**Exploring the Relationship Between Brain Microstructure Indices and Autism Spectrum Disorder Severity: NODDI dMRI Subgroup Analysis of the Toronto Adolescent and Youth Cohort Study**

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**Introduction**

Autism Spectrum Disorder(ASD) is a developmental disorder characterised by deficits in social cognition. Neurite orientation dispersion and density imaging(NODDI) is a recent biophysical model used in diffusion MRI(dMRI) that estimates microstructural complexity at a sub-voxel scale. Its three indices have shown to reliably quantify microstructure in grey and white matter(GM & WM). The three studies that have assessed NODDI indices in ASD show variation in findings. However, one finding of interest was the negative relationship between neurite density index in WM and communication scores of ASD participants.

**Purpose**

The CAMH TAY cohort study is a longitudinal study recruiting youth from ages 11-24. The purpose of our current investigation is to determine the correlation between NODDI indices and the Social Responsiveness Scale(SRS), a measure of ASD severity, in a subset of TAY participants. We aim to explore the relationship between SRS, age, assigned sex at birth and NODDI indices across childhood and early adulthood in ASD and validate prior findings.

**Methods**

dMRI data from 187 participants was preprocessed using the FreeSurfer pipeline, fit to the NODDI model using the AMICO framework and mapped to the cortical surface using Ciftify. A multilinear regression model will be built with age, social responsiveness, and sex as the independent variables and NODDI indices as the dependent variables.

**Results**

We anticipate findings to show a strong correlation between NODDI indices and SRS scale.

**Conclusions**

NODDI is a novel biophysical model we hope will uncover global microstructural patterns that contribute to the detection of ASD severity.