Neural Mechanisms Underlying Empathy

Study of Adolescents with ASD and their Fathers

Amanda Seelman
Background
Autism Spectrum Disorder is ~90% heritable.
SLC6A4 x life stress

Neural circuitry of imitation and bonding

- ACC
- Parietal MNS
- Frontal MNS
- IC
- pSTS

Von Economo neurons

Social bonding

Mirror neuron system (MNS)

Goal-directed behavior or the observation of such behavior of others

SLC6A4 variation moderates social organization?
GEM = Griffith Empathy Measure
BEES = Balanced Emotional Empathy Scale
Results

Other Task: ASD adolescents  $<$ Controls for *weak* stimuli

Self Task: ASD adolescents $<$ Controls for *weak* stimuli

Both groups of fathers showed no differences in correct/congruent responses for either task.

Notably: Fathers of ASD adolescents exhibited faster reaction time during presentation of strong stimuli in the self task.
fMRI Results
- Stronger activation in Fusiform Gyrus for controls compared to ASD adolescents and their fathers.
  ASD fathers showed decreased amygdala volume compared to controls.
- In healthy adolescents, there was a positive association between GEM scores and insula activity.
Inferences

Strong genetic component

Fathers showed reduced FG activation in other task

Empathy abilities correlate with FG activation

Amygdala plays a role, but is age-dependent

Strategies must be present to compensate for FG and amygdala dysfunction

The hMNS and insula also play a major role in empathy

Initial deficits in face perception may actually lead to cascading social problems and dysfunctions of related brain areas.