule L	0.620	0.578	0.029	1.429
23	Anterior corona radiata R	0.455	0.421	0.029	1.139
24	Anterior corona radiata L	0.445	0.407	0.028	1.344
25	Superior corona radiata R	0.443	0.442	0.026	0.037
26	Superior corona radiata L	0.467	0.460	0.026	0.259
27	Posterior corona radiata R	0.476	0.434	0.029	1.428
28	Posterior corona radiata L	0.453	0.433	0.028	0.715
29	Posterior thalamic radiation R	0.542	0.529	0.032	0.378
30	Posterior thalamic radiation L	0.523	0.519	0.030	0.136
31	Sagittal stratum R	0.516	0.481	0.027	1.281
32	Sagittal stratum L	0.511	0.468	0.028	1.531
33	External capsule R	0.370	0.388	0.022	-0.783
34	External capsule L	0.431	0.425	0.025	0.257
35	Cingulum (cingulate gyrus) R	0.461	0.453	0.027	0.302
36	Cingulum (cingulate gyrus) L	0.525	0.496	0.030	0.961
37	Cingulum (hippocampus) R	0.392	0.358	0.029	1.153
38	Cingulum (hippocampus) L	0.400	0.371	0.033	0.863
39	Fornix (cres) / Stria terminalis R	0.475	0.439	0.025	1.391
40	Fornix (cres) / Stria terminalis L	0.536	0.490	0.031	1.504
41*	Superior longitudinal fasciculus R	0.489	0.428	0.026	2.392
42	Superior longitudinal fasciculus L	0.488	0.449	0.026	1.529
43	Superior fronto-occipital fasciculus R	0.430	0.452	0.031	-0.725
44	Superior fronto-occipital fasciculus L	0.443	0.438	0.030	0.164
45	Uncinate fasciculus R	0.404	0.423	0.032	-0.605
46	Uncinate fasciculus L	0.420	0.423	0.033	-0.112
47	Tapetum R	0.367	0.365	0.030	0.086
48	Tapetum L	0.245	0.298	0.027	-1.981

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: Mr. Lenzi
Fiber Tract Regions of Interest With Abnormal FA Values on Individual Isolated Evaluation

Following correction for multiple comparisons, **only 2** of the fiber tracts that were abnormal on isolated, individual evaluation are still considered to abnormal from a statistical perspective.

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/R	Connects Primary Motor Cortex with Contralateral Spinal Motor Neurons	Motor Control of the Contralateral Side of the Body
Medial Lemniscus	L*/R	Connects Dorsal Column Nuclei with the Contralateral Thalamus (VPL)	Somatosensory Perception of the Contralateral Side of the Body
Inferior Cerebellar Peduncles	L/R	Connects Spinal Cord and the Medulla to the Cerebellum	Posture, Balance, and Coordination
Superior Cerebellar Peduncles	L/R	Interconnects Cerebellum to Pons and Midbrain	Motor Coordination and Balance
Cerebral Peduncles	L/R	Interconnects Cerebellum with the Thalamus and Motor Cortex	Motor Control
Anterior Limb of the Internal Capsule	L/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	L/R	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 (L/R)
Retrolenticular Part of the Internal Capsule	L/R	Interconnects Thalamus and Occipital Cortex	Visual Processing
Anterior Corona Radiata	L/R	Contains Descending and Ascending Fibers Related to Cortex – especially for the Frontal Lobes	Higher Cognitive Function
Superior Corona Radiata	L/R	Contains Descending and Ascending Fibers Related to Cortex – especially for the Motor Cortex	Motor Control
Posterior Corona Radiata	L/R	Contains Descending and Ascending Fibers Related to Cortex – especially for the Parietal Lobes	Attentional Control, Somatosensory Function
Posterior Thalamic Radiation	L/R	Interconnects Thalamus and Cortex	Visual and Auditory Function
Sagittal Stratum	L/R	Interconnects Thalamus with Occipital, Parietal, Temporal and Cingulate Cortices	Visual, Auditory, and Cognitive Function
External Capsule	L/R	Contains Cortico-Cortical Association Fibers for Occipital, Temporal, Parietal, and Cingulate Cortices	Cognitive Processing
Cingulum (cingulate cortex)	L/R	Interconnects Cingulate and Pre-Frontal Cortices	Cognitive Processing and Decision Making
Cingulum (hippocampus)	L/R	Interconnects Cingulate and Entorhinal Cortices	Memory, Emotional Processing
Fornix (cres) and Stria Terminalis	L/R	Interconnects Hippocampus and Mammillary Bodies; Amygdala with the Septal Region and Hypothalamus	Memory, Emotional Processing, Fear Response
Superior Longitudinal Fasciculus	R*	Interconnects the Front and Back of the Cerebrum, Including Frontal, Parietal, Occipital, and Cingulate Areas	Higher Cortical Functions
Superior Fronto-Occipital Fasciculus	L/R	Interconnects the Frontal Lobe with the Occipital and Parietal Lobes	Spatial Awareness
Uncinate Fasciculus	L/R	Interconnects Hippocampus and Amygdala with Orbital Frontal Cortex	Memory, Emotional Processing
Tapetum	L	Contains Commissural Fibers Interconnecting Right and Left Temporal Lobes	Interhemispheric Integration for Auditory Processing

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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