



# Frontostriatal circuitry and cerebellum in relation to repetitive behaviors and executive function in autism

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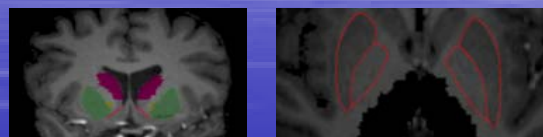
## Abstract

**BACKGROUND:** The phenomenology and neurobiological substrate of the repetitive behaviors domain in autism is still not well delineated. This study explores the relationship of basal ganglia and cerebellar structures to the severity of high vs. low order repetitive behaviors in adults with autism.

**METHODS:** Fifteen subjects with autism by DSM-IV, Autism Diagnostic Interview (ADI-R) and Autism Diagnostic Observation schedule (ADOS-G) and 15 matched controls completed a 3 T magnetic resonance image (MRI) of the brain (MPRAGE). Two blinded researchers, with good inter-rater reliability, outlined the right and left caudate, putamen, and cerebellum. The groups were compared in terms of volumes of these structures, as well as corrected volumes for full scale IQ and total brain volume (TBV). Volumes within the autistic group were correlated with the ADI-R repetitive behavior domain and with measures of executive function on CANTAB.

**RESULTS:** There were no statistically significant differences between groups for basal ganglia and cerebellar volumes. There were also no statistical significant differences in full scale IQ or total brain volume between groups. However, within the autism group, putamen volumes significantly correlated with the high order repetitive behavior score of the ADI and this correlation became stronger when covarying for TBV and full scale IQ. In addition, caudate volumes significantly correlated with the lower order repetitive behaviors score of the ADI, and this correlation became stronger when covarying for TBV and full scale IQ. Lastly the volume of the right cerebellum significantly correlated with lower order repetitive behaviors when controlled for total brain volume.

## Methods



The striatal structures and cerebellum were traced in both hemispheres on every transverse slice in which they appeared using Analyze.

The other views, coronal and sagittal, were used to trace or check parts of the caudate nucleus that are difficult to define in the transverse view.

The total pixel count for each structure was generated and those numbers were then multiplied by the pixel dimensions to get the volume of each structure.

The volumes of the striatum and cerebellum were compared between groups

Analysis of covariance was used to explore correlations between structures and repetitive behaviors scores as well as executive dysfunction scores, co varying for TBV and IQ

## Results

	ADI-R-rep	ADI-R-rep- high order	ADI-R-rep Low order	Full Scale IQ
Mean (SD)	6.67 (2.58)	4.21 (2.08)	2.28 (1.26)	117 (15)

	ADI- repetitive	ADI- repetitive High order	ADI- repetitive Low order
<b>Caudate</b>	0.516 0.05	ns	<b>0.622</b> <b>0.023**</b>
<b>Putamen</b>	<b>0.791</b> <b>0.004</b>	<b>0.743</b> <b>0.004</b>	0.535 0.06
<b>Cerebellum</b>	ns	ns	ns
<b>Right Cerebellum</b>			5.19* 0.05

	SOC	IED	SRM	PRM	SSP	DMS
<b>Caudate</b>	0.65 0.07	ns	<b>0.70</b> <b>0.05</b>	-.65 0.08	ns	<b>0.74</b> <b>0.03</b>
<b>Putamen</b>	ns	ns	ns	-.74 .03	ns	ns
<b>Cerebellum</b>	ns	ns	ns	ns	<b>0.75</b> <b>0.03</b>	ns

**CONCLUSIONS:** Within the autism group, the volumes of putamen vs. caudate and cerebellum seem to preferentially correlate with high vs. low order repetitive behaviors respectively, suggesting differential roles for these structures in the development of repetitive behaviors in autism. Additional correlation were noted between memory and striatum and cerebellum.

\*\* Survive corrections for TBV and IQ, \*Survive correction for IQ