Examining the effects of age on neuroimaging measures in children with and without neurodevelopmental conditions
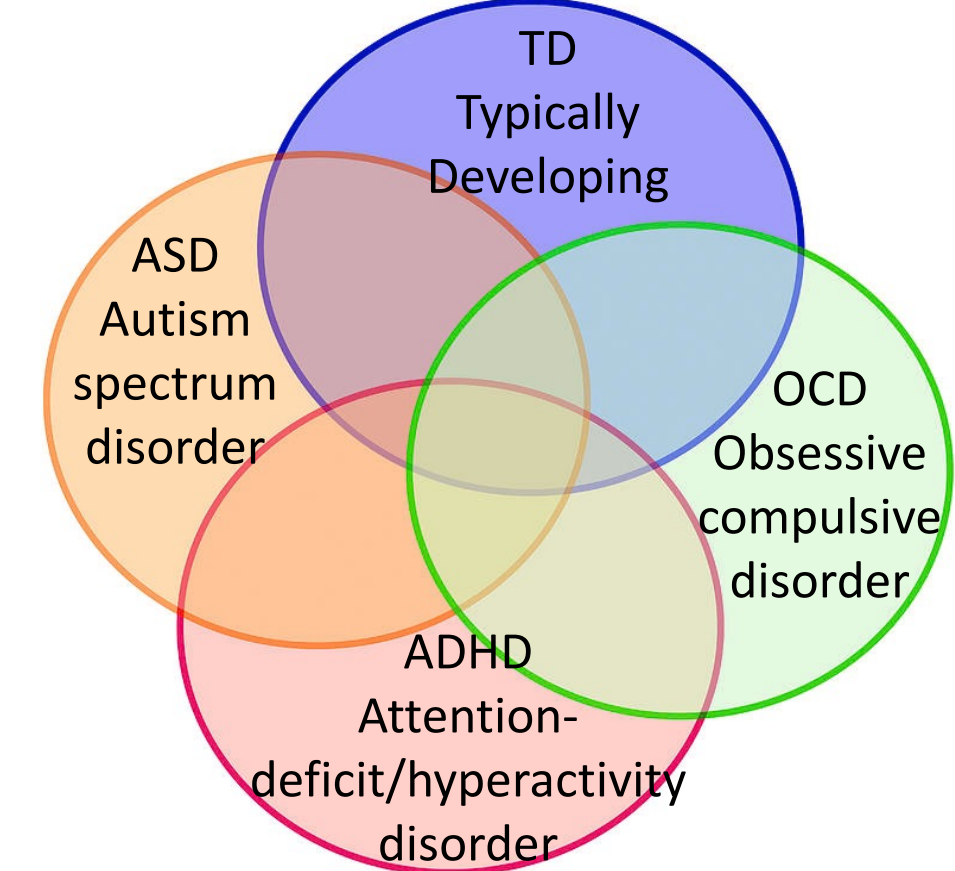
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Introduction

Neurodevelopmental Conditions (NDC) of Interest:

- TD Typically Developing
- ASD Autism spectrum disorder
- OCD Obsessive compulsive disorder
- ADHD Attention-deficit/hyperactivity disorder

Previous Research:
1. NDCs are highly heterogeneous within condition and overlapping across conditions

2. Heterogeneity motivates trans-diagnosis research using neuroimaging data.

Established effects of age on measures of brain function and structure within- and across- NDCs and typical development

- Age effects are corrected in most neuroimaging studies.
- However, effects may differ between independently collected datasets.
- This challenges the replicability and generalizability of findings.

Research Question

Are developmental effects in NDCs different in two datasets: the Province of Ontario Neurodevelopmental Network (N = 551) and the Healthy Brain Network (N = 551)?

POND NETWORK Province of Ontario Neurodevelopmental Disorders

Child Mind Institute HEALTHY BRAIN NETWORK

## Methods: fMRI Data Analysis on Age-Related Effects

1. Functional connectivity strengths on 232 brain regions were derived from fMRI data.
2. Normative modelling (PCNToolKit), was implemented to construct dataset-specific age-related trajectories and deviation scores. for each sex.
3. Deviation scores are compared between datasets by training normative model on one and testing on the other, for each sex.

Independently collected neuroimaging datasets have different developmental trajectories.

Observations & Findings (QR Code for visuals)

1) When the HBN model is used as the training model, deviations in the POND dataset are largest in connections involving the subcortical regions

2) When the POND model is used as the training model, deviations in the HBN dataset are larges in non-subcortical networks

Train: HBN, Test: POND   Train: POND, Test: HBN

Females

Males

Effect size 0.8 — 0.0
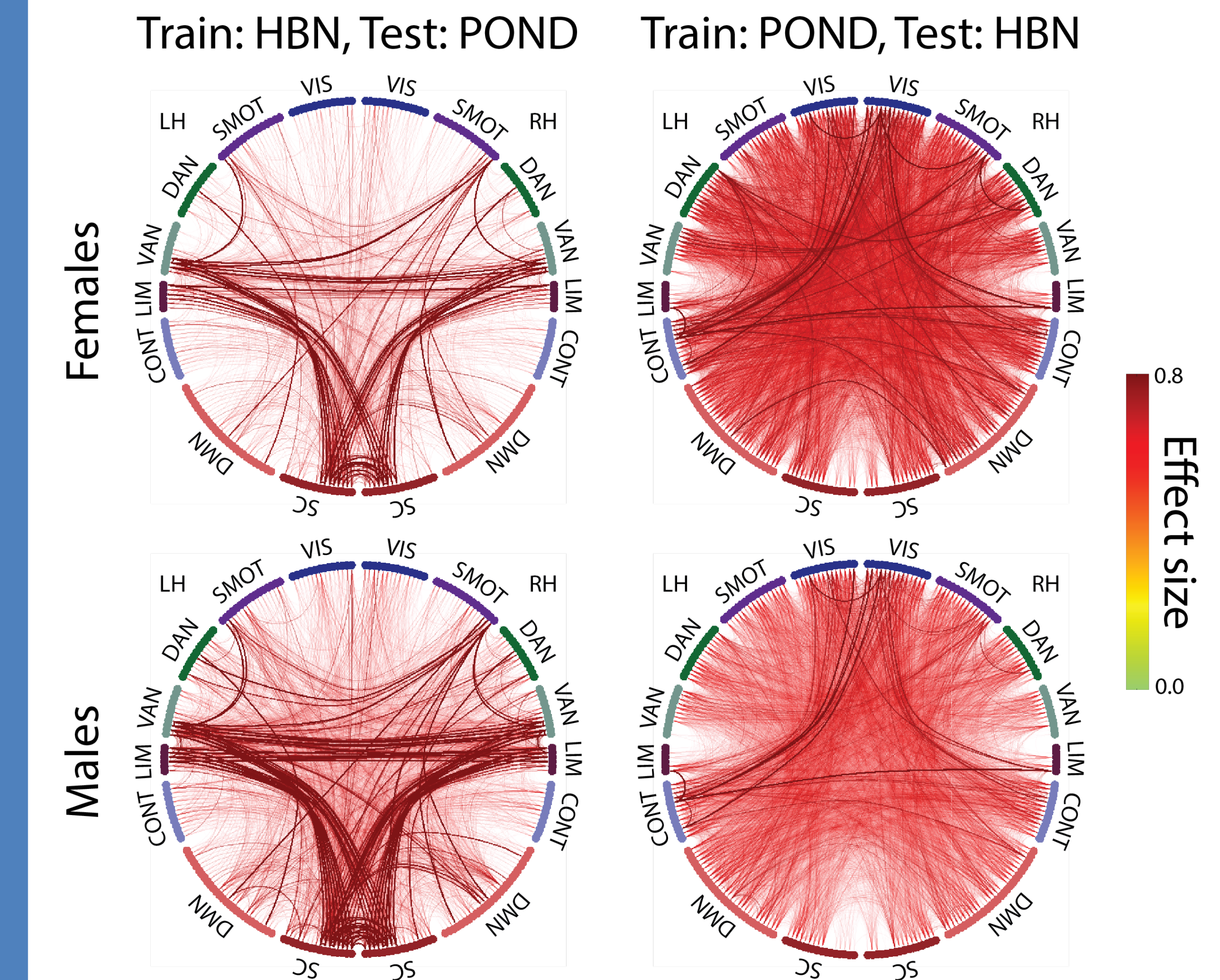
Next Step

1. Identify the effect of age-correction methods on findings
2. Quality control on QSIRecon outputs (structure connectomes)
3. Apply normative modelling on structural connectomes

Relevance to Holland Bloorview Clients & Families

- The results of the project will help understand the replicability of age-related effects in NDCs in different datasets.
- This might lead the development of better diagnosis of NDCs, and ultimately contribute to improving outcomes for individuals with these conditions.

Acknowledgement