

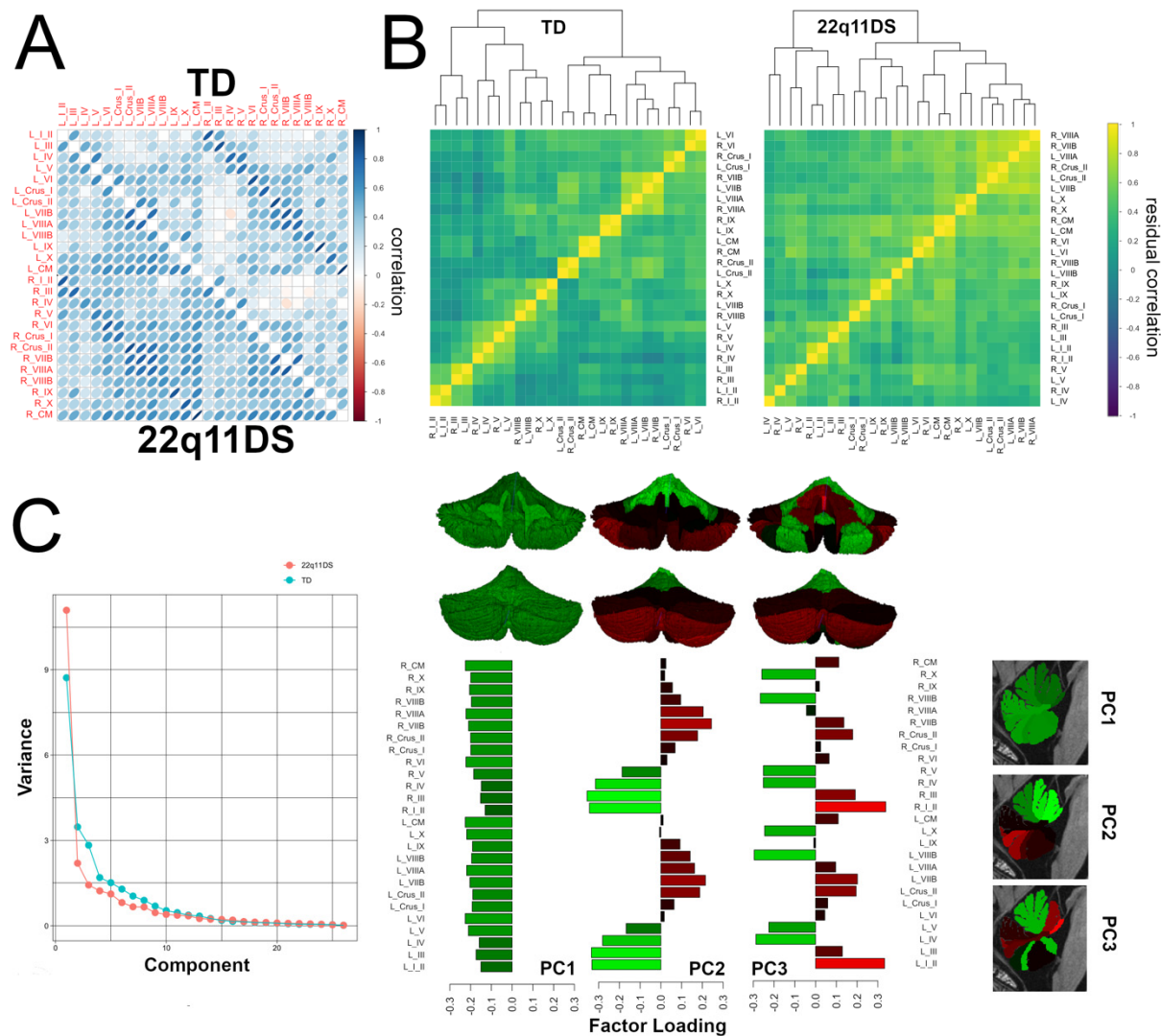
# A Comprehensive Analysis of Cerebellar Volumes in the 22q11.2 Deletion Syndrome

## *Supplement*

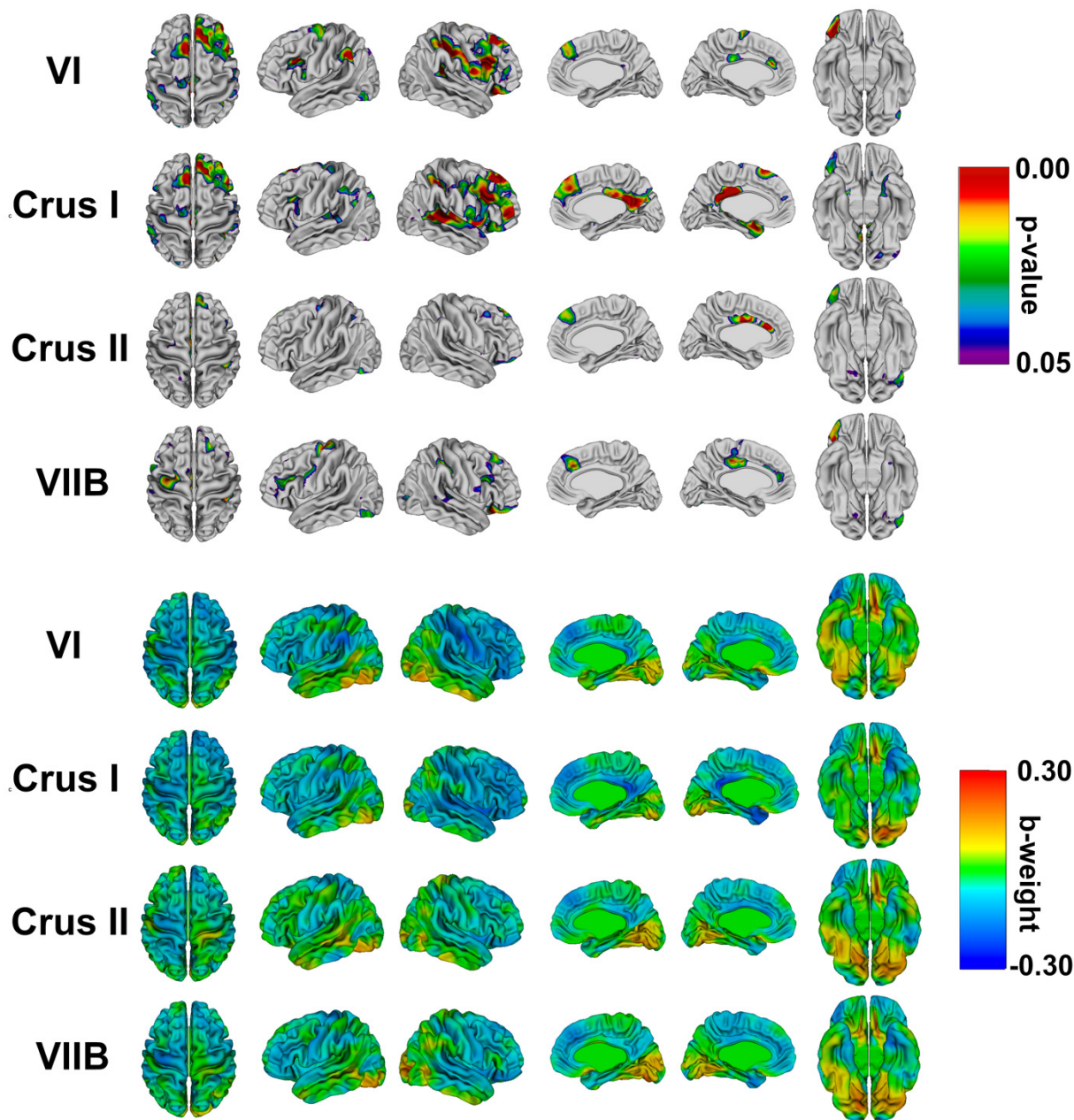
### Supplementary Data:

**Table S1:** Cohen's d values for cerebellar lobules with 95% CIs. These results are also presented graphically in Figure 2.

ROI	LEFT			RIGHT								
	Cohen's d			TBV-Adjusted d			Cohen's d			TBV-Adjusted d		
I,II	-0.54	[-0.88	-0.22]	-0.30	[-0.64	0.02]	-0.65	[-1.00	-0.33]	-0.38	[-0.71	-0.05]
III	-0.97	[-1.33	-0.64]	-0.49	[-0.83	-0.17]	-1.22	[-1.60	-0.89]	-0.69	[-1.04	-0.36]
IV	-0.57	[-0.92	-0.25]	-0.39	[-0.72	-0.06]	-0.76	[-1.11	-0.43]	-0.44	[-0.78	-0.11]
V	-0.85	[-1.21	-0.52]	-0.46	[-0.80	-0.14]	-1.22	[-1.59	-0.88]	-0.82	[-1.17	-0.49]
VI	-1.15	[-1.52	-0.81]	-0.58	[-0.92	-0.25]	-1.18	[-1.55	-0.84]	-0.72	[-1.07	-0.40]
Crus I	-1.17	[-1.54	-0.84]	-0.67	[-1.01	-0.34]	-1.06	[-1.42	-0.72]	-0.55	[-0.89	-0.23]
Crus II	-1.25	[-1.63	-0.91]	-0.72	[-1.07	-0.39]	-1.48	[-1.87	-1.13]	-0.87	[-1.23	-0.54]
VIIIB	-1.28	[-1.66	-0.94]	-0.84	[-1.20	-0.51]	-1.38	[-1.76	-1.03]	-0.93	[-1.29	-0.60]
VIIIA	-1.39	[-1.77	-1.05]	-0.96	[-1.32	-0.63]	-1.24	[-1.61	-0.90]	-0.71	[-1.06	-0.39]
VIIIB	-1.02	[-1.39	-0.69]	-0.55	[-0.89	-0.23]	-0.80	[-1.15	-0.47]	-0.39	[-0.73	-0.07]
IX	-1.00	[-1.36	-0.67]	-0.63	[-0.98	-0.31]	-1.04	[-1.41	-0.71]	-0.65	[-0.99	-0.32]
X	-0.66	[-1.00	-0.33]	-0.29	[-0.62	0.04]	-0.61	[-0.95	-0.28]	-0.30	[-0.63	0.03]
White Matter	-1.40	[-1.81	-1.08]	-0.85	[-1.22	-0.52]	-1.42	[-1.81	-1.08]	-0.84	[-1.19	-0.51]



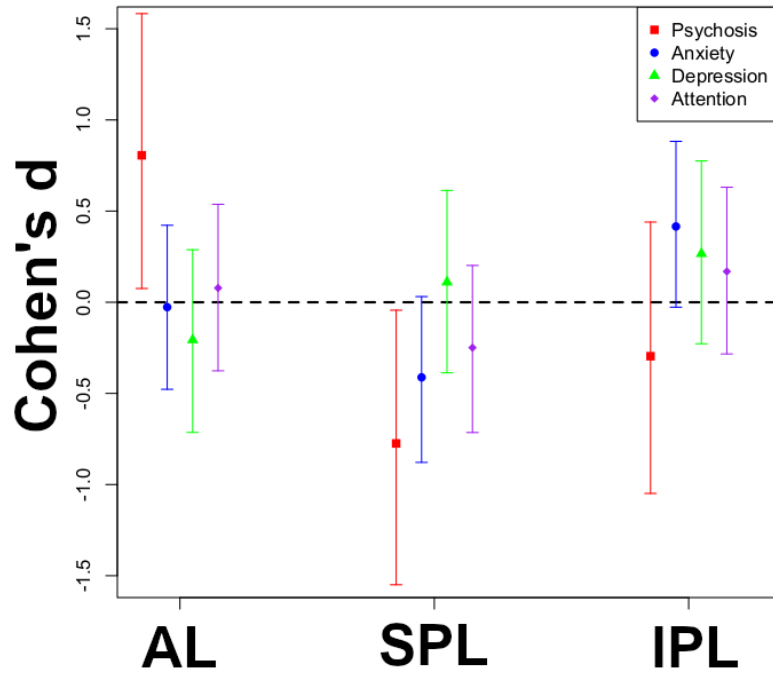
**Figure S1:** Intra-cerebellar volumetric relationships. Panel **A** shows the strong correlational patterns for all ROIs for both TD (upper triangle) and 22q11DS (lower triangle). Panel **B** provides results for hierarchical cluster analyses, after adjusting for TBV and demographic covariates. Panel **C** shows results from principal components analysis. The scree plots (left) suggested that three factors explained the majority in the total variance for both groups. Common factor loadings from multigroup PCA are shown (center and right) as barplots, as well as overlaid on anterior and posterior cerebellar projections and mid-sagittal slices. Factor loadings indicate the strength of individual ROIs with the component (and subsequently with other ROIs via the component). The absolute sign of a loading is arbitrary, but two ROIs of similar sign are positively correlated via the component (or negatively correlated through the component, if of opposite sign).



**Figure S2:** Group differences in cerebro-cerebellar associations for specific cerebellar lobules in SPL. FDR-corrected probability maps (top) show statistically significant total and lobular cerebellum x group interactions on vertex-level measures of cortical thickness. The color maps (bottom) display the standardized b-weights for the ROI x diagnosis interaction (TD dummy coded 1, 22q11DS 0). Red indicates thicker cortex in the TD group with increasing volumes (relative to 22q11DS), with areas in blue having relatively thicker cortex in 22q11DS.

**Table S2:** Demographic information for 22q11DS subjects with (+) and without (-) a clinical diagnosis of schizophrenia, schizoaffective disorder, or psychosis not otherwise specified.

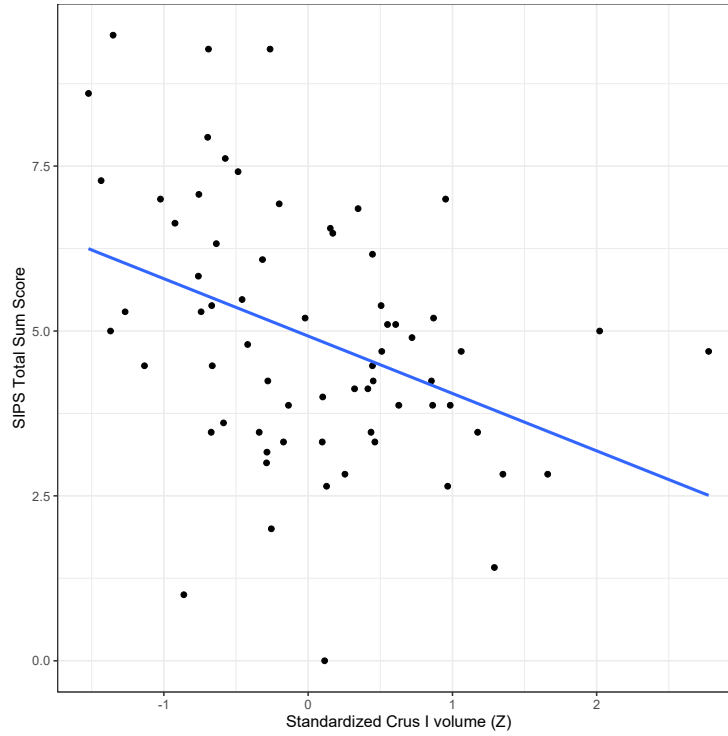
	22q11DS psychosis <sup>-</sup>	22q11DS psychosis <sup>+</sup>	p-value
<b>N</b>	70	9	
<b>Age (years)</b>	21.6 (8.7) range 10.2 – 52.3	25.9 (8.3) range: 10.9 – 36.6	0.1700
<b>Sex</b>	34 Male (49%) 36 Female (51%)	8 Male (89%) 1 Female (11%)	0.0319
<b>Race</b>	56 White (80%) 9 AA (13%) 5 Other (7%)	9 White (100%) 15 AA (0%) 5 Other (0%)	0.7793
<b>Deletion Length</b>			
A-D	64 (91%)	8 (89%)	0.2957
A-B	3 (4%)	0 (0%)	
A-C	2 (3%)	0 (0%)	
C-D	1 (1%)	0 (0%)	
FISH only	0 (0%)	1 (11%)	



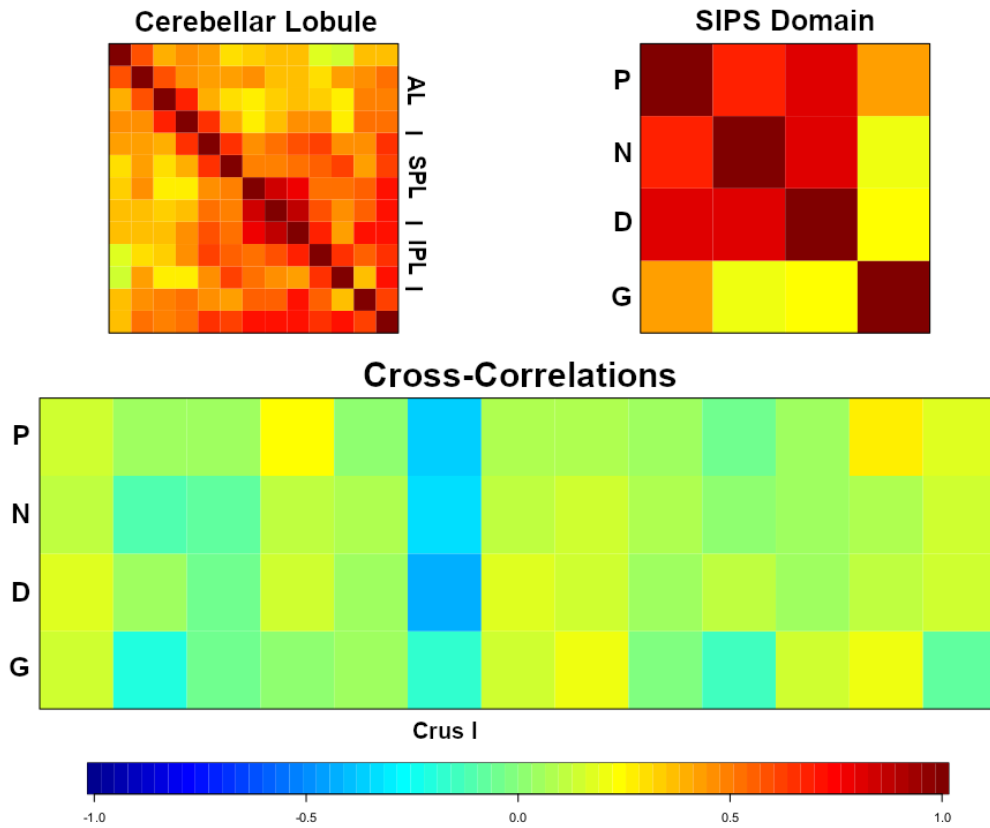
**Figure S3:** Within-group differences in relative lobar volumes based on the presence of Axis I disorder categories. Given their lower prevalence, subjects with schizophrenia, schizoaffective disorder, and psychotic disorder NOS were pooled into a single group. 95% confidence intervals are also provided.

**Table S3:** Association between SIPS sum scores and lobular volumes. At left, serial correlations between SIPS and each ROI are estimated separately. On right,  $\beta$ -weights and test statistics simultaneously-estimated via multivariate linear regression; total cerebellar volume and demographic variables were also included as covariates.

ROI	Correlation [95%CI]			std b	t-score	p-value	FDR-corrected
<i>I/II</i>	0.14	[-0.10	0.37]	0.28	1.71	0.0942	0.1750
<i>III</i>	-0.13	[-0.36	0.11]	-0.38	-1.83	0.0732	0.1585
<i>IV</i>	-0.05	[-0.28	0.19]	-0.15	-0.80	0.4263	0.5541
<i>V</i>	0.09	[-0.15	0.32]	0.18	0.85	0.4018	0.5541
<i>VI</i>	0.01	[-0.23	0.25]	0.25	1.04	0.3044	0.4946
<i>Crus I</i>	-0.38	[-0.57	-0.16]	-0.71	-3.50	<b>0.0010</b>	<b>0.0136</b>
<i>Crus II</i>	0.13	[-0.11	0.36]	0.04	0.15	0.8820	0.8820
<i>VII B</i>	0.20	[-0.04	0.42]	0.66	2.03	0.0478	0.1475
<i>VIII A</i>	0.05	[-0.19	0.28]	-0.77	-2.27	<b>0.0277</b>	0.1400
<i>VIII B</i>	-0.01	[-0.25	0.23]	-0.11	-0.46	0.6501	0.7683
<i>IX</i>	0.19	[-0.05	0.41]	0.43	1.95	0.0567	0.1475
<i>X</i>	0.24	[0.00	0.45]	0.40	2.21	<b>0.0323</b>	0.1400
<i>White Matter</i>	0.12	[-0.13	0.35]	0.07	0.24	0.8105	0.8780



**Figure S4:** Association between adjusted Crus I volumes and SIPS sum score in 22q11DS.

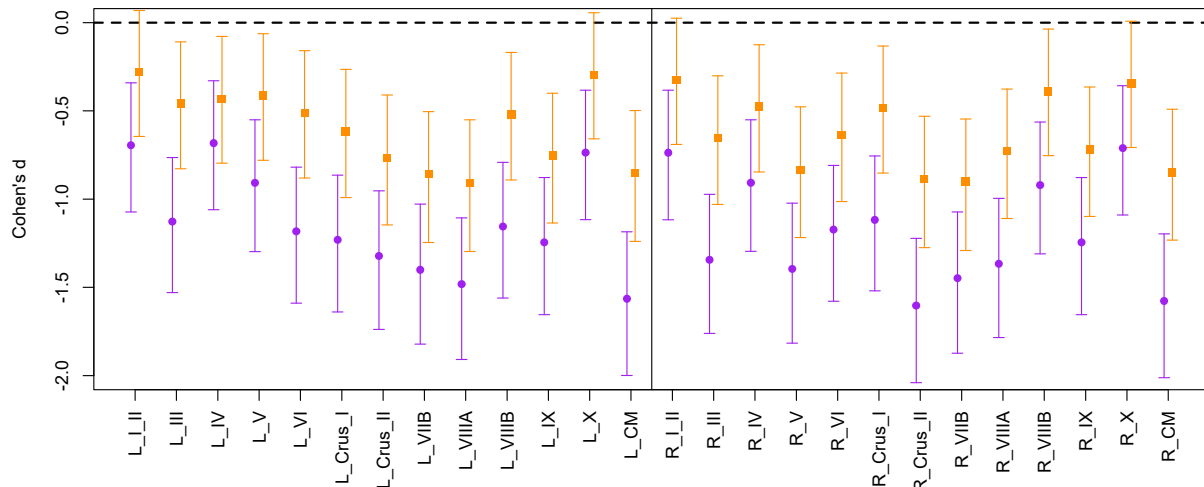


**Figure S5:** Brain-behavior correlations between adjusted cerebellar lobule volumes and SIPS domain subscores (**P**ositive, **N**egative, **D**isorganization, **G**eneral). Within-ROI and within-SIPS correlations are also shown in the provided square matrices (top).



### Age-restricted Subsample:

Because there were significant age differences between groups, we reanalyzed our data restricting both samples to age <25 years (N=125, 58 22q11DS, 67 TD), with more comparable (and nonsignificant) means (22q11DS vs TD: 18.0 versus 18.1 years), medians (17.4 versus 19.3), and standard deviations (3.8 versus 3.4). Similar patterns were observed, with Cohen's d and 95% CIs as follows (purple includes demographic covariates only, yellow includes TBV as an additional covariate):



Group Differences in Cerebellar Lobular Volumes in Age-Restricted Subsample

ROI		LEFT				RIGHT			
		TD	22q11DS	F	p-value (FDR)	TD	22q11DS	F	p-value (FDR)
I/II	MEAN	73.91	61.96	14.53	0.0006	96.76	81.31	18.52	0.0001
	SD	20.55	15.43			24.56	16.33		
	SEM	0.31	0.27			0.37	0.28		
III	MEAN	954.11	814.25	38.97	<0.0001	1060.68	874.50	58.55	<0.0001
	SD	130.23	139.29			146.54	138.94		
	SEM	1.94	2.40			2.19	2.40		
IV	MEAN	2988.12	2688.48	15.74	0.0001	2317.71	2004.60	28.47	<0.0001
	SD	460.86	459.32			377.00	313.98		
	SEM	6.88	7.92			5.63	5.41		
V	MEAN	4890.46	4377.21	29.30	<0.0001	4907.37	4165.55	66.61	<0.0001
	SD	573.03	617.31			617.34	517.57		
	SEM	8.55	10.64			9.21	8.92		
VI	MEAN	9290.20	8045.93	47.22	<0.0001	10143.62	8731.23	47.50	<0.0001
	SD	1078.69	1176.15			1248.04	1216.74		
	SEM	16.10	20.28			18.63	20.98		
Crus_I	MEAN	11734.78	9958.69	47.40	<0.0001	12689.58	11077.10	40.75	<0.0001
	SD	1351.76	1612.10			1452.03	1652.69		
	SEM	20.18	27.79			21.67	28.49		
Crus_II	MEAN	8150.75	6885.53	57.12	<0.0001	9510.46	7852.83	84.77	<0.0001
	SD	1007.22	1047.88			1019.45	1234.25		
	SEM	15.03	18.07			15.22	21.28		
VIIB	MEAN	4132.00	3452.19	61.62	<0.0001	5481.13	4522.43	67.53	<0.0001
	SD	535.09	486.25			700.64	665.93		
	SEM	7.99	8.38			10.46	11.48		
VIIIA	MEAN	6673.65	5535.62	72.64	<0.0001	5046.06	4189.35	61.37	<0.0001
	SD	821.66	819.25			697.76	671.62		
	SEM	12.26	14.12			10.41	11.58		
VIIIB	MEAN	4138.80	3515.47	46.89	<0.0001	3836.53	3423.25	28.15	<0.0001
	SD	650.28	487.73			528.76	421.72		
	SEM	9.71	8.41			7.89	7.27		
IX	MEAN	4089.59	3418.64	46.87	<0.0001	3990.21	3338.13	47.64	<0.0001
	SD	657.32	515.88			617.57	467.52		
	SEM	9.81	8.89			9.22	8.06		
X	MEAN	711.19	646.33	17.97	0.0001	703.82	639.19	17.10	0.0001
	SD	91.36	89.69			99.92	87.76		
	SEM	1.36	1.55			1.49	1.51		
White Matter	MEAN	10146.09	8637.80	78.84	<0.0001	9617.80	8148.73	79.56	<0.0001
	SD	878.44	1137.61			868.37	1077.94		
	SEM	13.11	19.61			12.96	18.59		