Whole-Brain Structural Imaging in Autistic Children: A Comparison of Spatial Normalization to Adult Versus Pediatric Template

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Differences between autistic and typically developing individuals' behavior are believed to be manifested by differences in their brains' structure. The present study investigated:

1) neuroanatomical differences between autistic (AUT) and typically developing (TD) children, and

2) whether the use of a pediatric (PED) brain template yields different results than an adult (MNI) brain template.

Method

Participants: 13 AUT and 22 TD children

Table 1. Participant Demographics. No group differences (all ps > .10).

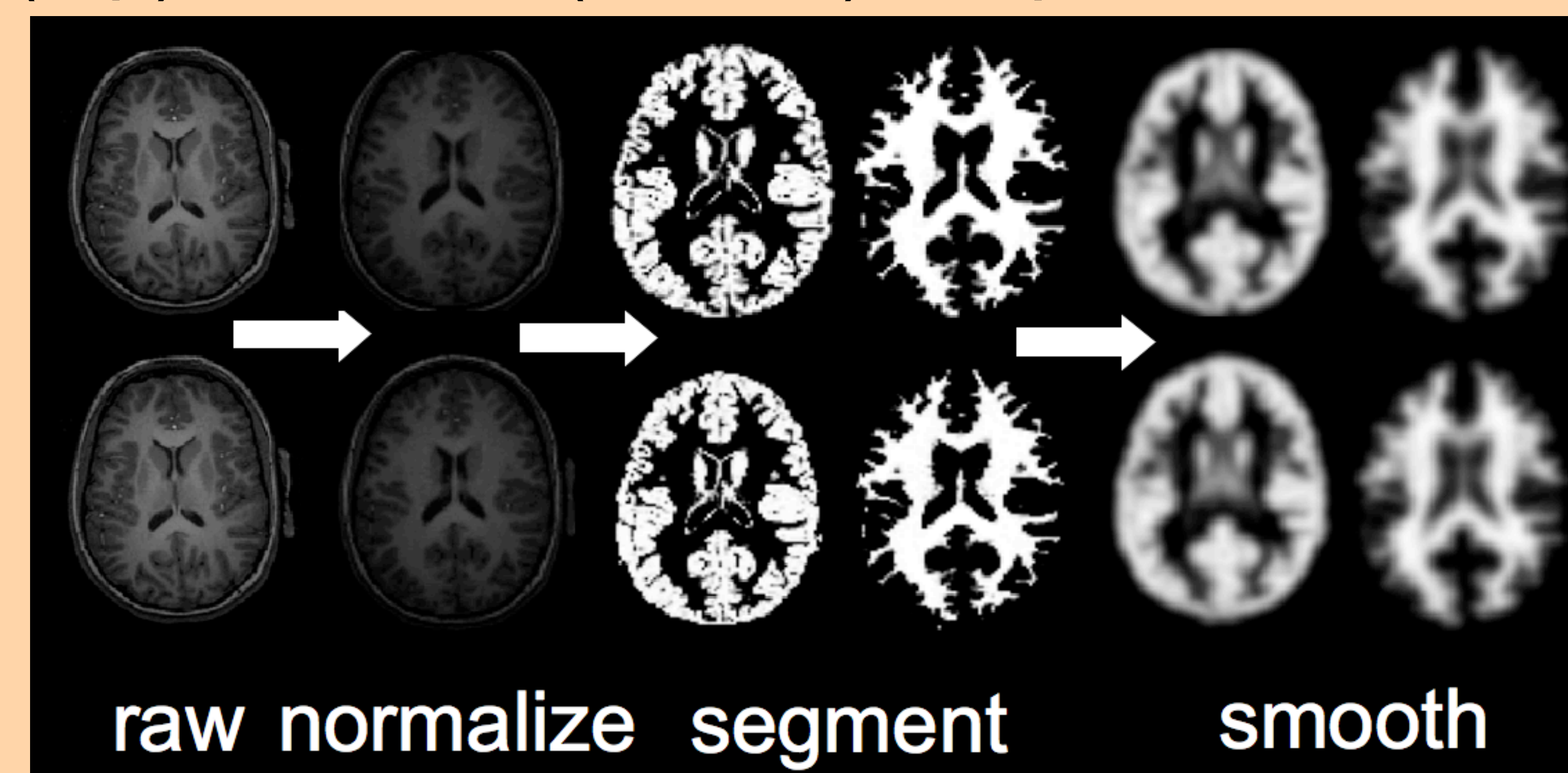|	Age	Peabody (raw)	Peabody (std)
AUT	12.84 (2.88)	159.77 (19.33)	112.08 (20.28)
TD	12.56 (3.09)	164.91 (20.32)	121.05 (17.52)

Procedure: 3.0 Tesla GE Signa Scanner, T1-weighted MRI scan, axial plane, TR = 8.4 ms, TE = 1.7 ms, flip angle = 10°, field of view = 24 cm, matrix size = 256 x 256 x 124, 1 x 1 x 1.2 mm resolution.

Data Analysis: Voxel-based morphometry analyses implemented with SPM5.

Figure 1. Templates for MNI (left; www.fil.ion.ucl.ac.uk) and PED (right; www.irc.cchmc.org/software/pedbrain.php).

Figure 2. Data processing pipeline for MNI (top) and PED (bottom) templates.
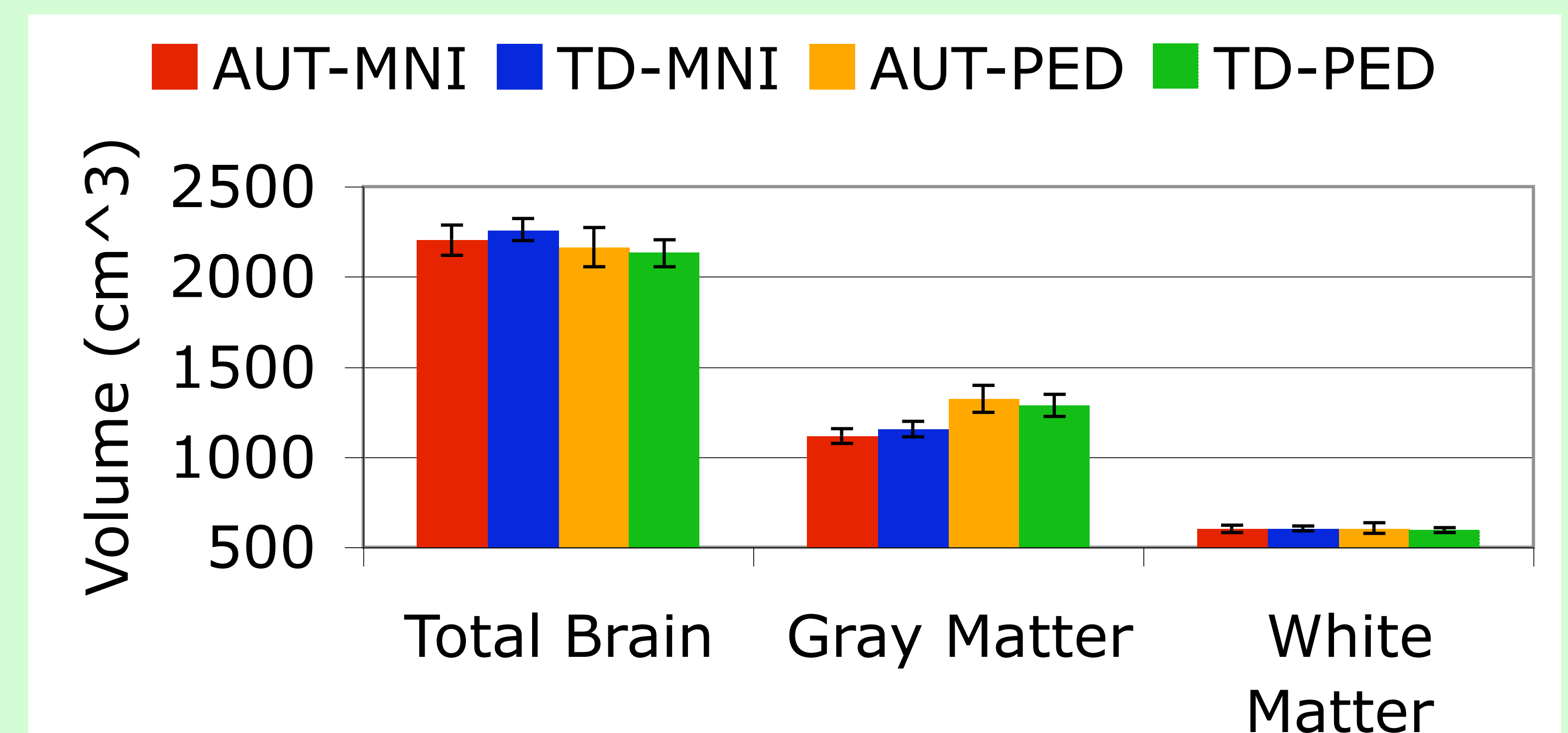

raw   normalize   segment   smooth

Results

Table 2. Group differences in gray matter with MNI template. (No group differences with PED template.)

Brain Region	x, y, z	Z	p*
TD > AUT			
Left Uncus (BA 20)	-32, -10, -32	4.09	.005
TD > AUT, covary age, Peabody, gray matter volume			
Right Dentate	14, -48, -34	3.73	.099

*corrected multiple comparisons, cluster level

Figure 3. Brain volume displayed by group and template. Effect of template for total brain (p = .006) and gray matter (p = .001) volumes. Group x template interaction for gray matter volume (p = .015). Error bars represent 2 SE.

Conclusions

➢ There were group differences in gray matter density with the MNI template but not with the PED template.

➢ The MNI compared with PED template overestimated total brain volume for all participants and underestimated gray matter volume more for AUT than TD participants.

Acknowledgements