SES was estimated using a composite score derived from family income and neighborhood impoverishment at ages 1.5, 2, and 3.5. Subjects underwent diffusion tensor imaging (61 directions, b=1000) on a 3T Siemens TIM Trio at age 20. Preprocessing was conducted in FSL, Tract-Based Spatial Statistics (TBSS) was used to calculate measures of white matter microstructure, and mean fractional anisotropy (FA) was calculated for the left and right cingulum.
Results: Lower SES in early childhood was associated with significantly lower FA in early adulthood in the right (β=.188, p=.019) and left (β=.177, p=.028) cingulum.
Conclusions: Early socioeconomic disadvantage is linked to lower cingulum FA in young adulthood. Enduring impairments in cingulum microstructure may confer increased risk for poor physical, psychological, and cognitive functioning across development.
Supported By: NIH R01 DA026222
Keywords: socioeconomic status, diffusion MRI, longitudinal, Neurodevelopment

925. Global Probabilistic Tractography and Symptom Dimensions in a Prospectively Characterized Sample of Adults with a Childhood Diagnosis of Attention Deficit-Hyperactivity Disorder

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Background: White matter abnormalities have been shown to play an important role in the pathophysiology of Attention Deficit-Hyperactivity Disorder (ADHD). However, little is known about the extent to which ADHD symptom severity is associated with abnormalities in white matter tracts known to be involved in attention and emotional control processes
Methods: We aimed to determine if abnormalities in fronto-temporal white matter tracts involved in attention (superior longitudinal fasciculus, SLF) and emotional control processes (uncinate fasciculus, UF) relate to clinically relevant symptom-dimensions in 46 adults with or without ADHD (32 ADHD, 14 non-ADHD; mean age[SD]=33[3] years, 44males), recruited from an ongoing longitudinal study in 347 children with ADHD prospectively characterized from-youth-to-adulthood. Symptom-dimensions of inattention, hyperactivity/impulsivity (H/I), and anger-irritability (A/I) were used. Global probabilistic tractography was used to reconstruct SLF and UF. Volume, length, and diffusivity metrics were extracted for each participant.
Results: ADHD, vs non-ADHD, adults showed smaller volume in the right UF (p=.05) and right SLF (p=.06). In ADHD adults, H/I symptoms were negatively correlated with length in the SLF (left: r=-.40, p=0.01; right: r=-.40, p=0.03) and A/I symptoms were positively correlated with volume of the right UF (r=0.40,p=0.04).
Conclusions: Findings suggest that higher volumes in fibers connecting medial-temporal and orbitofrontal regions might be associated with higher severity of A/I symptoms. Abnormal reorganization of the fibers connecting DLPFC and temporo-parietal regions, as evidenced by a shorter length in the SLF, may represent a neurobiological substrate of higher levels of H/I symptoms, possibly associated with inability of modulating thoughts and actions in goal-directed behaviors reported in ADHD.
Supported By: NIMH (R01MH101096-03)
Keywords: global probabilistic tractography, Symptom Dimensions, Adults with a Childhood Diagnosis of Attention Deficit-Hyperactivity Disorder, hyperactivity/impulsivity, anger-irritability

926. Regional Differences and Demographic Correlates of Cerebrovascular Reactivity Among Healthy Adolescents

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Background: Cerebrovascular reactivity (CVR), a proxy of cerebrovascular health, is reduced in adult depression. Breath-holding (BH) paradigms alter vasoactive CO2, are well tolerated, and produce robust CVR measures in adults. We therefore look to extend BH-CVR to a healthy adolescents (HA) sample, investigating two modelling approaches, evaluate regional differences in BH-CVR, and examine BH-CVR in relation to demographics (e.g. sex).
Methods: Thirty-nine HA (ages 13-20 years, 20 females) completed six 15-second BHs, alternating with 30-second free-breathing intervals. Blood-oxygenation-level dependent (BOLD) fMRI at 3-Tesla measured CVR voxel-wise and in five major brain subdivisions. Hemodynamic responses were modelled using a: 1) double-gamma variate convolved with a boxcar function with an individualized delay term (HDR-Delay), and 2) a sine-cosine regressor with a delay term. CVR-delay was the elapsed time between end of BH and peak BOLD signal.
Results: There were regional differences in CVR (Frontal >Occipital >Parietal >Temporal >Subcortical) and CVR-delay (Occipital >Parietal >Frontal >Temporal >Subcortical). Males had higher CVR than females (p=.03, partial η2=.35). Comparing both models, the HDR-Delay method yielded a significantly superior model fit and marginally larger cluster volume than the sine-cosine regressor.
Conclusions: This study found regional CVR differences in HA, which can inform future studies of adolescents with brain- and/or vascular-related diseases. Our regional CVR hierarchy findings were consistent with prior healthy adult studies, except for the relatively higher frontal CVR. Lower CVR in females converges with prior evidence of higher basal cerebral blood flow. Both methods for modelling the raw CVR data were effective, albeit the HDR-Delay method was marginally superior.
Supported By: Ontario Mental Health Foundation
Keywords: Cerebrovascular Reactivity, Breath-Hold, Magnetic resonance imaging, Healthy subjects, Adolescents