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1-A-1 The role of medial frontal theta among children and adolescents with consistently high threat sensitivity

Taylor Heffer[1], Stefon van Noordt[2], Teena Willoughby[1]

[1]Brock University, [2]Montréal Neurological Institute-Hospital, McGill University

OBJECTIVES: Threat sensitivity--a heightened responsiveness to aversive situations-- has been associated with better inhibitory control, perhaps due to hypervigilant performance monitoring. We investigated the neural underpinnings by examining whether longitudinal trajectories of threat sensitivity were linked to medial frontal theta power dynamics, a robust marker of performance monitoring. We expected that individuals who consistently report high levels of threat sensitivity would have greater medial frontal theta power and better inhibitory control compared to individuals with lower or less consistent threat sensitivity. METHOD: Youth (N=432, Mage=11.96 years) filled out annual self-report measures of threat sensitivity for three years. A latent class growth curve analysis was used to identify distinct profiles of threat sensitivity. Participants also completed the go/no-go task (an inhibitory control task) while EEG was recorded. RESULTS: We identified three distinct threat sensitivity profiles: (1) high-stable(N=116), (2) moderate-increasing(N=241), and (3) low-stable(N=74). Participants in the high-stable threat sensitivity group (M=4.68, SD=1.51) had greater levels of medial frontal theta power compared to participants in the low-stable threat sensitivity group (M=3.88, SD=1.80), $p < .05$. The high-stable group (M=0.76, SD=0.113) was also more accurate on the task than the low-stable group (M=0.68, SD=0.163), $p < .05$. CONCLUSIONS: Youth with consistently high threat sensitivity have greater medial frontal theta power and better inhibitory control compared to youth with consistently low threat sensitivity, suggesting that stable high threat sensitivity is associated with hypervigilant performance monitoring. Of concern, both hypervigilance and threat sensitivity have been associated with anxiety; thus, youth with high-stable threat sensitivity may at risk for the development of anxiety.

1-A-2 The moderating role of parental scaffolding in relationships between low socioeconomic status and development of executive function: A preregistered longitudinal study

Maya Rosen[1], Rachel Rome[1], Liliana Lengua[2], Katie McLaughlin[1]

[1]Harvard University, [2]University of Washington

Executive functions (EF) are a set of cognitive functions important for adaptive behavior. Childhood socioeconomic status (SES) is positively associated with EF, such that children from higher SES backgrounds tend to perform better on tests of EF than their lower SES peers. Parental scaffolding, or the provision of guidance and support to facilitate a child's learning, allows a child to explore the world, learn from experience, and move toward independence. Parental scaffolding is thought to be important for the development of EF. Moreover, individual differences in parental scaffolding strongly predict children's EF, over and above the effect of SES. Thus, parental scaffolding could moderate the impact of growing up in a low-SES household on the EF and their underlying neural mechanisms, such that the SES-EF association will be weaker for children whose parents engage in high levels of scaffolding. This preregistered study will use a longitudinal cohort of children that were followed from ages 3 to 12, in which SES, parenting behavior, EF, and brain function during an inhibitory control task (Go/No-go) were assessed. We hypothesize that parental scaffolding (measured at 3 years) will moderate the association between SES (separately defined as early life income and early life maternal education) and EF performance (11-12), such that high levels of parental scaffolding will buffer against the negative effects of low SES on EF. Additionally, we predict that parental scaffolding will moderate the association between early life SES and activation in lateral prefrontal cortex during a Go/No-Go inhibition task (age 11-12) such that children who experience low levels of scaffolding will show a positive association between early life SES and activation in these regions, and this association will be weaker or absent among children who experience high levels of parental scaffolding.

1-A-3 Examination of Neurobehavioral Developmental Trajectories of Cognitive, Motor, and Emotional Control in Relation to Sex Differences in Psychopathology

Keri Rosch[1], Rebecca Rochowiak[2], Alyssa DeRonda[2], Stewart Mostofsky[1]

[1]Kennedy Krieger Institute, Johns Hopkins University, [2]Kennedy Krieger Institute

Neurodevelopmental disorders such as attention-deficit/hyperactivity disorder (ADHD) emerge during early childhood and are more prevalent in males. In contrast, anxiety and mood disorders commonly emerge during adolescence and occur more in females. Our understanding of the mechanisms that underlie sex differences in the occurrence of various forms of psychopathology is limited. Research is necessary to understand whether neurobehavioral markers of internalizing (INT) and externalizing (EXT) psychopathology differ across development for girls and boys. This study will examine whether and how the neurobehavioral trajectories of cognitive, emotional, and motor control differentially predict trajectories of EXT and INT symptoms and the impact of sex. To accomplish this, we have integrated data collected across cross-sectional and longitudinal studies of children with and without a diagnosis of ADHD, including preschool children (ages 4-5) followed into middle childhood and pre-pubertal 8-12 year-old children followed into adolescence. Analyses will be conducted on a sample of 602 participants (55% ADHD, 33% female among both groups), with 857 good quality structural magnetic resonance imaging scans, all acquired at the same scanning site between the ages of 4-17 years. Generalized linear mixed effects models will be applied to test the following hypotheses: (1) Developmental trajectories of motor and cognitive control will predict EXT symptom trajectories and emotional and cognitive control will predict INT symptom trajectories. (2) Developmental trajectories of fronto-subcortical neural circuitry governing motor and cognitive control will predict EXT symptoms and emotional and cognitive control will predict INT symptoms. (3) Trajectories of neurobehavioral measures of cognitive control among girls and motor control among boys will predict trajectories of EXT symptoms and trajectories of emotional control will predict trajectories of INT symptoms, regardless of sex.

1-A-4 Longitudinal development of response inhibition as measured by the Go/No-Go and Stop Signal Tasks across adolescence and into young adulthood

Hannah Weiss[1], Paul Collins[2], Monica Luciana[2]

[1]University of Minnesota-Twin Cities, [2]University of Minnesota Twin Cities

Behavioral disinhibition, the difficulty in inhibiting goal-inconsistent automatic behaviors in favor of more appropriate responses, not only characterizes many of the psychopathologies that emerge during adolescence, but also may characterize typical development. While behavioral disinhibition has been examined in developmental samples, heterogeneity across tasks, samples, and analytic designs has precluded a consensus regarding the trajectory of maturation from adolescence to early adulthood. METHODS: Inhibitory control will be measured using Stop Signal Reaction Times from the Stop Signal Task (SST) and Commission Errors (CE) from a Go/No-Go (GNG) task. Data from 147 typically developing participants (overall age range 11-32 years) were collected across four waves of a longitudinal study, with each wave about 2 years apart. HYPOTHESES: Based on review of the literature of various response inhibition tasks, we hypothesize that an inverse age function will best fit both CE and SSRT development and that we will observe a significant age by intercept interaction, where worse performance at baseline predicts steeper longitudinal improvements. We hypothesize a significant random effect of intercept and age for both measures. ANALYSIS: Linear, quadratic, and inverse age mixed linear effects models of SSRT and CE with and without random effects of slope will be fit use R's nlme package. Additional models will test effects of gender and intelligence on task performance and developmental trajectories. Best fitting model will be determined by BIC and AIC. Step-up modeling procedures will assess the effects of age by baseline, gender, and intelligence effects. IMPLICATIONS: This study will provide clarification on the developmental trajectory of response inhibition and the first to test an inverse age model using the GNG and SST tasks. Comparing results from the two measures will also address construct validity as they are rarely studied in the same sample.

1-A-5 Resting State Cortical Hubs in Youths

Damion Demeter[1], Evan Gordon[2], Tehila Nugiel[3], AnnaCarolina Garza[1], Tyler Larguinho[1], Jessica Church[1]

[1]University of Texas, Austin, [2]Washington University, St. Louis, [3]University of North Carolina, Chapel Hill

During childhood, the neural systems that support complex cognitive processes, such as executive functions, undergo periods of rapid growth and refinement. This refinement is seen in resting state (RS) coactivation as cortical regions exhibit stronger connections within their own RS network as children get closer to adulthood. Cortical hubs - regions that show strong coactivation with functional networks other than their own - are thought to support the efficient integration of specialized RS networks. While distinct categories of cortical hubs have been identified in adults, the makeup of cortical hubs found in youths is relatively unknown. The current study replicated the general methods previously used with adults to identify and categorize RS hubs in a large, youth sample. Our sample (N=567) combined data collected locally with data from the ABCD study. First, parcels with top 20% highest participation coefficient values for each individual were labeled a hub. We then categorized hub types based on the similarity of hub connectivity profiles, across all participants. We found that youth cortical hubs cluster into four distinct categories (control-default, control-processing (visual), control-processing (auditory + somatomotor), and cross-control) and generally resemble the three hub categories found in adults. However, youth cortical hubs exhibit more diverse connectivity profiles than those found in adults, and youth control-processing hubs are split into two distinct categories. Further, we found that functional coactivation for hubs in both youth control-processing categories were associated with participant scores on a cognitive flexibility task, suggesting that these cortical hubs may play a specialized role in routing sensory information to and from cognitive-control networks. This work suggests that adult-like hubs are seen in middle childhood and offers insight to the possible role of hubs in behaviors dependent on cognitive flexibility.

1-A-6 Influence of semantic language ability on inhibitory control tasks in children across the socioeconomic spectrum

Rita Taylor[1], Deanna Barch[1]

[1]Washington University, St. Louis

Deficits in inhibitory control (IC) over child development have been shown to be associated with worse academic achievement, poorer inter/intra-individual functioning, and increased reporting of behavioral problems. Reduced IC has been a robust finding amongst socioeconomically disadvantaged (SES-D) youth, highlighting the importance of elucidating mechanisms. One mechanism to explore is language ability. Language ability has been found to be strongly associated with both SES-D and IC, with poorer language ability being related to more impoverished youth and poorer performance on IC tasks. Research has theorized that language facilitates internalization of behavioral control through self-talk and symbolic/semantic representations. The current study aims to provide further insight by examining how semantic language influences performance on an IC task across SES. A language-primed go-no-go task will be used, wherein some trials will be preceded by a "congruent" prime, and some trials will be preceded by a "neutral" prime. Multiple regression models will be used to predict behavioral indices of IC (Children's Behavior Questionnaire effortful control subscale and Flanker task) from SES-D, age, sex, and race/ethnicity. Next, the relation between errors of commission (EOCs)/reaction time (RT) on the go-no-go task and SES-D will be determined. If a significant relation between SES-D and EOCs/RT is supported, we will examine trial-type as a predictor of EOCs/RT. This model will predict EOCs/RT from SES-D, trial type and covariates. Finally, the presence of an interaction will be examined (whereby the effect of SES-D on IC task performance depends on trial-type). We hypothesize that "congruent" trials will predict better performance on the go-no-go task across the SES spectrum. We further hypothesize that "congruent" trials will facilitate greater performance in individuals from less impoverished environments compared to individuals from more impoverished environments.

1-A-7 Mindfulness Training is related to Improved Executive Functions in Preschool Children: An EEG Study

Ilana Shlomov[1], Tzipi Horowitz-kraus[1], Nava Levit-Binnun[2]

[1]Technion Israel Institute of Technology, [2]Segol

Mindfulness and kindness (MK) training has been shown to cultivate Executive Functions (EF) and attention capacities in adults and children. Electroencephalography (EEG) based studies in adults, showed higher attention scores following MK training. However, the neurobiological correlates for EF improvement in children following MK training remained unclear. The current study aimed to pinpoint at the impact of MK training on neural circuits supporting EF in typically developing preschoolers using EEG. Fifty-one preschool children participated in the current study. All children were randomly assigned into two intervention groups and took part in an 8-week training program of MK (N= 22) vs an active control group (N=29). Executive functions measures were collected before and after the training sessions, in both groups. EEG data during the Attention Network Task (ANT) was collected after intervention. N200 Event-Related Potential (ERP) previously associated with EF was compared between the groups. The difference between the congruent and incongruent conditions was tested in each group and compared between groups. Behavioral measures showed increased visual attention ability after MK intervention vs the control intervention. The MK group showed smaller difference in amplitude size between congruent and incongruent conditions for the N200 compared to the control group. The results demonstrate the biological mechanism for the effect of MK on EF and suggest that indirect EF training may be beneficial for this young population. The EEG findings of this study regarding the involvement of top-down processes in cognitive regulation following MK training highlight the benefits of MK practice in childhood - a critical period in the development of EF skills.

1-A-8 Training cognitive control in childhood: effects on behavioural intra-individual variability and functional connectivity of cognitive control systems

Roser Cañigueral[1], Claire Smid[1], Keertana Ganesan[1], Abigail Thompson[1], Scott Marek[2], Ryland Miller[2], Andrew Van[2], David Montez[2], Nico U. F. Dosenbach[2], Nikolaus Steinbeis[1]

[1]University College London, [2]Washington University in St. Louis

Cognitive control supports goal-directed and adaptive responses to the environment and is a reliable predictor for later life outcomes. Intra-individual variability measures of cognitive control are particularly sensitive to developmental trajectories. Moreover, brain networks underlying cognitive control are highly plastic: this offers an exceptional opportunity to improve cognitive control and, in turn, later life outcomes. We aim to investigate 1) how behavioural variability in cognitive control and functional connectivity of underlying networks change during childhood, 2) how these measures relate to each other, and 3) the effects of a cognitive control training on these measures. A group of 226 6-11 year-old children underwent an 8-week cognitive control or response speed training. Before (T0) and after (T1) the training children completed a stop-signal task (N T0 = 226; N T1 = 162), and a subgroup also completed a 5-minute resting-state fMRI scan (N T0 = 122; N T1 = 64). We will measure behavioural variability in cognitive control as the intra-individual variability in stop-signal response time (estimated using a Bayesian Parametric Approach). Moreover, resting-state brain activity will be processed with the ABCD-BIDS pipeline and resting state functional connectivity (RSFC) will be computed for the cingulo-opercular (CON), fronto-parietal (FPN) and sensorimotor networks. At T0 we expect that behavioural variability in cognitive control will be negatively correlated with age, and that RSFC for CON and FPN will increase with age. Moreover, greater RSFC for CON and FPN will be linked to reduced behavioural variability in cognitive control. At T1 we expect that children in the cognitive control training group will show reduced behavioural variability in cognitive control and greater RSFC for CON and FPN. These findings will further our understanding of cognitive control development and help identify potential intervention targets to improve later life outcomes.

1-A-9 Brain functional topology in infancy predicts error detection twelve months later

Josué Rico-Picó[1], Sebastián Moyano[1], Ángela Conejero[1], Ángela Hoyo[1], M. Ángeles Ballesteros-Duperón[1], M. Rosario Rueda[1]

[1]University of Granada

AIM: In the first years of life, functional brain connectivity evolves towards a more small-world network topology, which increases global efficiency of information processing within the network. In addition, during the second half of the first year, infants can detect the violation of expectations based on arithmetic operations, physical laws, etc. This effect is accompanied by a negative deflection and a burst of theta activation in the frontal midline, and is considered a brain marker of executive attention. However, little is known about how global functional connectivity relates to error detection in the first years of life. We explored whether early brain network topology at six months relates to the detection of physical laws violation one year later. We expected to observe a frontal error-related negativity (ERN) linked to the observation of violations, and that this effect would be longitudinally related to increased functional network integration. METHOD: We computed functional brain connectivity in gamma band (N=158) at six months in an EEG resting protocol, focusing on measures of efficiency integration: path length, global efficiency, and local efficiency. A subsample of participants (valid n=33) carried-out an ERN experimental protocol in which they observed videos with objects that violated vs not-violated physical laws during EEG registration at age 16-18 months. RESULTS: Babies showed greater frontal negativity in response to objects that violated laws of gravity and solidity ($t32= 3.05$, $p=0.005$). The ERN amplitude (violation>no violation) at 16 months of age was predicted by measures of global efficiency ($F(1,24)=5.591$, $p=.027$, $\beta=-.442$, $R^2=.161$) and path length ($F(1,24)=7.465$, $p=.012$, $\beta=.495$, $R^2=.212$) at 6 months of age. CONCLUSION: Our results indicate that more efficient integration of information in infancy is associated with ERNs of smaller amplitude, which might suggest increased efficacy of executive attention mechanisms of error detection.

1-A-10 Creating different cognitive and neurobiological profiles in typically developing children using a nonparametric approach: an fMRI study

Victoria Khalfin Fekson[1], Tzipi Horowitz-Kraus[1]

[1]Technion Israel Institute of Technology

Executive Functions (EF) is an umbrella term for a set of mental processes gearing towards goal-directed behavior, problem-solving, and planning. One of the critical functional networks associated with EF is the Default Mode Network (DMN). Due to the conflicting involvement of inhibition (a main sub-function in EF) in several emotional and cognitive deficits in childhood, the current study uses inhibition control tests to create profiles in a large sample (N=5055) of adolescence ages 9-10 from the Adolescent Brain Cognitive Development (ABCD) study. Using a Latent Profile Analysis approach, the behavioral data related to inhibition control was automatically divided into four different inhibition classes: Behavioral Inhibition, Cognitive Inhibition, Attention/Hyperactivity, and Controls. For each class, resting state based functional connectivity (FC) within the DMN was calculated, using a novel non-parametric approach for detecting group similarities. Different DMN segregation profiles were found for each class, with a higher FC between the anterior and posterior parts in the Behavioral Inhibition class, reduced FC within the anterior part in the Cognitive Inhibition class, and a higher FC with the precuneus and within the right hemisphere, in the Attention\Hyperactivity class. These results align with previous findings of DMN segregation characteristics. The DMN's anterior-posterior connectivity was previously associated with increased brain maturation, reduced functional connectivity within the frontal DMN was related to delayed brain maturation and attention abilities, the precuneus connectivity was related to the motor system and DMN's right lateralization was associated with brain disorders. Hence, the current study demonstrated that a group of typically developing children may show different cognitive and neurobiological subgroups. Using artificial intelligent tools, these results could be further used as a cognitive profiler along with development.

1-A-11 Can immaturity be adaptive? Developmental changes in the interaction between top-down control and experiential learning in a predictable task environment

Dietsje Jolles[1], Zdena Op de Macks, Margot Schel, Bruno Bocanegra[2], Linda Van Leijenhorst[1]

[1]Leiden University, [2]Erasmus University Rotterdam

The ability to learn in a top-down, controlled manner greatly benefits from the maturation of the prefrontal cortex, and associated cognitive control abilities. However, it has been argued that other types of learning, e.g. picking up statistical patterns from the environment, may suffer from increased control. The aim of the present study was to characterize changes in the interaction between these two types of learning across development. A total of 142 participants, including 28 third graders (7-9 yrs, 60% females), 52 sixth graders (10-12 yrs, 50% females), and 62 adults (17-36 yrs, 75% females), performed a rule-application task with complex and simple task instructions (Bocanegra & Hommel, 2014). The complex instructions involved a feature-conjunction rule intended to emphasize the need for top-down control. The simple instructions involved a single-feature rule that could be applied relatively automatically. Unbeknownst to the participants, half of the trials contained an additional feature that predicted the correct response, which could be learned through feedback. Results showed a facilitative effect of the predictive feature on response times and accuracy, which was enhanced in the simple task relative to the complex task. Response time benefits were largest in third graders and smallest in adults, with sixth graders in between. Accuracy benefits showed a more complex pattern involving a three-way interaction. This interaction was characterized by a nonlinear change in the effects of the predictive feature on the complex relative to the simple task across development. Taken together, our findings suggest that top-down control may interfere with the automatic detection of predictive cues in the environment, which is consistent with prior research in adults. Yet, the ability and/or willingness to exert top-down control changes across development. As a result, qualitative differences in learning may occur between children, adolescents, and adults.

1-A-12 Reduced inter-subject correlations of brain activity patterns during lexicosemantic decision in adolescents with ASD

Kalekirstos Alemu[1], Apeksha Sridhar[1], Molly Wilkinson[1], Ksenija Marinkovic[2], R. Joanne Keehn[1], Annika Linke[1], Ralph-Axel Müller[1]

[1]San Diego State University Brain Development Imaging Labs, [2]Spatio-Temporal Brain Imaging Laboratory

Inter-subject correlation (ISC) is a method used in functional magnetic resonance imaging (fMRI) to detect brain response similarity across individuals while viewing natural stimuli. A few studies have reported reduced similarity across individuals with autism spectrum disorder (ASD), in comparison with typically developing (TD) peers while watching movies. We aimed to assess brain response similarity between ASD and TD participants while performing a complex task involving several cognitive domains impacted in ASD, including lexical processing, sustained attention, executive function and behavioral flexibility. 19 ASD and 19 TD adolescents performed a lexicosemantic decision task with trial order kept constant across participants. Groups were matched on age, gender, handedness, non-verbal IQ and in-scanner head motion (RMSD). A 7min fMRI scan was performed using a multi-echo simultaneous multi-slice protocol and was denoised using ME-ICA. Within-group similarity was calculated as the average ISC of each participant to all other participants within the same group. Typicality was measured by averaging ISC between each participant and all TD participants. Similarity and typicality group differences (FDR-adjusted, $p<.05$) were assessed for 106 ROIs (Harvard-Oxford atlas) using ANOVAs with age and RMSD as covariates. While both groups performed at high levels, the ASD group showed significantly lower accuracy (92% vs. 94%, $t(36)=-2.954$, $p=.005$). Similarity and typicality were significantly reduced in the ASD group (16 and 14 regions, respectively, 9 of which overlapped) in the temporal, parietal, and frontal lobes in the right hemisphere as well as in bilateral inferior lateral occipital cortex. Our findings suggest that cortical responses during complex lexicosemantic decision are idiosyncratic in ASD. Planned analyses will assess how similarity and typicality of these brain responses are related to task performance, cognitive control, and language skills in ASD.

1-B-13 The impact of depression on mothers' neural processing of their adolescents' social cues

Marjolein Barendse[1], Nicholas Allen[1], Lisa Sheeber[1], Jennifer Pfeifer[1]

[1]University of Oregon

Parent-child relationships are essential for child wellbeing, also in adolescence. Depression affects neural processing of emotional stimuli, and could, through that, impact parent-child interactions. However, it is unknown how mothers with depression process their own adolescent children's affective and interpersonal signals compared to mothers without mental health problems and how this neural processing relates to the mother's parenting behavior as observed during parent-child interactions. 64 mothers with depression and 51 mentally healthy mothers (M age 40 years; M age of child 12.8 years) were included in analyses. They completed an interaction task, which was coded for aggressive, dysphoric, positive and neutral affective behavior of the parent as well as the adolescent. The fMRI task presented their own adolescent's affective behavior drawn from the interaction task, as well as the same affects shown by an unfamiliar adolescent. Mothers with depression showed more aggressive and less positive affective behavior during the interaction task. They also showed more bilateral insula, inferior frontal gyrus and striatum activation while viewing aggressive and neutral affect, whereas the control group activated self-related regions (medial prefrontal and precuneus) more while viewing happy or dysphoric affect. More aggressive and dysphoric behavior by the parent was associated with similar patterns of activation as being in the depression group. Interestingly, findings were comparable for viewing familiar and unfamiliar adolescents' affect. Thus, depression is associated with altered processing of affective behavior of both close others and unfamiliar others and this might partially explain more negative behavior during parent-child interactions.

1-B-15 Cognitive control during an emotional interference task in adolescence: A BANDA study

Haley Hegefeld[1], Yoon Ji Lee[1], Susan Whitfield-Gabrieli[1], Juliet Davidow[1]

[1]Northeastern University

STUDY OBJECTIVE: Impairment in cognitive control during emotional distraction is an essential facet of anxiety and mood disorders and may be pronounced in adolescence. Additionally, the neural circuitry supporting cognitive control-related and emotion-related behavior, specifically in the prefrontal cortex, undergoes significant change during adolescence. Thus, examining the brain bases of impaired emotional cognitive control is crucial to furthering our understanding of the development of psycho-pathology. METHODS: To address this issue, 199 participants 14-18 years old completed an emotional interference task while undergoing fMRI. Participants attended to or ignored face stimuli expressing fearful or neutral emotion. Clinician interviews diagnosed participants in accordance with the DSM-V. RESULTS: Using mixed-effect regression we ask how inhibitory behavioral accuracy was attributed to predictors of interest. We found that including Goal (Attend v. Ignore), Valence (Fearful v. Neutral), Age, and Diagnosis (Healthy Control, Anxiety, Depression, Anx/Dep), with interaction terms and a random effect for Participant identity, was the best fitting model, $\chi^2(34)=37.48$, $p=.039$. Collapsing over Diagnosis and Age, there was an interaction in accuracy for Goal by Valence, $B(573)=0.03$, $p=.048$. Post-hoc paired-sample t-tests showed a significant difference between the Attend-Fear and Ignore-Fear conditions, $t(198)=3.19$, $p=.002$, suggesting interference when inhibiting to a fearful face for all participants. Additional behavioral results, including results about diagnostic group, and brain analyses will also be presented. CONCLUSIONS: Preliminary analyses indicate deficits when inhibiting a fearful face stimulus, consistent with previous findings that emotional distraction interferes with goal-directed actions during adolescence. This may contribute to our understanding of how a key feature of anxiety and mood disorders, emotional cognitive control, develops in adolescence.

1-B-16 Behavioral and neural responses to processing facial expressions and their links with peer victimization

Sanne Kellij[1], Gerine Lodder[2], René Veenstra[3], Berna Güroğlu[4]

[1]Groningen University / Leiden University, [2]Tilburg University, [3]Groningen University, [4]Leiden University

Based upon predictions from the Social Information Processing theory, victims of bullying might become hypersensitive to negative social cues (e.g., angry facial expressions). This hypersensitivity might influence social cue processing and subsequent behavior in social interactions. Thus, the current study aims to examine links between peer victimization and processing. Participants are recruited from schools that participate in the KiVa anti-bullying program. We aim to include 105 children (aged between 9-12; current N=53) who have at least two victimization measurements (Bully/Victim questionnaire of Olweus, 1996) in the last two years. During the fMRI task participants are presented with facial expressions (neutral, happy, angry, afraid, sad, surprised) and scrambled control faces. They judge either the gender of the face (boy/girl) or the direction of the arrow (left or right). An emotional dot-probe task where participants are presented with neutral, angry, happy and afraid faces, is assessed outside the scanner. At the behavioral level, we expect that average peer victimization over the last two years is related to a larger attentional bias towards negative facial expressions, as indicated by faster reaction times in the emotional dob-probe task. At the neural level, we expect that children who report higher levels of peer victimization over the last two years show stronger amygdala responses to negative expressions (angry, afraid, sad). Furthermore, we want to explore whether emotional faces differentially activate areas important for social processing (insula, anterior and posterior cingulate cortex and MPFC). The findings of the study will inform us on whether peer victimization is related to emotional cue processing. Interpretation of facial emotions is crucial for social information processing and in maintaining social relationships. As such, hypersensitivity might be an important factor to address in anti-bullying interventions.

1-B-17 Temperamental typologies in the ABCD study: Implications for psychopathology risk factors

Lauren Hill-Bowen[1], Jessica Flannery[1], Arshitha Basavaraj[2], Matthew Mattoni[3], Sarah Hartmann[1], Angela Laird[1], Elisa Trucco[1], Matthew Sutherland[1]

[1]Florida International University, [2]National Institute of Mental Health, [3]Temple University

INTRO: Adolescence is a key developmental period in which early markers of mental illness emerge. Research has sought to identify early risk/protective factors of psychopathology to inform targeted interventions. Among such factors is temperament, which manifests in childhood and is multidimensional in nature. The current study identifies typologies of temperament and examines which profiles are associated with psychopathology in females and males. METHODS: Participants were a subset of 6,605 youth from the ABCD Curated Annual Release 3.0 (43% female, mean age 12, 54% white). To identify temperament profiles, latent profile analyses (LPA) were conducted separately across sex on parent-reported Early Adolescent Temperament Questionnaire levels of effortful control (EC), surgency (S), negative affectivity (NA), and affilitiaveness (A). Ancillary linear mixed-effects models examined whether identified profiles significantly differed on psychopathology risk measures and task performance (i.e., inhibitory control/attention and processing speed). RESULTS: Female-LPA results indicated three profiles: internalizing [n=417, (low EC/high NA)], typical [n=1497, (moderate-all scales)], and resilient [n=953, (high EC/low NA)]. Male-LPA results indicated four profiles: internalizing [n=590, (low EC/high NA)], typical [n=1447, (moderate-all scales)], resilient [n=832, (high EC/low NA)], and withdrawn [n=329, (low S/low A)]. Across sex, follow-up analyses indicated profiles significantly differed on psychopathology scores: internalizing, externalizing, detachment, neurodevelopment, and somatoform, and task performance (Bonferroni-adjusted $p<.007$). Resilient profiles displayed lower psychopathology and better task performance versus internalizing ($p's<.01$). CONCLUSIONS: Examining adolescent temperamental typologies may identify those at greatest risk for psychopathology. Adolescents with internalizing profiles may be at high risk, while resilient profiles may be at low risk.

1-B-18 Babies - processing of emotional expressions: multivariate pattern analysis of EEG signals

Angela Conejero[1], Eduardo López-Larraz[2], Angela Hoyo[1], Maria Concepción Castellanos[1], Luis Montesano[2], M. Rosario Rueda[1], María Ángeles Ballesteros[1], Aurelie Coubart

[1]University of Granada, [2]BitBrain

The understanding of others' emotions is a key milestone in human development. Infants show preferential looking to face-like stimuli, and analyses of looking time to emotional faces indicate that infants are able to discriminate between happy and fearful faces. However data on the brain basis of this preferential behavior are still unclear. Infant research commonly uses EEG as a method to investigate functional brain activity associated with cognitive processing, and the analysis of Event-related Potentials (ERPs) has been the traditional approach to analyze EEG signals. Results from existing ERPs research regarding infants' processing of emotional expressions have yielded inconsistent findings. The present study aimed at investigating infants' brain activity in response to emotional faces using a multivariate pattern analysis (MVPA) approach. We expected to find significant differences in brain patterns shown by infants to different emotional expressions (fearful, happy and neutral) in adult faces. For this purpose, faces showing different emotions were randomly presented to infants (initial N=50, final n=21; mean age=10.81 months) while EEG activity was recorded with a high-density 128-channels sensor net. Using MVPA we found that the brain activity patterns among the three conditions were significantly different ($p = 0.009$). A post-hoc analysis comparing happy and fearful conditions did not reveal distinctive patterns between them ($p = 0.11$).This suggests that the brain of infants show differential processing of emotion vs neutral stimuli, which can be traced by analyzing the overall pattern of EEG signals. However, MVPA failed to specifically distinguish brain activation for positive vs negative emotions. Future studies with larger samples and greater number of trials per condition might improve statistical power and lead to increased levels of specificity. Nevertheless, MVPA seems a promising tool to investigate infants' emotion processing at a system level.

1-B-19 Leveraging hierarchical growth curve modeling with parcellated fMRI data to rigorously test the adolescent social reorientation model

Danielle Cosme[1], John Flournoy[2], Jordan Livingston[3], Matthew Lieberman[4], Mirella Dapretto[4], Jennifer Pfeifer[5]

[1]University of Pennsylvania, [2]Harvard University, [3]University of Toronto, [4]University of California, Los Angeles, [5]University of Oregon

Adolescence is widely characterized as a period when social relationships shift toward peers. The adolescent social reorientation model posits this shift is driven by neurobiological changes that increase the salience of peer relationships and social status. This model has been highly influential and is frequently used to interpret adolescent developmental trajectories. However, it has rarely been subjected to rigorous tests that have the potential to falsify its propositions. In this study (N = 78), we tested whether sensitivity to status-related social information (compared to academic-related information) increases in early- to mid-adolescence by examining longitudinal changes in neural responses during a self/other evaluation task. We expected these changes to occur uniquely in brain regions associated with social cognition. However, massively univariate fMRI methods cannot test whether neural responses differ between brain regions. Therefore, we used a novel approach and applied growth curve modeling to whole-brain parcellated data to test the uniqueness of the developmental trajectories in social brain regions compared to a set of control regions. By pooling information across the whole brain in the model, we increased power to detect developmental effects beyond standard univariate methods. Whereas no clusters of activation survived thresholding in univariate contrasts assessing age-related changes in neural responses to status- versus academic-related information, the parcellation analysis revealed an adolescent-emergent trend in social brain regions compared to control regions. Critically, this developmental trajectory was not unique to status-related social information. This indicates weak evidence for a central tenet of the model. Consequently, this finding qualifies existing models of adolescent social reorientation and highlights the importance of adopting novel analytic methods that enable rigorous test of developmental theories.

1-B-20 Does Maternal Depression History Moderate Youth Reaction to Mothers' and Peers' Social Evaluation? An fMRI-daily diary study

Reuma Gadassi-Polack[1], Erica Ho[1], Wisteria Deng[1], Richard Watts[1], Dylan Gee[1], Jutta Joormann[1], Hedy Kober[1]

[1]Yale University

Maternal depression increases risk for offspring depression. While the specific mechanisms underlying risk transmission are unclear, one critical factor may be aberrant emotional reactivity to social feedback. Past work has demonstrated that adolescents at risk for depression exhibit aberrant neural reactions to positive and negative stimuli in general; however, few studies have employed social stimuli, and none have assessed the impact of parents vs. peers. The present study examines neural responses to social evaluation in adolescents at high (vs. low) depression risk. Data collection is ongoing (N=21 of 60). In the scanner, participants listen to pre-recorded critical, praising, and neutral comments from their mother and a peer. To increase ecological validity, we complemented fMRI with daily assessments of social experiences and depressive symptoms (28 days). Hypothesis 1: Those at high risk will respond to: (a) criticism with greater activation in brain regions related to negative affect (e.g., amygdala), and less activation in regions related to cognitive control (e.g., dlPFC/vlPFC); and (b) praise with less activation in reward circuitry (e.g., ventral striatum) and increased activity in regions related to cognitive control (e.g., dlPFC/vlPFC). Analytic Plan. Group-level analysis will examine differences between conditions (e.g., high risk group+maternal criticism>low risk group+maternal criticism). We will also focus on the amygdala, ventral striatum, and dlPFC/vlPFC as a priori ROIs. Hypothesis 2: Neural responses to criticism and praise will moderate the association between social evaluation and depressive symptoms in daily life. Analytic Plan. Neural responses to criticism and praise will be examined as a moderator of the daily praise/criticism-depression association. Implications: This multi-method study advances our understanding of the mechanisms through which maternal depression confers risk for offspring, and helps identify modifiable risk factors

1-B-21 Valence Flexibility in Appraising Self and Others: Effects of Development Before and After COVID-19

Jennifer Britton[1], Beatriz Yepes[1], Stephanie Novotny[1], Evan Burdette[1]

[1]University of Miami

Valence flexibility, the ability to switch between negative and positive emotions, may be critical for normative socio-emotional development. Task-switching studies have examined cognitive flexibility and flexibility switching between cognitive and emotional attributes. However, no studies have examined how individuals can effectively switch between making negative and positive appraisals about oneself or others. Peer relationships change during adolescence; therefore, understanding the development of valence flexibility is important within an emotion-based interpersonal context. During fMRI acquisition, 73 9-20 years old (mean 15.8±3.4 years, 43 females, 60% Hispanic, 74% White/Caucasian) indicated whether positive or negative statements generally described themselves (i.e., self-appraisal) or a close friend (i.e., other appraisal). Additionally, participants completed a mixed run that included both appraisals. Consecutive statements were either the same or different valence. Significant 4-way interactions between run (i.e., self, other, mixed), previous trial-valence (i.e., positive or negative), trial type (switch vs. repeat) and age are expected in analyses of reaction times (RT) and neural activation in emotional processing regions (e.g., amygdala, striatum, ventromedial prefrontal cortex) and regions of the central-executive, default mode and salience networks. Social distancing policies during COVID-19 required youth to change how they interact with peers. 26 individuals (16.9±3.6 years, 14 females, 70% Hispanic, 77% White/Caucasian) completed a follow-up scan approximately 10 months after COVID stay-at-home orders. Baseline valence inflexibility is expected to predict worse behavioral, neural and clinical outcomes during the chronic stress of COVID-19. Understanding the changes in valence flexibility when making appraisals under different stress conditions may offer insight into the mental health and risk for developing psychopathology.

1-C-23 Young children form highly specific memory for structured experiences

Tess Allegra Forest[1], Zahra Abolghasem[1], Amy Finn[1], Margaret Schlichting[1]

[1]University of Toronto

Statistical learning allows extraction of meaningful information from patterned inputs like reliable sequences of visual stimuli. Such learning is thought to support the ability to predict future events, or understand general item co-occurrence. Much work has shown that people can discriminate the most reliable, frequently occurring item sequences from foils already in infancy. However, we know little about the particular nature of information used to support these decisions--for example, whether learners are remembering the specific order of shapes and/or their general groupings-- and whether this varies with development. We hypothesized that due to earlier maturation of neural systems underlying representation of specifics (hippocampus) relative to those supporting abstraction across repeated experience (hippocampus-medial prefrontal cortex connections), sensitivity to specific transitions would emerge earlier in development than would sensitivity to groups. We tested this by showing 5-9 year old children and young adults (N=211 total) a stream of individual shapes that contained triplets which were always presented in the same order (e.g. ABC, DEF), followed by an old-new memory test including lure sequences that matched exposure on either transitions (BCD) or groupings (CBA). We found that, accounting for overall age differences in memory, all groups were sensitive to intact transitions, such that their "old" responses to transition lures were elevated. In contrast, order-independent group membership did not develop until age 8: only older children and adults endorsed grouplures containing scrambled triplets as "old". We also assessed memory for ordinal position, which did not impact behaviour at any age. Our results highlight that young children form highly specific memories for their experiences, while the ability to form representations emphasizing commonalities across events emerges later. These results also inform ongoing related neural investigations.

1-C-24 Longitudinal changes in white matter properties, not cross-sectional differences, predict development of reading and math scores

Ethan Roy[1], Manjari Narayan[1], Adam Richie-Halford[2], John Kruper[2], Timothy Brown[3], Terry Jernigan[3], Ariel Rokem[2], Jason Yeatman[1]

[1]Stanford University, [2]University of Washington, [3]University of California, San Diego

Past research has linked differences in white matter (WM) tissue properties to differences in reading and math abilities in children. In this study, we tested two hypotheses surrounding the relationship between WM and academic skills. First, we aggregated two large-scale, publicly available datasets (HBN; PING; N=2129) to test if differences in WM structure serve as static traits that predict academic abilities across development. Second, we leveraged a four-year longitudinal dataset (PLING) to test the hypothesis that the WM is part of a dynamic, experience-dependent system that is linked with learning over time. To explore the first hypothesis, we compared differences in diffusion metrics across four groups (low reading, low math, low reading/math, and control) in several WM tracts implicated in the literature. In the largest sample to date, we found no group differences in WM properties. We then trained gradient-boosted random forest models on both diffusion and demographic data to examine high-dimensional predictions of reading and math scores. These models consistently showed that WM did not improve predictions above demographic factors. To link an individual's white matter development to their learning trajectory, we calculated individual rates of WM development along with changes in reading and math scores. Correlation analysis and linear-mixed effects models revealed a significant relationship between the rate of an individual's WM development and their rate of reading score change (but not math scores). For an individual, year to year change in arcuate fasciculus diffusion properties tracked growth in reading skills. In summary, we find that WM properties should not be interpreted as static traits that differentiate individuals but, rather, that WM and learning are dynamically linked systems that systematically change over the course of an individual's educational experience.

1-C-25 Learning about Safety: Neural Correlates of Conditioned Inhibition in Typical Development

Paola Odriozola[1], Sahana Kribakaran[1], Stephanie DeCross[2], Emily Cohodes[1], Jason Haberman[1], Katie McLaughlin[2], Dylan Gee[1]

[1]Yale University, [2]Harvard University

BACKGROUND: Adolescence is a peak time for the onset of psychiatric disorders, with anxiety disorders being the most common and affecting as many as 1 in 3 youths (Kessler et al., 2005). A core feature of anxiety disorders is difficulty regulating fear, with evidence suggesting diminished extinction learning and corresponding alterations in frontolimbic circuitry (Lee et al., 2014). Safety signal learning, based on conditioned inhibition of fear in the presence of safety, has been shown to effectively reduce anxiety-like behavior in animal models and attenuate fear responses in healthy adults (Christianson et al., 2012; Odriozola and Gee, 2020). Cross-species evidence suggests that safety signal learning involves connections between the ventral hippocampus and the dorsal anterior cingulate cortex in adulthood (Meyer and Odriozola et al., 2019). Particularly because this pathway follows a different developmental trajectory than fronto-amygdala circuitry involved in traditional extinction learning, safety cues may provide a novel approach to reducing fear in youths. METHODS: fMRI data were collected during a developmentally-adapted safety signal task (n=60; ages 10-18; no psychiatric diagnoses). Conditioned stimuli consisted of geometric shapes and the unconditioned stimulus was an aversive noise (CS+: 50% reinforcement rate). This task included the pairing of a safety signal (CS-) with a conditioned stimulus (CS+) and an extinction block. fMRI data will be analyzed using FSL for a priori ROI-based analyses. HYPOTHESES: We hypothesize that hippocampal-dACC functional connectivity will be involved in safety signal learning in youth, as has been shown in adults, whereas extinction will involve stronger fronto-amygdala functional connectivity. Lastly, we hypothesize that there will be stronger hippocampal-dACC functional connectivity during safety signal learning in adolescents than in children.

1-C-26 Exploration heuristics decrease during youth

Magda Dubois[1], Aislinn Bowler[1], Madeleine Moses-Payne[1], Johanna Habicht[1], Rani Moran[1], Niko Steinbeis[1], Tobias Hauser[1]

[1]University College London

OBJECTIVE: Deciding when to explore new avenues or forego known exploitative choices is central to learning. Recent evidence has shown that exploration is not a unitary concept and that humans deploy multiple distinct strategies to solve this trade-off, including computationally demanding mechanisms and computationally cheap heuristics. Solving this exploration-exploitation trade-off changes during development, but little is known about the emergence of these strategies. Here, we investigate changes in exploration during development by focusing on the balance between computationally demanding strategies and inexpensive heuristics. METHODS: We used a novel exploration task and computational modeling to investigate how different exploration mechanisms change during childhood and adolescence. We compared 26 children (8-9 year old), 38 early adolescents (12-13 yo) and 33 late adolescents (16-17 yo) and assessed specific model and behavioural indicators for exploration strategies. RESULTS: We demonstrate that children and younger adolescents rely more heavily on value-free random exploration, a computationally light exploration heuristic (age main effect: $F(2, 94)=3.702$, $p=.028$; pairwise comparisons: children vs late adolescents: $t(52)=3.229$, $p=.002$; early vs late adolescents: $t(76)=2.982$, $p=.003$; children vs early adolescents: $t(52)=.581$, $p=.562$). Moreover, we show that excessive usage of this exploration heuristic is linked to ADHD symptoms ($r=.260$, $p=.010$). CONCLUSION: Our results demonstrate that when exploring, computationally light heuristics are predominantly used by children to counteract their limited neurocognitive resources, but less so during adolescence. Overall this study shows how exploration can be performed using different strategies, in accordance with ones developmentally-governed limited capabilities.

1-C-27 Longitudinal cortical changes in audio-visual letter-sound processing in typically reading children

Linda Romanovska[1], Roef Janssen[1], Milene Bonte[1]

[1]Maastricht University

While children are able to name letters fairly quickly following the onset of reading instruction, the automatization of letter-speech sound mappings continues over the first years of reading development. To explore the neurocognitive underpinnings of this developmental change, we conducted a longitudinal fMRI study in typically reading 8-11 year-old children using text-based recalibration. In this paradigm, combined exposure to text and ambiguous speech sounds shifts children's later perception of the ambiguous sounds towards the text, tapping into perceptual learning mechanisms relevant to the acquisition of letter-speech sound associations. Our results revealed a significant developmental change in audio-visual letter-speech sound responses in the left superior temporal gyrus. Namely, activity in this region followed an inverted-u-shape developmental pattern with a peak in activation during the second measurement that was driven by 9-year-olds. As similar inverted-u trajectories have been reported for children's visual cortical responses to text, this non-linear pattern of changes may indicate specific learning phases while the brain adapts it's circuitry to the task of reading.

1-C-28 Statistical learning in newborn infants and fetuses in the last trimester of pregnancy

Julia Moser[1], Laura Batterink[2], Franziska Schleger[1], Magdalene Weiss[3], Ken Paller[4], Hubert Preissl[1]

[1]Helmholtz Center Munich at the University of Tübingen, [2]Western University, [3]University of Tübingen, [4]Northwestern University

Statistical learning refers to the detection of statistical regularities in the environment. It is most noted for its role in language acquisition, but also operates across nonlinguistic auditory and visual stimuli. Evidence of statistical learning has been found in infants under 1 year old, but whether this form of implicit learning may emerge even earlier, prior to birth, has not yet been examined. To address this question, we investigated 15 newborns in the first eight weeks of life and 36 fetuses between week 32 and 38 of gestation. Compared to the preregistered sample size of 36 per group (https://osf.io/5vdfe) fewer newborn data could be acquire because of the pandemic situation. Participants were exposed to sequences made up of 12 pure sinusoidal tones between 261.63 and 932.33Hz, arranged in two conditions: one structured - containing repeating tone triplets - and one random. Tones in this frequency range are transmitted relatively unaltered through maternal tissue, compared to speech stimuli that possess a more complex frequency structure. All participants were exposed to both conditions while their brain signals were measured with (fetal) magnetoencephalography (MEG). As an index of statistical learning, we will measure neural entrainment to the triplet structure by computing inter-trial phase coherence (ITC) from the MEG signal. Specifically, ITC will be measured at the frequency of a single tone (3Hz) and of a tone triplet (1Hz). We hypothesize that ITC values at the triplet frequency will be higher in the structured condition compared to the random condition. Furthermore, we will split the data into segments to test the prediction that ITC values in the triplet frequency will increase over the exposure period (13 min) in the structured but not in the random condition. Demonstrating statistical learning in newborns and possibly even in fetuses in the last trimester of pregnancy will give new insights into the ontogeny of this important form of learning.

1-D-29 Discounting rates and reward in the ABCD cohort: Relationship to social, familial and clinical factors

Robert Kohler[1], Sarah Lichenstein[1], Sarah Yip[1]

[1]Yale University

Adolescence is a period of development marked by the emergence of substance use and increased risk for other psychiatric disorders. Identifying at-risk individuals before the onset of substance-use or psychopathology would provide opportunities for early clinical interventions that may reduce future severity. Delay discounting is a well-established assessment of decision-making that has been proposed as a putative risk marker for early substance-use initiation and other forms of psychopathology. However, the extent to which other key factors (e.g., socioeconomic status, cognitive ability, brain areas subserving reward processes) relate to discounting behavior in young adolescents is not well established. The present study leverages baseline data from the Adolescent Brain and Cognitive Development (ABCD) study to assess associations between demographic and familial variables and hyperbolic delay discounting rates (k) in youth before the onset of significant psychopathology using mixed-effect models. A canonical correlation analysis (CCA) was performed between neural activation during reward anticipation trials on the Monetary Incentive Delay task and behavioral measures of reward. Effect size estimates revealed robust effects of multiple variables related to social determinants of health including familial income, parental education, and parental marital status. CCA results revealed discounting behavior significantly contributes to multivariate associations between brain areas and behavioral measures of reward. Taken together, the present results suggest structural, demographic and familial variables may impact differences in impulsive decision-making during early adolescence. These differences in decision-making behavior may be associated with brain areas of reward during anticipatory events. Future ABCD releases will help determine the extent to which these associations relate to the onset of substance-use or psychopathology.

1-D-30 The structural brain basis of model-based and model-free decision-making in childhood

Claire Smid[1], Abigail Thompson[1], Keertana Ganesan[1], Roser Canigueral[1], Wouter Kool[2], Tobias Hauser[1], Nikolaus Steinbeis[1]

[1]University College London, [2]Washington University in St Louis

Human behavior is supported by both goal-directed and habitual decision-making and the arbitration between these systems is thought to be regulated by a process known as metacontrol. How these systems emerge and develop in humans remains poorly understood. Recently, it was found that model-based decision-making and its metacontrol emerge during childhood (Smid et al. 2020). Here, we expand on that work by studying structural brain development in children to illuminate which brain regions support this developmental emergence. We collected decision-making data using a two-step task (Kool et al. 2017) of 68 children aged 6-13 years and we measured brain structure and structural connectivity using Magnetic Resonance Imaging.

Previous research with adults has found model-based decision-making to be supported by connectivity between frontal areas such as the dorsolateral prefrontal cortex and reward-related areas such as the striatum (Lee et al. 2014). In this study, we will assess whether the structural development of frontal brain areas similarly supports the development of model-based decision-making in children. Behavioral decision-making data will be analyzed with various computational modeling methods, such as a dual-system reinforcement-learning model, and hierarchical modeling, while MRI data will be analyzed in terms of cortical thickness and structural connectivity. This study will provide evidence on the neurocognitive underpinnings of model-based decision-making and its metacontrol during childhood. Lee, S. W., Shimojo, S., & O'Doherty, J. P. (2014). Neural computations underlying arbitration between model-based and model-free learning. Neuron, 81(3), 687-699. Kool, W., Gershman, S. J., & Cushman, F. A. (2017). Cost-benefit arbitration between multiple reinforcement-learning systems. Psychological science, 28(9), 1321-1333. Smid, C. R., Kool, W., Hauser, T. U., & Steinbeis, N. (2020). Model-based decision-making and its metacontrol in childhood. PsyArXiv.

1-D-32 Characterizing puberty-related changes in fronto-striatal resting-state functional connectivity in adolescence

Amar Ojha[1], Ashley Parr[1], Will Foran[1], Finnegan Calabro[1], Cecile Ladouceur[1], Beatriz Luna[1]

[1]University of Pittsburgh

Sensation-seeking and reward sensitivity peak during adolescence and are supported by frontostriatal connectivity. Frontostriatal functional connectivity (FSFC) show decreases with age. However, the role of pubertal maturation, after accounting for age, on the FSFC specialization remains unclear. Evidence suggests that reward sensitivity, risk taking, and nucleus accumbens (NAcc) activation are associated with pubertal maturation. Here, we leverage two developmental datasets of 149 adolescents (76 girls) (205 total scans) ages 10-18 imaged in the same 3T MRI scanner with self-report measures of pubertal status (adrenal and gonadal axes computed from the Pubertal Developmental Scale), to compute functional connectivity of the NAcc with four vmPFC subregions that underlie reward processing. Age-related changes in FSFC were assessed using both linear mixed effects models and non-linear (generalized additive mixed models, GAMMs). Among regions showing significant age effects, we further investigated whether vmPFC-NAcc connections were associated with pubertal development, after controlling for age. FDR was applied to control for multiple comparisons. As previously shown, GAMMs showed non-linear age-related decreases across all four vmPFC-NAcc FCs (p's<.001). After controlling for age, puberty-related non-linear development was observed for rACC-NAcc (GAMM pcorrected =.048), and linearly for anterior vmPFC-NAcc (pcorrected=.007), with the latter driven primarily by changes in the adrenal axis (pcorrected<.001). There were no sex effects (p's>.05). These effects were driven by decreases in the last two stages of pubertal development. Findings suggest that the later stages of pubertal maturation play a primary role in the specialization of decision-making and reward learning systems (e.g., rostral ACC/vmPFC-NAcc) in parallel to adolescent peaks in sensation-seeking.

1-E-33 Exploring neural correlates of behavioral and academic resilience among children in poverty

Monica Ellwood-Lowe[1], Carolyn Irving[1], Silvia Bunge[1]

[1]University of California, Berkeley

Children in poverty must contend with systems that do not meet their needs. We explored what, at a neural level, helps explain children's resilience in these contexts. Lower coupling between the lateral frontoparietal network (LFPN) and default mode network (DMN)--linked, respectively, to externally and internally directed thought--has previously been associated with better cognitive performance. However, we recently found the opposite pattern for children living in poverty: higher LFPN-DMN connectivity associated with better test performance. Here, we followed up on these surprising results to investigate the potential mechanism and long-term consequences of this pattern of brain network coupling for children's cognitive, behavioral, and academic performance. In a pre-registered study, we analyzed longitudinal data from the Adolescent Brain Cognitive Development Study. Our sample comprised 10726 children at baseline (T0, ages 8.9-11.1y), n=10176 at one-year follow-up (T1, ages 9.1-12.4y), and n=6029 at two-year follow-up (T2, ages 10.6-13.6y). Of these children, 1826 were living below poverty at T0. As predicted, children living in poverty had, on average, lower grades in school than children above poverty ($X^2(1)=438.90$, $p<.001$), and more attentional and self-regulation problems as measured by the Attention subscale of the Child Behavior Checklist ($X^2(1)=49.31$, $p<.001$). However, higher LFPN-DMN connectivity was linked to better grades and fewer attentional problems for children living below poverty, while the opposite was true for children above poverty (interactions: $X^2(1)=6.80$, $p=.009$; $X^2(1)=4.12$, $p=.042$). Moreover, this interaction between LFPN-DMN connectivity and poverty status at baseline was associated with children's grades one year later, even when controlling for their baseline grades ($X^2(1)=4.61$, $p=.032$). Together, these findings suggest that the neurodevelopment trajectory toward resilience differs meaningfully for children living in poverty.

1-E-34 Canonical network functional connectivity predicts math achievement in childhood: A connectome-based predictive modeling approach

Andrew Lynn[1], Eric Wilkey[2], Gavin Price[1]

[1]Vanderbilt University, [2]Western University

Math abilities are supported by numerous brain regions spanning multiple brain networks that support different cognitive systems and are modulated by task. Functional connectivity (FC) among various brain regions correlates with math abilities. Yet, it is unclear whether these relations 1) reflect FC at the network level (e.g., frontoparietal, dorsal attention, etc.) vs disparate regional connections and 2) are consistent across tasks. We used connectome-based predictive modeling (CPM) to test whether FC within/between canonical networks during math-related tasks and rest predicts math achievement in childhood. Children (N=31, 8-10yrs) completed symbolic (SYM) and non-symbolic (Non-SYM) number comparison tasks and a resting scan (RS) during fMRI, and a math achievement test. For each task, we selected all connections correlated with math scores (full CPM), or

only connections within/between canonical networks (network CPM) that occurred in greater numbers than by chance. These connections were submitted to model fitting and math achievement score prediction. For Non-SYM, network CPM revealed FC between dorsal attention and limbic networks best predicted math scores ($r=.603$, $p<.01$). For SYM, network CPM did not predict math scores ($p=.5$), but full CPM did ($r=.398$, $p<.05$), suggesting disparate connections during SYM predicts math scores. For RS, network CPM revealed FC within ventral attention and frontoparietal networks best predicted math scores ($r=.530$, $p<.01$). All connections were negatively related to math scores. These results suggest that network-level FC predicts math achievement in childhood, but the specific network interactions depend on the task. Thus, rather than a trait-level pattern of FC, flexible reconfigurations of FC across task demands may underlie math achievement in childhood. These findings provide insight into the neurocognitive systems supporting children's math achievement and a framework to compare findings across future studies.

1-F-35 A longitudinal study of episodic memory and cognitive development in early childhood

Rachael Elward[1], Maneet Saini[2], Faraneh Vargha-Khadem[2]

[1]London South Bank University, [2]UCL

BACKGROUND: Episodic memory is thought to develop over early childhood, particularly between ages 3-5 years. However, there are few longitudinal studies that investigate the emergence and development of memory-related processes in the context of overall cognitive development. METHODS: We developed two novel paradigms designed to detect early indicators of episodic memory. One is an associative-binding test wherein children are encouraged to learn associations between specific objects and characters. A second test uses a deferred imitation paradigm wherein children imitate novel actions of the examiner after a delay. The accuracy of imitated actions reflects delayed nonverbal recall. Children were assessed twice (Time 1: N=41, Mean age = 3.3yrs, range = 2.0yrs - 4.25yrs; Time 2: N = 22, Mean age = 5.1yrs, range = 4.6yrs - 6.2yrs). All children completed the Bayley Scale of Infant Development (BSID) at Time 1. RESULTS: Pearson's correlations showed that performance on both measures of memory improved with age (Associative memory: $r = .478$, $p < .01$; Deferred imitation: $r = .354$, $p < .05$). However, the two measures of memory were not correlated ($r = .28$, $p = .09$), and were differentially associated with the measures from the BSID. Performance on the Deferred Imitation Test correlated with all 5 BSID subscale scores (all $p<0.05$), whereas the associative memory scores correlated with the BSID cognitive scores only ($p<0.05$). A regression model showed that associative memory at Time 2 could be reliably predicted from BSID and memory scores at Time 1 ($F = 3.29$, $p<0.05$), although the only reliable predictor in the model was the previous associative memory score, $p<0.01$). CONCLUSION: The results indicate that the two measures of episodic memory reflect memory processes that develop independently, and differentially relate to the development of overall cognitive and behavioural systems. The results show remarkable stability in associative memory over this early period.

1-F-36 Effects of sleep duration and quality on memory consolidation of preterm and term born children

Tobias Haase[1], Henriette Schütz[2], Nina Wald de Chamorro[2], Iryna Schommartz[1], Angela Kaindl[2], Yee Lee Shing[1], Claudia Buss[2]

[1]Goethe University, Frankfurt, [2]Charité Universitätsmedizin, Berlin

Preterm birth has been associated with impaired memory performance as well as differences in sleep characteristics compared to children born at term. This study investigates the role of sleep quality and duration for the association between preterm birth and impaired memory performance. N=35 children born term (>37 week of gestation, mean age = 6.30 years, SD age = 0.36) and N=25 children born preterm (<34 weeks of gestation, mean age = 6.31 years, SD age = 0.60) participated in this study (data collection still ongoing, target sample N=40 per group). An object-location memory task was conducted, for which children were trained to achieve memory accuracy at baseline of 83% through repeated retrieval cycles with feedback, followed by retrieval over 14 days to measure memory consolidation. Sleep quality (derived from a sleep fragmentation index) and duration across the same 14-day period are measured through actigraphy. We predict an association between both sleep duration and quality with memory consolidation. We furthermore hypothesize shorter and more disrupted sleep in children born preterm. Moreover, we predict the association between both sleep quality and sleep duration with memory consolidation to be moderated by preterm birth. Term born children would benefit to a larger extent from long and less fragmented sleep in consolidation. Linear mixed effect modeling will be used for testing the hypotheses.

1-G-38 Examining the relationship between shared book reading at home, white matter organization in kindergarten, and subsequent language and reading abilities: a longitudinal investigation

Kelsey Davison[1], Jennifer Zuk[1], Lindsay Mullin[2], Vivian Schultz[2], Ola Ozernov-Palchik[3], Elizabeth Norton[4], John Gabrieli[3], Xi Yu[5], Nadine Gaab[6]

[1]Boston University, [2]Boston Children's Hospital, [3]MIT, [4]Northwestern University, [5]Beijing Normal University, [6]Harvard University

Emerging research reveals links between parent-child conversational interactions and neural pathways critical for language. In the context of conversational interactions, parent-child shared reading serves as a rich opportunity for language as it exposes children to diverse concepts, sophisticated vocabulary, and syntax. Despite this, it remains unclear whether shared reading contributes to previously reported links between parent-child language interactions and white matter. Further, whether such brain-behavior associations relate to subsequent language and reading outcomes remains unexplored. This study examined shared reading and white matter organization in kindergarten in relation to subsequent language and reading outcomes among 83 typically-developing children. Characteristics of shared reading at home (i.e., number of children's books, amount of time read to weekly) and DTI/MRI were acquired in kindergarten (mean age: 66.82 ± 58-74 months). Follow-up of language and reading abilities was completed at the end of second grade. White matter organization (as indicated by fractional anisotropy (FA)) was estimated for key bilateral tracts (i.e., arcuate fasciculus (AF), superior longitudinal fasciculus (SLF), and inferior longitudinal fasciculus (ILF)) and left-lateralization indices (LI) were created for each tract. Correlation analyses reveal positive associations between the amount of time children are read to weekly and FA of the posterior segment of left AF, as well as LI for the anterior segment of the SLF. Further, LI for the SLF is associated with subsequent sight word reading ($r = 0.32$, $p < 0.01$) and reading rate

($r = 0.32$, $p < 0.01$). Results are significant when controlling for age and socioeconomic status. Findings reveal that pathways associated with parent-child conversational interactions are also linked with shared reading experiences among kindergarteners, and these neural-environmental factors may contribute to subsequent reading development.

1-G-39 Early Adversity Exposure and Brain Structure Across Development: An ROI-based Meta-Analysis

Anna Vannucci[1], Andrea Fields[1], Eleanor Hansen[1], Ariel Katz[1], Ayumi Tachida[1], John Kerwin[1], Nathan Martin[1], Nim Tottenham[1]

[1]Columbia University

Qualitative reviews have described links between early life adversity and alterations in brain structure, particularly for subcortical and medial prefrontal cortex (mPFC) regions in adults. Yet, there is no quantitative synthesis of comparable developmental studies in youth. This preregistered meta-analysis provides a quantitative summary of studies examining the association between postnatal adversity exposure and brain structure between birth and 18-years-old. A systematic review yielded a final sample of 80 studies with 27,220 youth (Mage=10.4, range: 1-month to 18 years; 49/51% F/M). Overall, adversity exposure was associated with smaller volumes in the hippocampus, insula, anterior cingulate cortex (ACC), posterior cingulate, ventral mPFC, dorsal mPFC, and ventrolateral PFC (rs= -.17, -.11). Moderator analyses suggested that interpersonal adversity was associated with smaller brain volumes than non-interpersonal adversity for the hippocampus, parahippocampus, middle temporal gyrus, superior temporal gyrus, vmPFC, dmPFC, vlPFC, and cerebellum. By contrast, only non-interpersonal adversity was associated with smaller brain volumes for the inferior parietal lobule, somatomotor cortex, and inferior temporal gyrus. Age-related differences in adversity-volume correlations also were found. Interpersonal adversity was associated with larger amygdala, caudate, and ventral ACC volumes until age ~10-11, when interpersonal adversity became associated with smaller volumes. Additionally, general adversity exposure was not associated with PFC volume differences until ~10-12 years-old, after which adversity was associated with increasingly smaller vmPFC, dmPFC, and vlPFC volumes across adolescence. These findings reveal age-specific associations between adversity and distinct brain regions, providing a more nuanced understanding of how early adversity shapes the developing brain.

1-G-40 Exploring the effect of an unsafe school environment on white matter development in late childhood: Findings from regression and family fixed effects approaches

Spencer Dudley[1]

[1]University of Colorado at Boulder

A growing body of research suggests that adversity in childhood influences neurocognitive development. Stress from the school environment, due to phenomena such as bullying and social exclusion, may exert a similar developmental influence that has yet to be given much attention in the literature. To address this gap, I explore the effect of experiencing an unsafe school environment on measures of volume and fractional anisotropy (FA) of the corpus callosum (CC) and superior longitudinal fasciculi (SLF). Analyses use baseline data from release 3.0 of the Adolescent Brain and Cognitive Development (ABCD) Study, affording a large (n = 11,878) sample of 9- to 10-year-olds from across the United States. I start with regression models that control for sociodemographics, other source of stress, psychosocial factors, and a corresponding measure for the cerebrospinal tract. To further address the causality challenge, I incorporate family fixed effects to control for unobservable family-related characteristics. Regression models show significant negative associations between an unsafe school environment and FA, but not volume, of the CC and SLF. When introducing family fixed effects, however, none of the coefficients of interest are statistically significant in analyses restricted to subsamples of siblings, multiples, or monozygotic twins. Implementation of fixed effects models by sex, however, reveals a different pattern. Across subsamples, FA of the SLF is significantly higher bilaterally in males who feel unsafe at school as compared to those who feel safe. For females, the estimates are negative but only significant for the left SLF in the monozygotic subsample. Findings suggest that a) the negative associations between early adversity and neurocognitive outcomes commonly observed in the literature may be driven in part by sources of endogeneity related to unobserved family characteristics and b) that the effect of feeling unsafe school on SLF FA may differ by sex.

1-G-42 Examining patterns of alpha EEG asymmetry and dimensions of early adversity: a preregistration

Summer Motton[1], Sarah Furlong[1], Madeline Robertson[1], Kinjal Patel[1], Amanda Mitchell[1], Dominique Martinez[1], Toni Howell[1], Margaret Sheridan[1]

[1]University of North Carolina, Chapel Hill

Exposure to adversity in childhood is linked to increased risk for psychopathology and poor developmental outcomes (McLaughlin et al., 2012). Child maltreatment, defined as physical and sexual abuse or witnessing violence, is a common form of early adversity related to increased emotional reactivity and dysregulation (Heleniak et al., 2016). Such emotion dysregulation is thought to be a mechanism linking child maltreatment and psychopathology risk, yet the underlying neural correlates of this relationship are not well understood (McLaughlin et al., 2019). Frontal alpha electroencephalography (EEG) asymmetry, or the lateralization of brain activity in the alpha band, has been studied as a reliable indicator of typical patterns of emotional responding in maltreated adolescents (Meiers et al., 2020; Tang et al., 2018). Few prior studies have examined associations between maltreatment and EEG alpha asymmetry in early childhood, and several have conflated experiences involving deprivation/neglect and experiences with violence exposure/abuse together within one maltreatment variable. A hypothesized dimensional model of adversity and psychopathology suggests that deprivation and threat exposure affect child development through distinct neural mechanisms (Sheridan et al., 2020). Thus, the present investigates how patterns of frontal EEG alpha asymmetry may be differentially associated with experiences of threat and deprivation. We address this question in a preregistered study in which resting-state EEG data were recorded from a sample of adversity-exposed children aged 4-7 years (n = 60 to date). Data collection is ongoing. We hypothesize that maltreatment/threat exposure will be a predictor of greater

right alpha asymmetry, which has been associated with increased emotional reactivity and bias towards negative stimuli. Our goal is to understand how specific dimensions of adversity relate to neural activity and increase risk for child psychopathology.

1-G-43 The association between maternal cortisol and neonatal amygdala volume is moderated by socioeconomic advantage

Max Herzberg[1], Regina Triplett[1], Sydney Kaplan[1], Dimitrios Alexopoulos[1], Dominique Meyer[1], Jyoti Arora[1], J. Philip Miller[1], Ronald McCarthy[1], Tara Smyser[1], Erik Herzog[1], Sarah England[1], Peinan Zhao[1], Deanna Barch[1], Cynthia Rogers[1], Barbara Warner[1], Christopher Smyser[1]

[1]Washington University, St. Louis

INTRODUCTION: Researchers have found links between postnatal stress and mental health, physical health, and brain development (Teicher et al., 2016). How prenatal stress impacts later outcomes, however, has not been studied to the same degree. Associations have been reported between prenatal maternal stress and brain and cognitive development (Sandman et al., 2016). The nature of the associations between maternal cortisol levels during pregnancy and neonatal brain structure, however, remain mixed in the literature. METHOD: Maternal cortisol output, measured in each trimester via area under the curve with respect to ground (Pruessner et al., 2005), and neonatal brain structure were assessed in a sample of 230 mother-infant dyads. We examined associations between the trajectory of maternal cortisol output across pregnancy and volumes of the cortisol-receptor rich amygdala, hippocampus, and medial prefrontal cortex, as well as caudate for testing specificity. Given known effects of poverty on infant brain structure (Hanson et al., 2013), socioeconomic advantage was included as a moderator. RESULTS: Amygdala volume was predicted by an interaction between cortisol output across pregnancy and socioeconomic advantage (std. $\beta = 0.49$, $p < .001$), controlling for infant sex, age at scan, and subcortical gray matter volume. Amygdala volumes increased as a function of increasing maternal cortisol for infants with advantage scores above one standard deviation from the mean (simple slope = 0.67, $p < .01$) while individuals with advantage scores at or below the mean showed no association. There were no significant interactions in the other brain regions examined. DISCUSSION: This study indicates that prenatal maternal cortisol output across pregnancy is associated with neonatal amygdala volume in the context of high, but not low, socioeconomic advantage. These findings have important implications for understanding the determinants of brain structure across the socioeconomic gradient.

1-G-44 Typical variations in stressful life events relate to smaller hippocampal subfield volumes in children

Morgan Botdorf[1], Tracy Riggins[1]

[1]University of Maryland, College Park

The negative impact of extreme stress on early brain development is well-documented. An emerging body of work suggests that less extreme and more typical variations in stressful experiences (e.g., starting a new school; parental divorce) may also exert an impact on the brain, especially in early childhood; however, more systematic research is needed. This research aimed to address this gap by exploring effects of typical variations in stressful life events on hippocampal development, a brain region highly susceptible to stress. Specifically, this study assessed the impact of stressful life events on development of hippocampal subfield volumes (i.e., CA1, CA2-4/dentate gyrus (DG), subiculum) in an accelerated longitudinal sample of 101 4- or 6-year-old children who were each followed for 3 years. Subfields were traced using a combination of manual and automated (i.e., ASHS) methods. Latent growth models revealed that experiencing more stressful life events was related to smaller CA1 ($b = -8.44$, $SE=3.78$, $p<.05$) and CA2-4/DG ($b= -17.55$, $SE=6.52$, $p<.05$) volumes in the 6- (but not 4-) year-old cohort. Furthermore, there was a marginally significant association between greater stressful life events at 4 years old and change in CA1 volume between 5 and 6 years old ($b = -8.91$, $SE=4.73$, $p<.06$), such that experiencing more stressful events was related to less positive change in CA1 volume. Results suggest that typical variations in stressful events relate to smaller subfield volumes in a region and age-dependent manner. Findings have implications for behaviors heavily reliant on hippocampus, such as memory, and for stress-related disorders.

1-G-45 Early caregiving quality may mitigate the impact of severe psychosocial deprivation on neural development in previously institutionalized children

Lucy Lurie[1], Katie McLaughlin[2], Meredith Gruhn[1], Kathryn Humphreys[3], Kinjal Patel[1], Charles Zeanah[4], Nathan Fox[5], Charles Nelson[6], Margaret Sheridan[1]

[1]University of North Carolina, Chapel Hill, [2]Harvard University, [3]Vanderbilt University, [4]Tulane University, [5]University of Maryland, College Park, [6]Harvard School of Medicine

Early institutionalization is a severe form of psychosocial deprivation which results in persistent deficits in cognitive and socioemotional development. Exposure to this psychosocial deprivation during the first few years of life impacts neurodevelopmental trajectories in frontal regions. Less is known, however, about how variation in caregiving quality following early psychosocial deprivation may rescue neural development. The present study examined the potential role of caregiving quality in mitigating the effects of institutionalization on neural development in the Bucharest Early Intervention Study, the only randomized control trial of foster care intervention for institutionally-reared children. Specifically, we investigated if observed caregiving quality in early childhood or adolescence predicted neural structure at nine or sixteen years of age controlling for prolonged exposure to institutionalization. We tested these associations in regions previously observed to be associated with exposure to institutionalization (Mackes et al., 2020; Sheridan et al., in prep): the inferior frontal gyrus (IFG), anterior cingulate cortex (ACC), and temporal pole. We observed that institutionalization, but not caregiving quality in early childhood or adolescence, predicted cortical thickness in the left IFG (ßs ≤-0.274; ps ≤.038) and ACC (ßs ≤-0.24; ps ≤.004) at ages nine and

sixteen, such that children randomized to foster care had thinner cortex than those in institutional care. Interestingly, worse early caregiving quality, controlling for exposure to earlier institutionalization and later caregiving, was associated with less change in cortical thickness in the IFG from ages nine to sixteen (right: ß =-0.306, p =.007; left: β =-0.304, p=.01). We conclude that caregiving quality in early childhood, during periods of heightened neural plasticity, could mitigate the impact of early psychosocial deprivation on neural regions supporting cognitive control.

1-G-46 Modelling depressive symptom trajectories in obese pregnancies reveals complex heterogeneity in maternal inflammation, placental growth, dietary intake, infections and preterm birth: implications for fetal neurodevelopment.

Julie Nihouarn Sigurdardottir[1], Sara White[2], Angela Flynn[2], Annette Briley[2], Claire Singh[2], Mary Rutherford[2], Lucilla Poston[2]

[1]King's College London, [2]KCL

OBJECTIVE:Clarify the mechanisms involved in the associations reported between maternal antenatal depression and offspring neurodevelopmental outcomes, especially in maternal obesity where uterine environment and maternal diet may be suboptimal and birth complications common. Dichotomisation of depression and single-point antenatal measures may also conceal outcome heterogeneity in "unaffected" pregnancies. METHODS: We applied Latent Class Growth Analysis in a cohort of 1369 multi-ethnic obese women (BMI ≥ 30kg/m2) from scores on the Edinburgh Postnatal Depression Scale at median 17, 27 and 34 weeks gestation. We used auxiliary modelling and latent variables to calculate odds ratios and mean differences against the reference class on demographics and maternal blood biomarkers of metabolism, glycemia, inflammation, placental function and reports of infections at each visit. Dietary intake at 17 and 27 weeks, pregnancy comorbidities (e.g. gestational diabetes) and birth outcomes were compared. RESULTS: 575(42%, reference group) women were Not Depressed, 523(37.5%) had moderate symptoms. 219(16%) women had subclinical depression and 62 (4.5%) women were chronically depressed. Depressed and Subclinical groups were more socio-economically deprived and ethnically diverse. Depressed women had higher inflammation (interleukin-6 and glycoprotein acetyls) and lower placental growth factor (plgf) at 15 and 27 weeks. Incidence of infection was more likely reported in the three other groups than the reference across all time points. Blood fatty acids and amino acids profiles were heterogeneous. Glycaemic load and saturated fat intake were higher in Depressed and Subclinical groups. Preterm birth was more likely in the Depressed and Moderate group. Obstetric complications and other birth outcomes were similar. CONCLUSIONS: Obese pregnancies confer multiple hits to the fetal brain beyond depression. Sample heterogeneity in pregnancy should be considered in epidemiological research.

1-G-47 Examining within-person fluctuations in stressful life events, physical activity, and affect during adolescence

Elizabeth McNeilly[1], Jessica Jenness[2], John Flournoy[3], Alejandro Valdivieso[2], Alexandra Rodman[3], Constanza Vidal Bustamante[3], Katie McLaughlin[3]

[1]University of Oregon, [2]University of Washington, [3]Harvard University

Adolescents experience an increase in stressful life events (SLEs) (Larson & Lampman-Petraitis, 1989), and these experiences are tightly coupled with increased negative affect and reduced positive affect (Larson & Ham, 1993; Rackoff & Newman, 2020), which heighten risk for internalizing psychopathology over time (Hughes & Kendall, 2009; Pine et al., 1999). Approach behaviors, such as physical activity, may be a mechanism linking SLE exposure to changes in affect, by way of changes in the positive valence system (PVS). While exposure to SLEs is associated with reduced physical activity (Salmon, 2001; Stults-Kolehmainen & Sinha, 2014) and low physical activity is linked to difficulty regulating affect (Mata et al., 2012; White et al., 2018), it is unknown whether physical activity mediates the association between SLEs and affect. In this preregistered, intensive longitudinal study, we will examine whether physical activity, continuously measured by an actigraphy wristband, mediates the association between SLEs and positive and negative affect (osf.io/8ztb6). Female participants (N=30, ages 15-17) completed 12 visits across one-year. Study visits included monthly and ecological momentary assessment of SLEs, physical activity, and affect. Using Bayesian hierarchical linear modeling, we hypothesize that within-person increases in SLEs will be associated with decreased physical activity, increased negative affect, and decreased positive affect. Further, we hypothesize that decreased physical activity will mediate the association between SLEs and affect. The present study's sample is from an intensive longitudinal neuroimaging study. Our future aim is to investigate whether changes in neural underpinnings of PVS function (i.e., neural reactivity to reward) is associated with fluctuations in physical activity following exposure to SLEs, thereby representing a behavioral indicator of neural reactivity to reward that can inform future translational neuroscience intervention.

1-G-48 Reduced resting state connectome similarity in parent-child dyads marked by maltreatment

Katharina Pittner[1], Carolyn Parkinson[2], Lisa van den Berg[3], Renate Buisman[3], Lenneke Alink[3], Marinus van IJzendoorn[4], Marieke Tollenaar[3], Bernet Elzinga[3], Marian Bermans-Kranenburg[5]

[1]Charité - Universitätsmedizin Berlin, corporate member of Freie Universität Berlin and Humboldt-Univ, [2]UCLA, [3]Leiden University, [4]Erasmus University Rotterdam, [5]VU University Amsterdam

OBJECTIVE: According to the bio-behavioral synchrony model, the synchronization of interactions and biological systems between parent and child lay the basis for the formation of the parent-child bond. In families in which child maltreatment occurs, interactions tend to be less synchronous. One window into the attunement between individuals, and in particular, between parents and children, is provided by resting state (RS) connectome similarity (RScs). The present study assesses the association between maltreatment and RScs in parent-child dyads. METHOD: Data from 76 parent-child dyads was included in the analyses. Parents were on average 49.81 years of age (range: 26.58 - 67.58 years; 54% female) and children were on average 20.86 years old (range: 9.17 - 40.08 years, 61% female). Child maltreatment was assessed retrospectively using questionnaires and a multi-informant approach. To construct the functional RS connectome, we correlated of the RS time courses of 264 nodes. As a measure of dyadic RScs, we calculated the correlation between the parent connectivity vector and the child connectivity vector

for each dyad. In a multiple regression analysis, we tested the association between RScs and the continuous maltreatment scores while controlling for covariates. RESULTS: An analysis of variance indicated that real parent-child dyads had significantly higher RScs than the matched unrelated pairs (Mreal = .35, Mmatched = .32; F(1, 148) = 8.48, p = .004). Maltreatment was significantly associated with RS connectome similarity (β = -.24, p = .03). CONCLUSION: Our findings suggest that disruption of parent-child relationships in the form of child maltreatment is associated with lower RScs. Parent-child alignment plays an important role in child development. As a result, the negative effects of experiencing abuse during childhood may be reinforced by parent-child relationships that are shaped by asynchronous interactions and a lack of alignment.

1-G-49 Hippocampal - prefrontal connectivity prior to COVID-19 pandemic predicts later anxiety in adolescents

Orma Ravindranath[1], Maria Perica[1], Finnegan Calabro[1], William Foran[1], Beatriz Luna[1]

[1]University of Pittsburgh

By adolescence, foundational cognitive and affective neurobehavioral processes are in place that drive adolescent predisposition as the brain continues to specialize based on environmental demands, such as stress, to determine adult trajectories. The recent COVID-19 pandemic has inflicted stress on all, including stressors unique to adolescence such as restrictions in socialization and education. There is significant variability in reactivity and adaptation to stress that may be driven by adolescent predisposition. Here we leverage our pre-pandemic brain development studies to identify how maturity of prefrontal connectivity with the amygdala and hippocampus, which underlie stress reactivity, impinge on reactivity to COVID-19. 111 10-31 year olds completed resting state fMRI scans prior to the pandemic and then completed a questionnaire 9 months into the pandemic measuring worry, COVID-related stress, sadness, perceived stress, and positive affect. Regression analyses indicated that both worry and COVID-related stress increased with age ($p<0.05$ FDR corrected). Pairwise connectivity analyses between anterior and posterior hippocampus (aHPC, pHPC), basolateral amygdala, centromedial amygdala, ACC, and PFC subdivisions were performed. Results indicated that greater connectivity between anterior ventromedial prefrontal cortex (avmPFC) and pHPC was associated with greater worry and COVID-related anxiety ($p=0.0057$), which was primarily driven by individuals under 18. pHPC supports problem solving and future planning while vmPFC underlies integration with affective processes including fear, and our previous work has shown that connectivity between these regions increases with age. Taken together, our results suggest that maturation of the ability to integrate future planning with emotional processing may underlie greater reactivity to chronic stress.

1-G-50 The effects of perceived early-life stress event severity and reaction severity on frontoamygdala circuitry and psychopathology

Jordan Foster[1], Emily Cohodes[1], Sarah McCauley[1], Jasmyne Pierre[1], Paola Odriozola[1], Jason Haberman[1], Sadie Zacharek[1], Sahana Kribakaran[1], H.R. Hodges[1], Camila Caballero[1], Dylan Gee[1]

[1]Yale University

An individual's perception of the severity of stressful events (event severity), as well as their perception of the severity of their reaction to stressful events (reaction severity), are specific, dissociable aspects of a stressor that may uniquely moderate the effect of stress exposure on psychobiological outcomes across development (Gunnar et al., 2009). Though the extant stress literature has emphasized the importance of testing associations between an individual's self-reported perceptions and appraisals of a stressor and mental health outcomes, this focus has scarcely been applied to the study of early-life stress in a developmental neuroscience framework. The current study plans to examine associations between perceived early-life stressful event and reaction severity, and neurobehavioral outcomes in a sample of adults (N = 166; data collected; neuroimaging and phenotypic QA in progress). We have three central hypotheses: 1) average higher ratings of event severity will be associated with higher ratings of reaction severity; 2) both event severity and reaction severity will be associated with greater PTSD-related symptom severity and weaker resting-state frontoamygdala connectivity; and 3) the association between both event and reaction severity with PTSD-related symptom severity and frontoamygdala connectivity will be stronger for events occurring in adolescence compared to childhood. Frontoamygdala resting-state functional connectivity and PTSD symptoms will serve as dependent variables in separate mixed-effects linear regression models that will include average age of stress exposure, average event severity score, and average reaction severity score as predictors of interest, as well as participant age at time of scanning, sex, and mean head motion during fMRI acquisition as covariates. The current study has implications for understanding how unique perceptions of early-life stressful experiences may impact development.

1-G-52 Neural Underpinnings of Heart Rate Defined Sustained Attention at 3-Months Predict Socio-Cognitive Outcomes at 9-Months

Annie Brandes-Aitken[1]

[1]New York University

INTRODUCTION: Early attention is foundational for socio-cognitive development. Attention in infancy has been measured using a variety of methods, however, researchers have demonstrated that prolonged periods of heart rate (HR) deceleration reliably differentiate infant sustained attention from inattention. Indeed, research has found that neural activity is higher during HR-defined phases of sustained attention. Here we investigate the predictive ability of electroencephalography (EEG) power during phases of HR defined sustained attention on subsequent socio-cognitive abilities. METHODS: Caregivers and their infants were recruited from the New York City Metropolitan area to participate in this study. Families were brought into the lab when infants were 3-months of age (N=82) and returned at 9-months (N=56). At the 3-month visit, infant EEG was recorded during an attention eliciting video paradigm. Frontal theta power (4-6 Hz) during heart rate defined phases of sustained was calculated. The count of sustained attention phases and average duration of sustained attention phases were also calculated and included as covariates. At 9-months, measures of joint attention, expressive language communication, and language comprehension

were collected. RESULTS: Preliminary paired t-tests demonstrated that frontal theta power during sustained attention was higher relative to inattention phases. Higher theta power during sustained attention at 3-months was associated with higher expressive communication and higher joint attention scores at 9-months of age but not language comprehension. Neither the count nor average duration of sustained attention phases was significantly associated with any 9-month outcomes. DISCUSSION: These findings suggest that neural activity during sustained attention is longitudinally predictive of multiple socio-cognitive outcomes in infancy. This study highlights the importance of examining biomarkers of attention in infancy for emerging socio-co

1-H-53 Individual variability in adolescent longitudinal development of cortical volume, thickness, surface area, and gyrification in two large European samples and influences of sex, height, pubertal status, and site

Nora Vetter[1], Lea Backhausen[1], Hervé Lemaître, Jonas Granzow[1], Juliane Froehner[1], Jean-Luc Martinot[1], Michael Smolka[1]

[1]Technische Universität Dresden

Studying typical adolescent cortical brain maturation is an important goal in developmental neuroscience for understanding psychopathological deviations. Recently, individual differences in cortical brain development also came into focus with studies investigating possibly delayed or accelerated maturation. Longitudinal studies with many data points are missing that particularly targeted adolescence, a time of fast cortical change. Therefore, we aimed to investigate cortical structural trajectories and possible influences of sex, height, pubertal status, and site across adolescence in two large European samples as part of an overall project (IMAGEN). We assessed structural magnetic resonance imaging data from mid-adolescence to early adulthood (14-24 years) in two samples (Dresden, Germany and Paris, France) across four waves with mean ages 14.54, 16.60, 18.68, 22.05 (Dresden) and 14.42, 16.81, 19.71, and 22.62 (Paris). After data processing using the longitudinal stream of FreeSurfer 6.0.0 and thorough on-site quality control, we will run analyses with 1318 total scans of 497 participants, 404 of which had at least two data sets. Data analysis plan: We extracted values for global measures of mean cortical thickness, total surface area, global cortical volume, and global gyrification index averaged between hemispheres. First, we will use general additive modeling (GAMM) with R's toolbox mgcv to investigate brain development on a group level and second, annualized change scores to investigate individual trajectories in terms of direction and magnitude. Further, we will look into differences in change variability between females and males, and the two sites, and explore the influence of height and pubertal status at age 14 on developmental changes.

1-H-54 Longitudinal trajectories of white matter fiber development differ between children with and without ADHD

Ian Fuelscher[1], Christian Hyde[1], Nandita Vijayakumar[1], Phoebe Thomson[2], Emma Sciberras[1], Daryl Efron[2], Vicki Anderson[2], Philip Hazell[3], Timothy Silk[1]

[1]Deakin University, [2]Murdoch Children's Research Institute, [3]University of Sydney

OBJECTIVE: Although a number of studies have found white matter differences in ADHD, there is a scarcity of longitudinal work examining whether white matter structural development reflects differential outcomes for children with and without ADHD. To examine whether deviations from typical trajectories of white matter fiber development are associated with the persistence or remission of ADHD symptoms, this study estimated microstructural and morphological properties of 71 white matter tracts from 390 high angular diffusion scans acquired prospectively on 62 ADHD-persistent, 37 ADHD-remitted and 85 non-ADHD control children. METHODS: High angular diffusion data were collected on a 3T MRI scanner (b = 2800 s/mm2, 60 directions). Participants underwent up to three MRI assessments between the ages of 9.5 and 14.5 years. White matter tracts were reconstructed using TractSeg, a semi-automated tractography method. For each tract, we derived measures of fiber density (microstructure) and fiber bundle cross-section (morphology) using Fixel-Based Analysis (FBA), a novel and fiber specific analysis framework. Linear mixed models were used to compare trajectories of fiber development between ADHD-persistent, ADHD-remitted, and non-ADHD control children. RESULTS: Relative to non-ADHD controls, the ADHD-remitted and ADHD-persistent groups showed accelerated fiber development in thalamic and striatial pathways as well as the superior longitudinal fasciculus. In the ADHD-remitted group, accelerated fiber development in corticospinal, fronto-pontine, and thalamo-premotor pathways was associated with greater reductions in ADHD symptom severity. CONCLUSIONS: This has been the first FBA study to demonstrate that deviations from typical trajectories of white matter fiber development are associated with the progression of ADHD in childhood. Findings inform the neurobiological foundations of ADHD and highlight white matter fiber connectivity as a possible neurodevelopmental marker of ADHD.

1-H-55 Cortical Thickness in Bilingual and Monolingual Children: Relationships to Language Use and Language Skill

My Nguyen[1], Juliana Ronderos[1], Arturo Hernandez[1], Kelly Vaughn[2]

[1]University of Houston, [2]University of Texas Health Science Center at Houston

A growing body of evidence suggests that the brain adapts to bilingual experiences to support language proficiency; however, there is limited research focused on the neuroanatomy of bilingual children. The Adolescent Brain Cognitive Development (ABCD) Study is a useful source of data for addressing this gap, as it involves the collection of neural and cognitive data from a large sample of American children throughout adolescence. Using the baseline ABCD Study data release at ages nine and ten, we explored the differences in cortical thickness between bilinguals and monolinguals and evaluated how variability within bilinguals in terms of English vocabulary and English use might explain these neural differences. We identified bilingual children from the ABCD study as those who reported speaking a language other than English and whose parents reported that the child's native language was not English or that a language other than English was spoken at least half the time in the home. We matched a sample of English monolingual children to the bilinguals on age, sex, pubertal status, parent education, household income, non-verbal IQ, and handedness--also included as covariates in all analyses. Comparisons of bilinguals and monolinguals revealed widespread cortical thickness differences. Within bilinguals, English use with family and friends--relative to use of the

other language--was associated with cortical thickness in frontal and parietal regions, including regions involved in cognitive control. English vocabulary was associated with cortical thickness in frontal and temporal regions, mostly within the language network. These findings replicate and extend previous research with bilingual children. They also highlight unexplained cortical thickness differences between well-matched samples of bilinguals and monolinguals, suggesting the need for additional research examining how bilingualism shapes neuroanatomy during childhood.

1-H-56 Common child psychiatric symptoms relate to global but no to specific cortical morphology differences

Yingzhe Zhang[1], Scott Delaney[1], Henning Tiemeier[1]

[1]Harvard T. H. Chan School of Public Health

OBJECTIVE: Childhood internalizing and externalizing problems frequently co-occur. Many studies report neural correlates of either internalizing or externalizing problems, but few account for their co-occurrence by analyzing them with mutual adjustment (e.g., by adjusting models of externalizing problems for co-occurring internalizing problems) or in one bifactor model. We aimed to assess specific cortical substrate of these behavior problems after accounting for their co-occurrence. METHODS: We used data from 9,951 children aged 9-11 years in the baseline Adolescent Brain Cognitive Development Study. We computed continuous internalizing and externalizing problem scores with the Child Behavior Checklist, and we standardized FreeSurfer-derived volumes of 68 cortical regions. We adjusted models for demographics, parental psychopathology, and site effects, and we corrected for multiple comparisons. We modeled cortical correlates of internalizing and externalizing problems separately and jointly, with and without adjusting for total intracranial volume (ICV), and in vertex-wise analyses. We also constructed bifactor models assessing global psychiatric symptoms, specific internalizing problems, and specific externalizing problems. RESULTS: In separate ICV-unadjusted analyses, internalizing and externalizing problems were not associated with cortical volumes. However, in mutually adjusted models, internalizing problems showed widespread positive associations with cortical volumes, and externalizing problems showed widespread negative associations. The bifactor model produced similar results. These associations likely represent global effects: adjusting for ICV rendered most associations non-significant. No sex differences were observed. CONCLUSION: Our results suggest that internalizing and externalizing problems have opposing, global, non-specific associations with cortical morphology in childhood, which may not be apparent when models do not account for their co-occurrence.

1-H-57 Sex differences in gray matter development: an analysis of 116 regional trajectories

Madison Long[1], Jess Reynolds[2], Jing Zheng[1], Yuankai Huo[3], Bennett Landman[3], Karthik Ramadass[3], Catherine Lebel[1]

[1]University of Calgary, [2]Telethon Kids Institute, The University of Western Australia, [3]Vanderbilt University

OBJECTIVE: Sex differences in brain structure have been well-documented in older children and adolescents, suggesting greater proportional gray matter volume in girls. However, developmental sex differences in gray matter volume are unclear in early childhood, a time of substantial brain change. Here, we characterized sex effects in developmental trajectories of cortical and subcortical gray matter volume in young children. METHODS: Using T1-weighted MRI, we analyzed volume in 116 gray matter regions in a longitudinal sample of 130 neurotypical children aged 2-8 years (437 scans, mean=3.4 scans/subject). Images were acquired on a 3T GE MR750w scanner at the Alberta Children's Hospital. We obtained brain segmentations with MaCRUISE software. Linear, quadratic, and cubic development trajectories were sequentially tested using mixed effects models (R package lme4) with subject as a random effect and sex main effects and interactions. We fit models first with the absolute volume values and again with regional volume normalized by intracranial volume. RESULTS: 51% of absolute regional volume trajectories followed a quadratic pattern, 31% linear, 2.5% cubic, and 15.5% showed no significant change with age. Most regional absolute volumes (53.5%) showed a main effect of sex with boys having larger volumes than girls. However, when normalized, girls had larger subcortical volumes than boys. In models with significant sex by age interactions, absolute trajectories tended to be steeper for boys (6 out of 8 regions) while normalized trajectories were more dynamic for girls (4 out of 7 regions). CONCLUSIONS: Most gray matter regions showed quadratic trajectories during early childhood. Boys had larger absolute cortical volumes, subcortical regions were proportionally larger in girls, and developmental sex differences varied by region. Sex differences in brain development may explain differential susceptibility of girls and boys to developmental and mental health disorders.

1-H-59 Specificity of structural markers of youth risk due to a parental history of psychopathology in the ABCD study

Matthew Mattoni[1], Helene Hopman[2], Adefunke Dadematthews[3], Thomas Olino[1]

[1]Temple University, [2]The Chinese University of Hong Kong, [3]Auburn University

Introduction Parental history of psychopathology is commonly identified as a risk factor for youth psychopathology. In the ABCD study, youth with a parental history of depression were observed to have volumetric differences that may be associated with this risk. However, previous research suggests that this risk is robust across multiple disorders rather than being specific to a particular history. This study examines whether the effect of parental psychopathology on youth subcortical volume is specific to depression or generalized to multiple forms of psychopathology. Methods We have preregistered a secondary analysis to use linear mixed models to test the association between subcortical brain volume and parental psychopathology history in 10,589 9-10 year old youth from the ABCD study. First, we aim to replicate previous ABCD findings of youth subcortical volume differences by examining parental depression history only. Second, we will add main and interaction effects of parental history of anxiety, alcohol/substance abuse and mania to test if the depression findings are robust when controlling for other psychopathology histories. Outcome regions are the bilateral accumbens, amygdala, caudate, hippocampus, pallidum, putamen, and thalamus, as well as total subcortical volume. All models will include intracranial volume, sex, age, puberty status, and sociodemographic covariates and use Benjamini-Hochberg correction to correct for multiple comparisons. Implications This

study will attempt to replicate the relationship between parental depression and youth subcortical volume in the ABCD study. It then will test if this effect persists when controlling for other forms of parental psychopathology history. If the effect persists, results will suggest that there are distinct structural markers in youth that are specific to parental depression. Otherwise, these markers may better represent a risk conferred by a parental history of general psychopathology.

1-H-60 Examining the effects of maternal psychopathology on neonatal neurodevelopment and infant temperament

Jesse Barr[1], Cathi Propper[1], Amanda Wylie[1], Rebecca Stephens[1], Sarah Short[1]

[1]University of North Carolina, Chapel Hill

From early childhood onward, externalizing problems underlie a significant proportion of mental health, behavioral, and academic challenges (e.g., Masten et al., 2005). While differences in brain structure have been identified in children diagnosed with ADHD, conduct disorder, and oppositional defiant disorder in middle and late childhood (e.g., Timo et al., 2008), few studies have examined whether indices of neonatal neurodevelopment serve as early predictors of later behavioral challenges. A number of common structural differences underlying externalizing behaviors in older children have been detected (e.g., Rubia et al., 2010); however, due to the age of the samples, the extent to which differences are a function of genetics or experience remains unclear. As some externalizing disorders have high heritability (Viding et al., 2005), the study of neonatal neurodevelopment is important in beginning to disentangle these influences. Using a sample of 121 mother-infant dyads, we will test the relation between history of maternal psychopathology (e.g., ADHD, antisocial behavior, substance use), measured via medical records and questionnaires during pregnancy, and neonatal brain volumes (total grey matter, corpus callosum, and amygdala), measured via 3T MRI at 2 weeks postpartum. In addition, we will examine maternal psychopathology and infant neurodevelopment as predictors of maternal-reported infant temperament (negativity, surgency, and regulatory ability) at 6 months of age, as infant temperament has been used as a predictor of later behavioral challenges (e.g., Wagner et al., 2016). We hypothesize that maternal psychopathology will be associated with differential neonatal brain volumes, and that volumes will mediate the relation between maternal psychopathology and infant temperament, particularly negativity. The results of this study may allow for earlier identification of children at risk for externalizing problems than would be possible with behavioral methods.

1-H-61 The role of the extreme capsule and the uncinate fasciculus in reading and mental health

Kassondra Pedenko[1], Bryce Geeraert[1], Catherine Lebel[1]

[1]University of Calgary

INTRODUCTION: Children with reading problems are at an elevated risk for mental health problems. The neurological basis for this remains unclear. The extreme capsule (EmC) and the uncinate fasciculus (UF) have been implicated in both reading and mental health and are thus potential biomarkers for comorbid reading disorder and mental health. METHODS: 52 typically developing children (6-18y;10.30±2.35y,27M/25F) underwent diffusion imaging on a GE 3T Discovery MR750w system. Some participants returned at 2 and/or 4 years, providing a total of 95 scans. Tractography of the EmC and UF was performed and fractional anisotropy (FA) and mean diffusivity (MD) were calculated for each subject in ExploreDTI. Internalizing behaviours were assessed using the Behavioral Assessment System for Children (BASC-2) Parent Report. Children's reading comprehension and fluency were assessed using the Wechsler Individual Achievement Test (WIAT-3). Mixed effects models were used to test relationships between FA and MD in the EmC and UF with reading scores and internalizing behaviour scores, including age and gender as covariates. RESULTS: Composite reading scores had a weak MD-gender interaction (P=0.054) in the left EmC, such that in girls, higher MD was associated with higher WIAT-3 scores. Internalizing behaviour had a weak MD-gender interaction (P=0.064) in the right UF, such that higher MD was associated with higher BASC-2 scores in girls and lower BASC-2 scores in boys. FA was not significantly associated with BASC-2 or WIAT-3 scores for either tract. Age was significantly positively associated with FA in the left EmC (P=0.007) and negatively associated with MD in the bilateral EmC (p<0.001), left UF (P=0.007), and right UF (P=0.02). CONCLUSION: White matter MD showed gender-differentiated associations with reading (left EmC) and internalizing behaviour (right UF). Ongoing research will investigate the trajectory of the EmC and UF longitudinally to elucidate developmental trends.

1-H-62 Myelin contributes to microstructural growth in human sensory cortex during early infancy

Vaidehi Natu[1], Mona Rosenke[1], Hua Wu[1], Francesca Querdasi[1], Holly Kular[1], Nancy Lopez-Alvarez[1], Mareike Grotheer[2], Shai Berman[3], Aviv Mezer[3], Kalanit Grill-Spector[1]

[1]Stanford University, [2]University of Marburg, [3]Hebrew University of Jerusalem

The establishment of neural circuitry during early infancy is critical for developing visual, auditory, and motor functions. However, how cortical tissue develops postnatally is largely unknown. By combining T1 relaxation time from quantitative MRI and mean diffusivity (MD) from diffusion MRI in 13 infants, we tracked cortical tissue development across 3 timepoints (newborn, 3 months, and 6 months, N=10 at each timepoint). Lower T1 and MD indicate higher microstructural tissue density and more developed cortex. Our data reveal three main findings: First, primary sensory/motor areas (V1: visual, A1: auditory, S1: somatosensory, M1: motor) have lower T1 and MD at birth than higher-level cortical areas. However, all primary areas show significant reductions in T1 and MD in the first six months of life, illustrating profound tissue growth after birth. Second, reductions in T1 and MD from newborns to 6 month-olds occur in all ventral and dorsal visual areas. Strikingly, this development is heterogenous across the visual hierarchies: Earlier areas are more developed with denser tissue at birth than higher-order areas, but higher-order areas develop at faster rates. Finally, analysis of transcriptomic gene data comparing gene expression in postnatal vs. prenatal tissue samples showed strong postnatal expression of genes associated with myelination and synaptic signaling. Our results indicate that these cellular processes may contribute to profound postnatal tissue growth in sensory

cortices observed in our in-vivo measurements. We propose a novel principle of postnatal maturation of sensory systems: development of cortical tissue proceeds in a hierarchical manner, enabling the lower-level areas to develop first to provide scaffolding for higher-order areas, which begin to develop more rapidly after birth for computations of vision and audition. Our findings have important implications for diagnosis of developmental disorders affecting life-long outcomes in children.

1-I-63 Task-evoked functional brain organization and its relationship to behavior in children

Mackenzie Mitchell[1], Jessica Cohen[1]

[1]University of North Carolina, Chapel Hill

Recent work in young adults has found that task-evoked functional connectivity (taskFC) relates more strongly to behavior than resting-state functional connectivity (rsFC; Greene et al., 2018). Functional brain networks mature through adolescence, and it is not yet known if rsFC and taskFC exhibit similar relationships to behavior in childhood as in adulthood. This pre-registration will leverage the ABCD dataset to assess whether taskFC elicits stronger brain-behavior relationships than rsFC in children. We will utilize FC matrices during rest and tasks probing response inhibition (RI), working memory (WM), and reward processing (RP) available from the baseline ABCD-BIDS dataset (n=2,000). For each subject, we will calculate FC measures of network segregation (modularity) and integration (global efficiency) during rest and each task. We will relate FC measures to two behavioral components derived from the ABCD neurocognitive battery (executive control and general cognitive ability; Thompson et al., 2019), as well as to self-reported reward responsiveness from the BIS/BAS scale. Mixed effects models wherein FC is predicted by an interaction between brain state (rest vs. task) and behavior will be estimated to test for brain state-driven modulations of relationships between FC and behavior. Covariates will include age, sex, race, ethnicity, parental education, family income, and family marital status, as well as random effects of scanner and subject. We hypothesize that overall, taskFC measures will exhibit stronger relationships to behavior than rsFC measures. Specifically, we expect that greater global efficiency during the WM and RP tasks will relate most strongly to general cognitive ability and reward responsiveness, respectively; while greater modularity during RI will relate most strongly to executive control. If these effects are observed, it would demonstrate the utility of taskFC to highlight neurobiological features relevant to behavior in childhood.

1-I-64 Relation between intrinsic brain network organization and internalizing and externalizing behaviors in children with ADHD following methylphenidate administration

Nicholas Fogleman[1], Teague Henry[2], Cleanthis Michael[1], Jessica Cohen[1]

[1]University of North Carolina, Chapel Hill, [2]University of Pittsburgh

Methylphenidate (MPH) is a first-line treatment for attention-deficit/hyperactivity disorder (ADHD) and has been shown to ameliorate both internalizing and externalizing behaviors, which frequently co-occur in children with ADHD. However, the neural mechanisms through which MPH improves these behaviors is currently unknown. Here, we seek to extend literature by implementing advanced network neuroscience techniques to examine associations between intrinsic brain network organization and internalizing and externalizing behaviors in children with ADHD, as well as how MPH changes these associations. Twenty children with ADHD participated in a double-blind, placebo-controlled, crossover trial with short-acting MPH. Children completed two functional magnetic resonance imaging resting-state scans (one on placebo and one on MPH) and their parents completed the Child Behavior Checklist, a measure of internalizing and externalizing behaviors. Using an established whole-brain functional atlas, functional connectivity was estimated between pairs of brain regions and then network membership of each brain region was defined. Graph theory metrics of participation coefficient and within-module degree were calculated on the network level to characterize the integration and segregation of networks with respect to the whole-brain system and how they differed after MPH administration. Higher levels of internalizing behaviors were associated with reduced integration of the salience network on placebo and increased integration of the salience network on MPH. Conversely, higher levels of externalizing behaviors were associated with increased integration of the salience network on placebo and reduced integration of the salience network on MPH. These findings suggest that the integration of the salience network with other brain networks is uniquely involved in co-occurring internalizing and externalizing behaviors in children with ADHD, and may provide evidence for how MPH affects behavior.

1-I-65 Using Probabilistic Atlases of Functional Neural Networks in Adolescents to Improve Reliability of Group Brain-Behavior Associations

Robert Hermosillo[1], Lucille Moore[2], Adam Pines[3], Eric Feczko[1], Greg Conan[1], Michael Mooney[2], Anita Randolph[1], Babatunde Adeyemo[4], Eric Earl[2], Anders Perrone[2], Johnny Uriate-Lopez[2], Kathy Snider[2], Olivia Doyle[2], Michaela Cordova[5], Ally Dworetsky[4], Caterina Gratton[6], Steven Petersen[4], Theodore Satterthwaite[3], Oscar Miranda-Dominguez[1], Damien Fair[1]

[1]University of Minnesota, [2]Oregon Health & Science University, [3]University of Pennsylvania, [4]Washington University School of Medicine, [5]San Diego State University, [6]NorthWestern University

The brain is organized into a broad set of functional neural networks. While networks are similar between healthy individuals, recent evidence suggests that precise topology is highly variable across participants. These individual differences are often lost in population studies due to averaging which assumes network topology uniformity. We leveraged precision brain mapping methods to establish a new open-source, method-flexible set of probabilistic atlases: the Masonic Institute for the Developing Brain (MIDB) Precision Atlas. Using resting-state fMRI data from 6,106 9-10 year olds from the ABCD study, these atlases include both all single subject precision networks, and probabilistic maps of network topography. Single subject precision maps were generated with both a supervised network-matching procedure (template matching) as well as an unsupervised community detection algorithm (Infomap). We demonstrate that probabilistic network maps generated for two demographically-matched

groups of n~3000 each were nearly identical, both between groups (Pearson's r >0.999) and between methods (r=0.96), showing both regions of high invariance and high variability. Compared to using parcellations based on groups averages, the MIDB Precision Atlases allowed us to derive a set of brain regions that are largely invariant in network topology and provide more reproducible statistical maps of executive function brain-wide associations (maximum intergroup subset correlation: whole brain parcellation=0.4725 vs probabilistic parcellation=0.5474). This suggests that topological network variation between subjects is a source of noise that can be reduced by selecting network features known to have minimal variation in topology across individuals. The MIDB Precision Atlases are provided open-source to encourage the scientific community to experiment with probabilistic atlases and individual topographies to more precisely relate network phenomenon to functions of the human brain.

1-J-66 Prepubertal ovariectomy alters dorsomedial striatum indirect pathway neuron excitability and explore/exploit balance in female mice

Kristen Delevich[1], Chrisopher Hall[2], Linda Wilbrecht[2]

[1]UC Berkeley, Washington State University, [2]UC Berkeley

Decision-making circuits are modulated across life stages (e.g. juvenile, adolescent, or adult)--as well as on the shorter timescale of reproductive cycles in females--to meet changing environmental and physiological demands. Ovarian hormonal modulation of relevant neural circuits is a potential mechanism by which behavioral flexibility is regulated in females. Here we examined the influence of prepubertal ovariectomy (pOVX) versus sham surgery on performance in an odor-based multiple choice reversal task. We observed that pOVX females made different types of errors during reversal learning compared to sham surgery controls. Using reinforcement learning models fit to trial-by-trial behavior, we found that pOVX females exhibited lower inverse temperature parameter (β) compared to sham females. These findings suggest that OVX females solve the reversal task using a more exploratory choice policy, whereas sham females use a more exploitative policy prioritizing estimated high value options. To seek a neural correlate of this behavioral difference, we performed whole-cell patch clamp recordings within the dorsomedial striatum (DMS), a region implicated in regulating action selection and explore/exploit choice policy. We found that the intrinsic excitability of dopamine receptor type 2 (D2R) expressing indirect pathway spiny projection neurons (iSPNs) was significantly higher in pOVX females compared to both unmanipulated and sham surgery females. Finally, to test whether mimicking this increase in iSPN excitability could recapitulate the pattern of reversal task behavior observed in pOVX females, we chemogenetically activated DMS D2R(+) neurons within intact female mice. We found that chemogenetic activation increased exploratory choice during reversal, similar to the pattern we observed in pOVX females. Together, these data suggest that pubertal status may influence explore/exploit balance in females via the modulation of iSPN intrinsic excitability within the DMS.

1-J-67 Intra- and inter-individual effects of pubertal hormones on perceived pubertal maturation: Baseline to Year 1 of the ABCD Study

Megan Patterson[1], Kristina Uban[2], Megan Herting[3], John Hewitt[4], Marie Banich[4]

[1]University of Colorado Denver, [2]University of California, Irvine, [3]University of Southern California, [4]University of Colorado, Boulder

OBJECTIVE: Physical changes during puberty are catalyzed by rising adrenal and gonadal hormones. Cross-sectional studies find modest associations between hormone concentration and measures of pubertal maturation. Longitudinal evaluation of the correspondence between hormones and puberty is needed to disentangle within- and between-person effects. METHODS: Baseline (ages 8.9-11.0, M=9.9±.63) and Year 1 (ages 9.1-12.4, M=10.9±.64) data from the ABCD Study were used to evaluate the effects of Dehydroepiandrosterone (DHEA; N=8127), Testosterone (T; N=8273) and Estradiol (E2; N=3685 girls only) on parent reported pubertal maturation on the Pubertal Development Scale (PDS). Mixed effects models were fit with timepoints nested within persons, family and site to account for longitudinal variation, and estimated fixed effects of age, person-level hormone average, and within-person hormone change (difference from average), moderated by sex. Covariates included BMI, race/ethnicity, time since midnight, saliva sample collection duration, and recent caffeine use and physical activity. RESULTS: Person-level average for all three hormones (DHEA, T and E2) were significantly associated with PDS (β=.26 (.01); β=.30 (.01); β=.10 (.02) respectively, ps<.001) such that increasing PDS reflected higher hormone levels. Effects of DHEA and T were more pronounced in girls (β=-.14 (.02); β=-.17 (.02) respectively, ps<.001). Only within-person change in DHEA was associated with change in PDS (β=.03 (.01), p<.01) with similar effects for both sexes. CONCLUSION: During a narrow window in early adolescence, interindividual differences in hormones positively predicted pubertal maturation. Given that girls begin maturing earlier than boys and that DHEA rises reflect earlier maturing adrenal processes, the sex differences and additional effect of within-person change in DHEA may suggest that correspondence between hormones and maturation strengthen from early- to mid puberty.

1-J-68 fMRI-derived measures of brain tissue iron as an indirect marker of striatal dopamine for neurodevelopmental research

Brenden Tervo-Clemmens[1], Bart Larsen[2], Ashley Parr[1], William Foran[1], Finnegan Calabro[1], Beatriz Luna[1]

[1]University of Pittsburgh, [2]University of Pennsylvania

Neurodevelopmental theories suggest adolescent peaks in risk-taking are driven by the normative maturation of the striatal dopamine (DA) system. To date however, empirical research in this area has been limited by an inability to assess DA systems non-invasively in vivo in human adolescents. Recent work from our group (Larsen et al., 2020) demonstrates that brain tissue iron, assessed via field-standard quantitative R2' scans, is associated with Positron Emission Tomography (PET) estimates of striatal dopamine, suggesting tissue iron may serve as an indirect marker of striatal dopamine in neurodevelopmental studies.

It has also been suggested that brain tissue iron can be assessed via time averaging and normalization of the T2* weighted (nT2*w) images that are standardly collected during functional neuroimaging (e.g., fMRI). The current work examined the association between these nT2*w values and established striatal tissue iron measures via R2' in a full developmental longitudinal sample (N=131, 236 total visits) and PET measures of vesicular dopamine (DTBZ) in subsample of adult participants (N=79, 158 total visits). In longitudinal non-linear models (general additive mixed models), fMRI-derived nT2*w was robustly associated with field-standard quantitative R2' across regions of the striatum and in the pallidum (FDR q's < .001) and displayed significant age-related changes (q's < .001) consistent with tissue iron accrual during adolescence. fMRI-derived nT2*w was also associated with PET measures of striatal dopamine (FDR q's < .05). Taken together, our results demonstrate brain tissue iron can be assessed with existing T2* data and may serve as indirect measure of striatal dopamine. The ability to assess brain tissue iron via T2*w imaging standardly collected during fMRI provides extensive opportunities for expanded research on dopamine-related neurophysiology in already obtained, ongoing, and future neurodevelopmental studies.

1-J-69 Touch for life

Francis McGlone[1]

[1]Liverpool John Moores University

Recent research has shown that some skin sensory nerves send 'feel good' signals to the brain when activated by gentle touch, and how this kind of touch may be all-important in developing a healthy 'social brain', sustaining human relationships, and controlling stress. Neuroscience research into the sense of touch has focussed mainly on touch receptors (mechanoreceptors) found in the fingertips, where information is conveyed to sensory areas of the brain by fast-conducting nerve fibers, enabling this information to be processed in 'real-time' - an important factor when handling objects or tools. However, we have recently discovered that touch has another sensory channel, beyond the purely discriminative - an affective and affiliative one. Recording the electrical activity in the skin nerves and gently stroking people when scanning their brains, we have identified a system of highly sensitive slowly-conducting nerves in the skin of the body (not found in the palms of the hands) that respond to gentle touch, called c-tactile afferents or CTs. This talk will describe research that has characterised the structure and function of CTs using psychophysical measures, electrophysiological recordings, functional neuroimaging techniques and measures of stress hormones. These data provide support for the functional role of a body-based emotional touch system - one that underpins the rewarding and pleasurable aspects of nurturing care between a mother and her infant, the reassuring hug from a friend in times of need, and the impact of social contact on the brain and the body's stress regulatory systems. CTs evolved to promote the psychological and immunological benefits derived from physical contact. We now have a neurobiological mechanism that helps explain how tactile deprivation (neglect) in early life damages social brain development. Attachment has a nerve.

1-K-71 Gold Standard Practices in Infant and Toddler MRI Acquisition

Cassandra Hendrix[1], Lanxin Ji[2], Moriah Thomason[1]

[1]New York University, [2]Beijing Tiantan Hospital, Capital Medical University

INTRODUCTION: Infant and toddler MRI has enabled unprecedented insight into the developing brain. However, this young field lacks consensus about optimal data collection processes, which interferes with the replication of findings across independent labs and continued scientific progress. In preparation for development of a common HBCD protocol, we address the need for a core, common set of best practices in early-life human brain imaging. Importantly, this study integrates strategies used across different institutions worldwide. METHODS: 40 infant/toddler neuroimaging experts (52% female) completed an online survey on data collection practices in early life MRI. Participants were highly educated (91% MD or PhD), predominantly professors, with an average of 9 years pediatric MRI experience (SD=6.4) and 250 infant/toddler MRI scans completed. RESULTS: There was significant variability in data collection practices across labs, but there were several areas of overlap. Experts generally agreed that newborns (age 0-3 months) are easiest to scan given their sleep patterns and ability to habituate quickly to novel sounds. Consistent with most published studies, researchers report that on average 73% of infants/toddlers make it through all high priority scans, though there is significant variability in scan success rates across labs (range: 30-92%) and across infant/toddler ages (range: 40-90%). In addition to a summary of overlapping strategies across labs, we will quantitatively examine which data collection strategies are correlated with scan success rates. CONCLUSION: Using a data-driven approach to define gold standard practices is an integral step in enhancing scientific rigor and reproducibility in early life neuroimaging. The consolidation of recommendations and lived experience from experts in infant and toddler neuroimaging will serve as a core reference for researchers and will lay the groundwork for a common language across research labs.

1-K-72 Characterizing multimodal phenotypes in youth with Klinefelter syndrome

Elizabeth Levitis[1], Ethan Whitman[1], Siyuan Liu[1], Allysa Warling[1], Erin Torres[1], Liv Clasen[1], François Lalonde[1], Joelle Sarlls[1], Armin Raznahan[1], Daniel Alexander[2]

[1]National Institute of Mental Health, [2]University College London

Klinefelter syndrome (KS) is caused by carriage of a supernumerary X-chromosome in males. KS increases risk for neuropsychiatric impairment - raising questions in KS and neuropsychiatric genetics more broadly - about the patterned impact of pathogenic gene dose variation on different properties of the brain. Here, we apply a novel framework for jointly evaluating group differences across diverse imaging-derived measures of brain structure and function. We gathered structural MRI (sMRI; 99 KS, 92 XY), diffusion MRI (dMRI; 83 KS, 69 XY), and resting-state fMRI (rs-fMRI; 66 KS, 73 XY) in KS and XY groups (ages 6-25 years). These modalities were processed to generate the following measures for the 360 regions of the cortical Glasser parcellation: sMRI: cortical thickness, surface area, gray matter volume, mean, gaussian, and intrinsic curvatures;

dMRI: mean, radial, and axial diffusivity, fractional and geodesic anisotropy; rs-fMRI: regional homogeneity and amplitude of low-frequency fluctuations. For each measure, we computed the standardized mean phenotype difference (SMPD) between KS and XY controlling for age, quality, and motion - for a final ROI*SMPD matrix. We examined the structure of this matrix using k-means clustering and principal component analysis (PCA). Clustering of the ROI*SMPD matrix defined 4 clusters: a posterior cluster with volume increases and diffusivity reductions and 3 distributed anterior clusters with varying reductions in SMPDs. Complementary PCA revealed: (i) a 1st PC explaining 46% of the variance, dominated by morphometric SMPDs and recapitulating a rostro-caudal sensorimotor-associative gradient, and (ii) a 2nd PC explaining 17% of the variance, dominated by microstructural SMPDs and following a ventro-dorsal gradient. By implementing a new multimodal technique we show that KS induces regionally-varying profiles of change that follow canonical spatial gradients of cortical organization and offer promising targets for multiscale decoding.

1-K-73 Impact of significant motion scrubbing on dynamic functional connectivity: validation in an adult resting-state cohort

Lanxin Ji[1], Cassandra Hendrix[2], Moriah Thomason[2]

[1]Beijing Tiantan Hospital, Capital Medical University, [2]New York University

INTRODUCTION: Emerging evidence suggests that dynamic functional connectivity (DFC) may reveal critical aspects of cognition and behavior. While static FC has been established during the fetal period, whether and how these fetal brain networks vary across time is an untested but crucial question. A challenge in fetal functional magnetic resonance imaging (fMRI) is that data undergo extensive motion censoring, which introduces extensive interruption in time-series data. The goal of this study is to establish whether DFC is robust to lack of continuity in fMRI data. This is a necessary first step in evaluation of fetal DFC. METHODS: Pre-processed resting-state fMRI data (818 frames) were downloaded from openneuro.org for 10 healthy adult subjects who were each scanned at 10 sessions, from the Midnight Scan Club dataset. DFC was examined using the GIFT toolbox with sliding window length of 40s and step of 2s. Using a functional atlas, a 50×50 pairwise covariance matrix was estimated within each window. To validate the effect of censoring on network dynamics, we simulated scrubbed data and estimated brain states with k-means clustering under four conditions respectively: C1. 300 continuous frames removed; C2. Consistently sized segments removed; C3. Randomly sized segments removed at random intervals; (C4) frames shuffled on C1. Paired t-tests were conducted on the dwell time for each state between conditions and the untouched data. RESULTS: Brain states were well-maintained across conditions. No significant differences were observed in dwell time for any states in comparison to the untouched data. However, with the shuffled data, many of the transition states were not detected. CONCLUSIONS: Brain states are sensitive to changed ordering of the timeseries and to motion, but are not sensitive to removal of large segments in continuous frames. Having established this proof of concept, we will analyze and present preliminary data on brain states in fetal brains.

1-L-74 Interrogating multivariate patterns of functional connectivity related to childhood and adulthood Tourette syndrome

Matthew Feigelis[1], Ashley Nielsen[2], Deanna Greene[1]

[1]UC San Diego, [2]Washington University School of Medicine

Tourette syndrome (TS) is a developmental neuropsychiatric disorder characterized behaviorally by motor and vocal tics, amongst other sensory and cognitive symptoms. Tic severity has been shown to improve with age for many, but not all patients. Hence it has been posited that different brain systems may underlie childhood and adulthood TS. Previously, we were able to predict diagnostic group membership (TS vs. control) in children and adults using whole brain network activity, as measured with resting state functional connectivity (RSFC) MRI. Here, we investigate the necessary brain systems driving the model's diagnostic classification performance. We combine SVM classification with a permutation sensitivity analysis approach in a sample of 39 TS and 39 matched control children, and 39 TS and 39 matched control adults. We found both similarities and differences in the brain networks that were necessary for accurate diagnostic classification of TS in each of the age groups. In childhood, the default mode network, somatomotor network, along with basal ganglia and thalamic functional connections were necessary for classifying TS. In adulthood, the default mode network, salience network, along with amygdala and hippocampal functional connections were necessary for classifying TS. These results point to specific functional networks that similarly and differentially drive diagnostic classification in TS, and support the idea of divergent neural mechanisms underlying childhood and adulthood TS.

1-L-75 Using machine learning to predict intelligence in atypically developing children and adolescents

Brian Pho[1], Yalda Mohsenzadeh[1], Bobby Stojanoski[1]

[1]Western University

OBJECTIVE: Childhood and adolescence represents a period of profound change to cognition, which can have lifelong influences on school, work, and happiness. It is also a period when many psychopathologies begin to emerge. Common across different adolescent psychopathologies are the detrimental effects they have on cognitive development. In this study, we applied machine learning to neuroimaging data to identify patterns of neural activity that best predict intelligence quotient (IQ) in a large cohort of atypically developing children and adolescents. METHODS: Atypically developing youth between the ages of 6 and 16 (n=678) watched a 10-minute 'Despicable Me' movie clip while functional MRI was acquired. The fMRI data was used to generate a functional connectivity matrix for each subject and connections were selected using mutual information. We then applied a partial least squares (PLS) model to predict individual cognitive abilities as defined by the WISC-V scale. RESULTS: The PLS model

successfully predicted IQ (R2 = 0.13), visual spatial and verbal comprehension (R2 = 0.12), fluid reasoning and working memory (R2 = 0.04), but the model was not able to predict processing speed (R2 = -0.07). Analyzing the PLS model showed that it weighed posterior cortical connections negatively and anterior connections positively. CONCLUSION: We can explain 13% of the variance in IQ from movie-watching data in atypically developing youth using a combination of mutual information feature selection and PLS modeling. Analyzing the model resulted in a set of connections that predicts intelligence and that this set of connections changes during development from youth to adolescence. These results show that movie-watching functional connectivity can modestly predict cognition in atypically developing youth, that different cognitive abilities can be predicted to varying accuracies, and that the set of neural mechanisms underlying cognition changes from childhood to adolescence.

1-L-76 Executive functioning, negative self-evaluation, and network coherence in depressed adolescents

Jordan Garcia[1], Johanna Walker[1], Anthony Gifuni[1], Ian Gotlib[1], Tiffany Ho[2]

[1]Stanford University, [2]University of California, San Francisco

BACKGROUND: Altered coherence in fronto-temporal-parietal networks has been associated with related cognitive deficits in depression. Few studies, however, have sought to examine these links in adolescents with depression, which is important given that depression onset commonly occurs during this period. METHODS: 44 depressed (12 boys, 16.52±1.35 years) adolescents completed a resting-state fMRI scan. We used independent components analysis followed by dual regression to identify and compute within-network coherence of various fronto-temporal-parietal networks across all subjects. To assess depression severity, we administered the Reynolds Adolescent Depression Scale (RADS-2), which includes a subscale for negative self-evaluation (NS). To operationalize executive functioning, we quantified completion performance on the Trail Making Test (TMT). Linear regression models were conducted to test whether brain networks related to executive functioning mediated associations between TMT performance and RADS-2 subscales. RESULTS: Longer TMT completion time was significantly associated with greater NS (B=0.08, t(26)=2.0, p=0.05) and lower temporoparietal network coherence including middle temporal gyrus (MTG; B=-0.01, t(26)=-2.06, p<0.05). MTG network coherence was negatively associated with NS (B=-4.03, t(34)=-2.66, p=0.01) and mediated the association between TMT completion time and NS (95% CI: 0.001-0.211). Frontoparietal network coherence was not associated with depression severity or TMT completion time (all ps<0.1). CONCLUSIONS: Coherence in the MTG network has previously been shown to be associated with executive functioning and semantic memory. Negative self-evaluation may be a modifiable cognitive process through treatments that target MTG coherence. Longitudinal studies with experimental manipulations are needed to confirm the potential mediating effect of MTG network on EF and negative self-evaluation in depressed adolescents.

1-L-77 Anxiety moderates attention to rapidly presented social stimuli in adolescent females

Carolyn Lasch[1], Jed Elison[1], Kathryn Cullen[1], Bonnie Klimes-Dougan[1]

[1]University of MN, Twin Cities

Anxious children show greater attentional bias to threat (ABT) in tasks such as dot-probe (Abend et al., 2017). Amygdala hyperactivation during dot-probe is found in MRI tasks of anxious children with presentations as short at 17 ms (Monk et al., 2008), suggesting behavior is not a perfect measure of ABT. Eye-tracking (ET) is well-suited to investigate how anxiety moderates visual attentional bias to rapidly presented threat faces. Research aims: 1) In a sample of female adolescents oversampled for non-suicidal self-injury (many with anxiety symptoms), can we elicit ABT to rapidly presented, socially salient stimuli competing with other social stimuli? 2) Does anxiety moderate the magnitude of ABT? METHODS: 30 females (12-16 yrs) completed an ET task with usable data. ET data has undergone initial processing; cleaning is ongoing. Diagnosis and symptom data is being cleaned. Full analysis is feasible in 3 months. In a variant of a spatial cueing task, competing cues (fear vs. neutral face) are briefly presented (24 ms) within the parafoveal visual field, then backward masked (126 ms) before presentation of a peripheral target. Facilitation and cost due to cue-target congruent/incongruent trial-types was captured via eye tracking (Tobii TX 300). Multilevel linear models will predict time to initiate look to target. Variables include main effects of target location (left vs. right), fear cue location (left vs. right), and interactions between these variables (importantly, the cue x target interaction would indicate ABT). Effects of anxiety diagnosis and symptoms (as well as their interactions with earlier effects) will also be included. Results and IMPLICATIONS: We expect to find an anxiety X cue X target interaction, such that ABT (cue X target interaction), will increase with anxiety diagnoses and more anxiety symptoms. Higher ABT in anxious adolescents suggests more vigilance to external threats in anxiety, and supports ABT as a symptom and mechanism of anxiety.

1-L-78 Self-concept in adolescent males with autism spectrum disorder

Renske van der Cruijsen[1], Sander Begeer[2], Eveline Crone[1]

[1]Erasmus University Rotterdam, [2]Vrije Universiteit Amsterdam

Adolescents with autism spectrum disorders (ASD) are thought to display an atypical concept of the self, but more recently it was discovered that their self-concept depends on the domain (i.e. social, academic) in which the self is described. This study aimed to provide a more in-depth study on within-person domain-differentiation of self-concept. Furthermore, based on prior studies suggesting that social perspective-taking may influence knowledge of self, we examined the similarity in direct and reflected self-concept in adolescent males with and without ASD. Finally, we examined possible relationships with alexithymia, which refers to difficulties identifying and describing feelings. Participants (NASD=35, NTD=34) completed an fMRI task in which they rated to what extent academic, physical, or prosocial traits described them (direct self-concept) and to what extent their peers would describe these traits to them (reflected self-concept). As expected, autism symptoms were negatively related to self-concept positivity and self-esteem. However, low self-esteem was more strongly associated with higher alexithymia levels. Within-person domain differentiation was similar in both groups, but only in TD adolescents it was positively related to age. On the neural level,

whole-brain analyses for self>control showed overlapping medial prefrontal cortex (mPFC) activation in males with and without ASD. Interestingly, differences in mPFC activation were explained by alexithymia levels but not ASD symptoms. Temporal-parietal junction (TPJ) activation for self>control was stronger in males with more autism symptoms. Thus, whereas ASD symptoms were related to TPJ activation, alexithymia relates to general self-positivity and mPFC activation underlying self-evaluations. Together this study gives a more comprehensive insight into the construction of self-concept in adolescents with ASD.

1-L-79 High genetic risk for bipolar disorder is associated with localised dysconnectivity during normal structural connectome development

Alistair Perry[1], Gloria Roberts[2], Megan Campbell[3], Kate Ridgway[2], Vivian Leung[2], Rhoshel Lenroot[4], Philip Mitchell[2], Michael Breakspear[3]

[1]University of Cambridge, [2]University of New South Wales, [3]University of Newcastle, [4]University of New Mexico

Recent studies of those with bipolar disorder (BD) or at high genetic risk reveal structural dysconnectivity amongst brain networks supporting cognitive and affective processes. Understanding the developmental trajectories of these networks through the peak age range of BD onset could facilitate individual risk prediction. Longitudinal diffusion-weighted images (b=1000 s/mm2, 31 directions) were acquired at baseline and after 2 years in 183 individuals aged 12-30 years in 2 cohorts: 97 unaffected individuals with a first-degree relative with BD (HR) and 86 matched controls (CN). Whole-brain probabilistic tractography was performed to generate whole-brain structural networks. Longitudinal changes in these networks, and group differences, were studied using network-based statistics and mixed linear models. Connections that weakened over time encompassed those particularly between sensorimotor areas, while those that strengthened are located more rostrally connecting subcortical and cognitive control systems (t=3.5; pFWE<0.001). On top of these global changes, HR participants showed weakening of connectivity with time in a more focal network (t=3; pFWE=0.007) encompassing the left inferior and middle-frontal areas, left striatal and thalamic structures, the left fusiform, as well as right parietal and occipital regions: Connections among these regions interestingly weakened at follow-up in those at HR whereas they increased in the CN group. Notably, this developmental change was numerically enhanced in those with their first manic or other mood disorder between baseline and follow-up. In sum, neurodevelopment into early adulthood is associated with substantial brain network reorganization, reflecting the maturation of higher-cognitive functions. In those at high-genetic risk, differences in these maturational processes occur in a localised subnetwork, involving key regions involved in facial affect, and emotion and cognitive control.

1-L-80 Developmental Trajectories of Resting-State Networks and Rumination

Katie Bessette[1], Melinda Westlund-Schreiner[2], Alina Dillahunt[2], Vincent Koppelmans[2], Robert Welsh[2], Heide Klumpp[3], Jonathan Stange[4], Katie Burkhouse[3], Scott Langenecker[2]

[1]University of Illinois at Chicago / University of Utah, [2]University of Utah, [3]University of Illinois at Chicago, [4]University of Southern California

Rumination, the habitual process of dwelling on negative thoughts, and internalizing psychopathology (IP) develop over adolescence. Rumination is considered a potential mechanism of internalizing disorder symptoms, with a robust literature linking onset and maintenance depressive illness with a higher ruminative habit. Both are associated with well-established disrupted brain connectivity within and between the default mode (DMN), cognitive control network (CCN), and salience and emotional (SEN) networks. Hyperconnectivity patterns of within-DMN and cross-network CCN-with-DMN are associated with rumination and IPs, particularly during resting state. Previous work has shown a strengthening of long-distance connectivity in DMN and CCN in typically developing (TD) individuals across the adolescent period. In cross-sectional studies, those with IPs do not show this general pattern of network strengthening over adolescent development. However, it is currently unknown how rumination may be related to atypical network connectivity across adolescence. The current study leverages several resting-state MRI studies across two sites (University of Utah and University of Illinois at Chicago) in 495 adolescents and adults (ages 9-39) either TD (n=181) or with IPs (n=313) to test associations of network connectivity with age and rumination. Using a data-driven approach, multiple regressions with group, age, rumination, and their interactions are conducted on spatial component maps and between component functional network connectivity using the Mancovan toolbox implemented in GIFT. We expect to replicate previous findings of strengthening within-network DMN and CCN connectivity in TDs across adolescence, with few associations with rumination. We expect IPs to show reduced developmental changes, particularly within- and across-DMN and CCN associated with rumination. This begins to shed light on the mechanisms behind aberrant brain network development contributing to IPs.

1-L-81 Acute alterations and longitudinal changes in the brain of young children after a mild traumatic brain injury: design of the EULE pilot study

Fanny Degeilh[1], Michaela Bonfert[1], Florian Heinen[1], Miriam Beauchamp[1], Christian Tamnes[1], Inga Koerte[1]

[1]Ludwig Maximilian University of Munich

Mild traumatic brain injury (mTBI) sustained during early childhood is highly prevalent and may disrupt brain development and compromise child functioning in the long term. However, due to the challenges of collecting neuroimaging data in young children, toddlers and preschoolers seldom undergo magnetic resonance imaging (MRI) after mTBI for research purposes. There is therefore a glaring lack of knowledge about the brain structure and function after early mTBI. The objective of the EULE study is to document indicators of brain integrity and function and their association with post-concussion symptoms (PCS) and functioning in young children with mTBI. Forty 3-5-year-old children with and without mTBI will be recruited. Data will be collected within 5 days (T1) and at 3 months (T2) post-injury. Non-sedated MRI, including structural, susceptibility, diffusion, and resting-state sequences, will be conducted following a brief behavioural preparation. PCS and child functioning will be measured using parent-report questionnaire and standardized tests. Aim 1 - To translate and validate a German-language PCS measure

in young child: The "Report of Early Childhood Traumatic Injury Observations and Symptoms" will be translated and validated in German following international recommendations. Aim 2 - To detect acute brain lesions: Brain lesions will be evaluated using susceptibility weighted imaging and quantitative susceptibility mapping collected at T1. Associations between brain alterations and PCS and functioning will be tested using correlation analysis. Aim 3 - To characterise longitudinal changes in brain structure and function: Latent change score models of diffusion and resting-state MRI collected at T1 and T2 will be computed to evaluate time-related changes and their association with PCS and child functioning. This pilot study will provide feasibility indicators and preliminary data to inform future work in early mTBI. The first progress of the study will be presented

1-N-82 Fluent reading is associated with increased functional connectivity within ventral and dorsal attention networks in children with dyslexia

Nikolay Taran[1], Rola Farah[1], Tzipi Horowitz-Kraus[1]

[1]Technion Israel Institute of Technology

Here, we aim to investigate the cognitive basis and the neurobiological correlates for the involvement of Visual Attention during fluent reading in Typical Readers (TR) and children with Developmental Dyslexia (DD). Seventy-nine 8-12 year-old children (36 TR, 39 DD) completed cognitive tasks and fMRI data was acquired while children performed a fluent reading task with a) deleted from the screen, b) compared to a condition where the text remained on the screen (Still text). Executive functions and Visual Attention abilities were compared between the groups using t-tests. Seed-to-voxel analyses for the fMRI data for both conditions were conducted focusing on DAN and VAN. Children with DD showed decreased EF and visual attention abilities compared to TR. Participants with DD showed increased functional connectivity within the DAN and VAN when compared to the TR. DD also showed increased FC within between VAN and several bilateral regions (IFG, MTG, SPL). TR showed greater FC than children with DD between DAN and the left Angular Gyrus while performing the Still and Deleted task condition. Furthermore, this FC values were associated reading comprehension for both groups in both conditions. Children with DD may compensate for their impairment by recruiting large brain areas together with the DAN and VAN. The correlation between this FC values and the behavioral data suggest that this is the most efficient connectivity pattern for the task. The results of the behavioral and the fMRI assessment combined suggest that VA plays a key role in the reading difficulties of children with DD.

1-O-83 Using task-based neural fingerprinting to predict canonical network engagement during development

Fengdan Ye[1], Robert Kohler[1], Bianca Serio[1], Sarah Lichenstein[1], Sarah Yip[1]

[1]Yale University

OBJECTIVE: The current study aims to test the novel hypothesis that individual participant multi-task co-activation fingerprints can be used to predict resting-state canonical network engagement and cognitive abilities at a young age. METHODS: Neuroimaging data were obtained from the Adolescent Brain and Cognitive Development (ABCD) Study for young adolescents at baseline (N=6073, age=9.97±0.63 years, 3056 girls) and at two-year follow-up (N=3539, age=11.94±0.63 years, 1726 girls). Individual multi-task co-activation patterns were constructed from the beta weights of twelve contrasts from the monetary incentive delay, stop signal task, and emotional N-back tasks. Resting-state connectivity within canonical networks and cognitive measures were obtained for the same individuals. Connectome-based predictive modeling (CPM) was adopted to predict resting state and cognitive measures from functional co-activation fingerprints. RESULTS: At baseline, co-activation fingerprints successfully predicted connectivity within the default mode network (DMN, rho=0.179±0.002) and general cognitive ability (rho=0.140±0.006). Removing the MID task or the nBack task from the co-activation fingerprints hindered model performances, whereas removing the SST did not harm, and sometimes even improved, model performances. Predictive features for resting-state connectivity within the DMN identified at baseline also predicted DMN connectivity at two-year follow-up (rho=0.243). CONCLUSIONS: Multi-task co-activation fingerprints are functionally meaningful and can be modeled to predict resting-state connectivity within the DMN, as well as general cognitive ability. Predictive features within the co-activation fingerprints identified at baseline can be extended to predictions at a future time point, suggesting validity of the features even over the course of development.

1-O-84 Developmental trajectories of myo-inositol across infancy via in vivo magnetic resonance spectroscopy

Marisa Spann[1], Martin Gajdosik, Karl Landheer, Dustin Scheinost[2], Christoph Juchem[1]

[1]Columbia University, [2]Yale University

Increasingly, brain inflammation, e.g., related to SARS-CoV-2 exposure, is recognized as a risk factor for future psychiatric disorders. The biochemical myo-inositol is a putative marker of brain inflammation that can be readily measured in adults with magnetic resonance spectroscopy (MRS). Yet, to date, the characterization of myo-inositol in the brain of infants is limited, in part due to methodological challenges. Here, we provide preliminary trajectories of myo-inositol concentrations across infancy using state-of-the-art MRS methods. In 16 infants, ranging from 0-9 months of age, we collected MRS data from the anterior cingulate cortex (ACC), prefrontal cortex (PFC), temporoparietal junction (TPJ), occipital lobe, and cerebellum, using the single-voxel MRS sequence, semi-LASER. Two infants were scanned twice, >3 months apart. Spectra were processed with the INSPECTOR software. NAA, choline, glutamate, and lactate were also quantified. To investigate trajectories pooling over all regions, we used linear mixed effect models. Myo-inositol was successfully quantified in the ACC for 89%, in the PFC for 44%, in the TPJ for 66%, in the occipital lobe for 55% and in the cerebellum for 66% of the scans. Myo-inositol was negatively associated with infant age ($t=-9.54$, $p<0.001$). In post-hoc analyses for each region independently, all regions exhibited a strong negative correlation with age (r's: -0.67 to -.90). NAA, choline, and glutamate all show significant associations with age across the brain (NAA: $t=6.62$, $p<0.001$; Cho: $t=-7.9$, $p<0.001$; Glx: $t=4.20$, $p<0.001$). No significant associations with age were found for Lac ($t=-1.66$, $p=0.11$). We showed that myo-inositol, a marker of brain inflammation, rapidly decreases in concentration across

infancy in typically developing participants. These trajectories provide important baseline measures for future studies, such as those investigating the impact of SARS-CoV-2 exposure or maternal immune activation on the developing brain.

1-O-85 Associations between age and brain synchrony during passive viewing in early childhood

Ryann Tansey[1], Kirk Graff[1], Christiane Rohr[1], Dennis Dimond[1], Amanda Ip[1], Shelly Yin[1], Deborah Dewey[1], Signe Bray[1]

[1]University of Calgary

BACKGROUND: Children's brains undergo extensive structural changes across early childhood. Less is known about how functional brain responses mature across this period. Movie stimuli engage brain regions involved in visual and auditory processing as well as attention, language, emotion, and navigation, in a more ecologically valid context than traditional task paradigms. Examining age effects on movie processing can shed light on the functional maturation of both sensory and higher-cognitive processing. Previous work suggests that relative to adults, young children show reduced and more diffuse brain synchrony to one another as measured by intersubject correlation (ISC), while relatively modest differences have been observed between younger and older children. Here, we used a longer acquisition and larger sample to test the hypothesis that older children show greater ISC than younger children across both sensory and cognitive regions. METHODS: We analyzed fMRI data from 81 4-7 year old children (F = 51) while they watched a series of clips from the children's TV show "Elmo's World" (18 min). Using a median split at M = 5.9 years, we created "younger" (n = 41) and "older" (n = 40) groups. We calculated within-group whole-brain ISCs and modeled group effects using a linear mixed effects model controlling for head motion. RESULTS: Older children had greater ISC in widespread bilateral areas including the posterior cingulate, fusiform, lateral occipital, parietal association, frontal, and much of the temporal cortices, the precuneus, and the left precentral gyrus. The younger group had greater ISC in isolated clusters in the bilateral lingual gyri, the intracalcarine cortex, and the occipital pole. CONCLUSION: Our findings suggest that brain responses to movie stimuli are more synchronized between older children in higher order sensory and cognitive areas, whereas primary visual response may be more consistent across younger children.

1-P-86 Physical fitness, hippocampal functional connectivity and academic performance in children with overweight/obesity: the ActiveBrains project

Irene Esteban-Cornejo[1], Chelsea M. Stillman[2], Maria Rodriguez-Ayllon[3], Arthur F. Kramer[4], Charles H. Hillman[4], Andrés Catena[1], Kirk I. Erickson[2], Francisco B. Ortega[1]

[1]University of Granada, [2]University of Pittsburgh, [3]Erasmus MC, [4]Northeastern University

OBJECTIVES: Physical fitness is a modifiable factor associated with enhanced brain health during childhood. To our knowledge, the present study is the first to examine: (i) whether physical fitness components (i.e., cardiorespiratory, motor and muscular fitness) are associated with resting state functional connectivity of hippocampal seeds to different cortical regions in children with overweight/obesity, and (ii) whether resting state hippocampal functional connectivity is coupled with better academic performance. METHODS: A total of 99 children with overweight/obesity aged 8-11 years were recruited from Granada, Spain. T1-weighted and resting-state fMRI images were acquired. Fitness and academic performance were assessed by the ALPHA battery and the Woodcock-Muñoz test, respectively. Hippocampal seed-based procedures with post-hoc regression analyses were performed. RESULTS: In the fully adjusted models, cardiorespiratory fitness was independently associated with greater hippocampal connectivity between anterior hippocampus and frontal regions (βranging from 0.423 to 0.424, $p < 0.001$). Motor fitness was independently associated with diminished hippocampal connectivity between posterior hippocampus and frontal regions (βranging from -0.583 to -0.694, $p < 0.001$). However, muscular fitness was not independently associated with hippocampal functional connectivity. Positive resting state hippocampal functional connectivity was related to better written expression (βranging from 0.209 to 0.245; $p<0.05$). CONCLUSIONS: Fitness components may associate with functional connectivity between hippocampal subregions and frontal regions, independent of hippocampal volume, in children with overweight/obesity. Particularly, cardiorespiratory fitness may enhance anterior hippocampal functional connectivity and motor fitness may diminish posterior hippocampal functional connectivity. In addition, resting state hippocampal functional connectivity may relate to better written expression.

1-P-87 Identifying differences in functional organization of left- and right-handed individuals using functional connectivity

Link Tejavibulya[1], Hannah Peterson[1], Siyuan Gao[1], Stephanie Noble[1], Max Rolison[2], Dustin Scheinost[1]

[1]Yale University, [2]Yale School of Medicine

Handedness is a characteristic that has led scientists to believe there is an innate hemispheric dominance, and that left-handed (LH) and right-handed (RH) individuals' functional organizations may differ. This has led LH's to be excluded from numerous fMRI studies due to our lack of understanding of functional organization differences. This study aims to uncover differences in functional organization between LHs and RHs using functional connectivity. To investigate differences due to handedness, connectomes were generated from 905 resting-state fMRI scans from the Healthy Brain Network. Connectomes were correlated with Edinburgh Handedness Questionnaire (EHQ) scores to explore differences in whole-brain functional connectivity between LH and RH and as a means of assigning handedness. As LH were rare in the sample and an ambidextrous group existed, direct group comparisons between LH and RH were done by thresholding EHQ scores at multiple thresholds to define groups (i.e., 50/-50, 60/-60, 70/-70, and 80/-80). We performed inference using the Network-Based Statistic (NBS; FWER=5%). Edges that were significantly different in all five analyses were selected for visualization. Across all analyses, we identified significant EHQ correlations and group differences between LH and RH ($p<0.001$, for all five analyses). LHs exhibited stronger connectivity in the right hemisphere, with differences in connectivity between the brainstem and cerebellum to dorsolateral prefrontal regions.

Amongst RHs, edges were more widespread across both hemispheres including edges between the left orbital frontal cortex to left limbic regions, right ventral parietal regions to the left cerebellum, and right motor strip to left temporal pole. In summary, we detected widespread effects due to handedness in a large dataset to investigate these characteristics. A better understanding of handedness will allow scientists to make informed decisions about accounting for this source of variability.

1-Q-88 Relation between Irritability and Rejection-Elicited Aggression Across Development

Athena Vafiadis[1], Megan Quarmley[1], Johanna Jarcho[1]

[1]Temple University

BACKGROUND: Irritability increases sensitivity to social rejection, a common elicitor of aggression. It is unclear whether irritability is associated with more aggressive behavior in social contexts. Sensitivity to rejection, rates of irritability, and aggressive behavior change from adolescence to adulthood. Thus, it is possible that the relation between irritability and aggression varies by developmental stage. We used an ecologically-valid social rejection paradigm to test the relation between irritability and rejection-elicited aggression in adolescents and young adults. METHODS: Adolescents (n=83, 12.39±1.17 years) and young adults (n=93, 19.06±1.34 years) completed the Affective Irritability Index (ARI) prior to the Virtual School (VS) task, a computer-based paradigm where participants interact with rejecting, accepting, and unpredictable purported peers. Following the VS, participants had the opportunity to deliver a white noise blast to the same peers at a volume of their choosing, which was used to quantify aggression. RESULTS: A repeated measures ANOVA showed the task evoked rejection-elicited aggression. Participants were most aggressive to rejecting, followed by unpredictable, and then accepting peers ($F(2,344)=152.126$, $p<.001$). Compared to adults, adolescents were more irritable ($t(170)=4.648$, $p<.001$) and aggressive towards rejecting peers ($t(171)=3.708$, $p<.001$). Although more severe irritability was associated with higher levels of rejection-elicited aggression ($t(168)=-1.919$, $p=.057$), age moderated this relation. Specifically, irritability was more predictive of aggression in young adults than in adolescents ($F(1,168)=6.017$, $p=.015$). DISCUSSION: Irritability is associated with rejection-elicited aggression in young adults but not adolescents. Thus, mechanisms promoting rejection-elicited aggression may differ across development. Future work is needed to test underlying neurocognitive circuits implicated in this shift.

2-A-89 Training cognitive control: Brain-Behaviour plasticity in childhood

Keertana Ganesan[1], Roser Cañigueral[1], Abigail Thompson[1], Claire Smid[1], Vanessa Puetz[1], Nikolaus Steinbeis[1]

[1]University College London

Childhood cognitive control is an important predictor for later success and wellbeing (Blair & Razza, 2007; Moffit et al., 2011) and has become the primary target for interventions (Wass, et al., 2012). Studies training cognitive control have been largely mixed (Cohen & Poldrack, 2008) but recent research training cognitive control through inhibition adopting a gold-standard protocol has yielded promising results (Ganesan et al., 2021). One outstanding question is how observed behavioural changes are underpinned by changes in functional activation of neural areas that support cognitive control. Studies in both children and adults have shown that late developing prefrontal areas such as the dorsoprefrontal cortex, anterior cingulate cortex and inferior frontal gyrus subserve inhibitory control (Aron et al., 2007; Rubia et al., 2007) and no developmental study has examined how training improvements in childhood could be mediated by neuroplasticity. To test this, children (6-12-years; N = 228) were assigned to an experimental group training cognitive control or active control group. Training lasted 8 weeks (4 sessions per week). Pre-post data collection included behavioural (stop-signal reaction time task; SSRT) and neural indices (functional activity during SSRT) of cognitive control. We hypothesise that (i) behavioral and neural indices of cognitive control will improve in the experimental group compared to the control group; and that (ii) behavioral changes will be coupled with neural changes. For hypothesis i, we plan to use a mixed model for repeated measures to examine if training leads to pre-post changes. Using correlations and mediation analysis (hypothesis ii), we will examine how these improvements are explained by changes in functional activity. Our study will help establish the malleability of brain-behaviour through cognitive control training in childhood and has crucial implications for interventions designed to boost this important cognitive function.

2-A-90 The long-term effects of social isolation during early puberty on the development of executive functioning

Katie Paige[1], Craig Colder[1]

[1]SUNY Buffalo

OBJECTIVE: Evidence suggests that hormonal changes during early puberty induce brain maturation that supports healthy development of executive functioning (EF), which is essential for positive adjustment (Blakemore et al., 2010). Therefore, early puberty may represent a critical period during which negative socioenvironmental experiences are particularly harmful to EF development. It has been proposed that social isolation during early puberty produces a cascade of physiological and neurobiological events that alter trajectories of EF development (Drzewiecki et al., 2020). However, this possibility has not been well-tested in humans. We propose that social isolation during early puberty will prospectively predict poor executive functioning across adolescence. METHOD: The current study will utilize data from a nine year longitudinal study of 387 (55% female) human adolescents (Wave (W) 1 M age=12.1). At W1-3, pubertal status was measured using the Pubertal Development Scale (PDS; Petersen et al., 1988). Early puberty will be operationalized as Tanner stages 2-3 (Tanner & Whitehouse, 1982). Social isolation was assessed at W1-3 using adolescents' self-report (Child Social Preference Scale, Coplan et al., 2004). Executive functioning was assessed using adolescent and parent self-reports on the Early Adolescent Temperament Questionnaire-Revised (W1-3) and the Adult Temperament Questionnaire (W7-9). ANALYSIS PLAN: Hierarchical linear modeling will be used to examine growth trajectories of EF. Social isolation in early puberty (a 2-way interaction) will be tested as a predictor of growth in EF. Findings will shed light on whether early puberty represents a critical period of neurobiological and social development during which social isolation has especially adverse effects on the long-term development of executive functioning.

2-A-91 Associations between neurocognitive measures, prefrontal cortical thickness and ADHD symptoms within the ABCD Study®.

Hope Doyle[1], Kelly Cosgrove[1], Florence Breslin[1], Amanda Morris[1], Martin Paulus[1], Robin Aupperle[1]

[1]Laureate Institute for Brain Research

OBJECTIVES: Lower executive functioning (EF), working memory and decreased prefrontal cortical thickness have been associated with attention-deficit/hyperactivity disorder (ADHD) symptoms. However, the strength and directionality of these relationships within specific developmental stages remains unknown. Using baseline ABCD Study® data (NDA Data release 3.0), we tested hypotheses that lower EF and learning and memory (LM) scores and decreased middle frontal gyrus (MFG) cortical thickness would relate to ADHD symptom status in pre-adolescents. METHODS: Participants were excluded for poor MRI data quality (n=1,095) or being a family member (n=1,699). ADHD group status was determined using T≥70 on the Child Behavior Checklist (CBCL) ADHD scale. An equal sized non-ADHD group was created via propensity matching on whole brain cortical thickness, sex, age, ethnicity, parent education, marital status, household income, and site (Final n=240/group; 39% Female, 53% Caucasian, mean age=118.7 months, SD=7.2). EF and LM were combined scores from the NIH Toolbox. Cortical thickness was measured from bilateral MFG masks (Destrieux atlas). Logistic regression analysis examined associations between EF/LM scores, cortical thickness and ADHD group status. RESULTS: EF and LM scores were significantly lower for the ADHD group (EF: B=-0.26, SE=0.12, p=0.03, OR=0.77 [95% CI: 0.61-0.97]; LM: B=-0.36, SE=0.14, p=0.01, OR=0.70 [95% CI: 0.53-0.92]). Cortical thickness was not significantly related to group status (B=0.01, SE=0.10, p=0.90). CONCLUSION: Lower EF and LM scores are cross-sectionally associated with having clinically significant ADHD symptoms in pre-adolescence, although effect sizes are small. However, MFG cortical thickness does not seem to relate to parent reported ADHD symptoms. Future research is needed to clarify potential predictors (e.g., thickness in other cortical regions, functional brain activation) of ADHD status cross-sectionally and longitudinally.

2-A-92 Now it's your turn!: Eye blink rate modulated by interaction of wait times, inhibitory control, and internalizing behaviors in a Jenga-like inhibitory control task

Kelley Gunther[1], Xiaoxue Fu[2], Leigha MacNeill[3], Morgan Jones[1], Briana Ermanni[4], Koraly Pérez-Edgar[1]

[1]The Pennsylvania State University, [2]University of South Carolina, [3]Northwestern University Feinberg School of Medicine, [4]Virginia Tech

Dopamine is a versatile neurotransmitter reflecting functioning in many domains, including anxiety and inhibitory control (IC). Although high levels of IC are often regarded as adaptive, other work suggests that high levels of IC may be a risk factor for anxiety disorders (Henderson & Wilson, 2017). Dopamine signaling may be key in understanding relations between IC and anxiety. Eye blink rate is a proxy of midbrain dopamine activity (Jonkees & Colzato, 2016). However, like many constructs in psychology, work with eye blink rate has largely been constrained to screen-based tasks lacking in ecological validity. Here, we asked whether changes in eye blink rate through a naturalistic IC task differ as a function of parent-reported IC, as measured by the effortful control (EC) scale of the Children's Behavior Questionnaire (Rothbart et al., 2001), and parent-reported internalizing behaviors, measured by the Child Behavior Checklist (Achenback & Edelbrock, 1983). 55 children (Mage = 6.15 years) were asked to play a Jenga-like task with an experimenter. With each successive trial the experimenter took an increasingly long time to take their turn. Blinks-per-second were computed during each wait period. Multilevel modeling examined the relation between duration of wait period, level of EC, and count of internalizing behaviors on eye blink rate, nested within individuals. We found a significant 3-way interaction between EC, internalizing behaviors, and duration of the wait period, $b < 0.001$, $p < .05$. Simple slopes testing revealed that for children who were 1SD below the mean in internalizing behaviors and 1SD above the mean in EC, their eye blink rate significantly decreased as the task required them to wait longer to take their turn. These findings index task-related changes in midbrain dopamine activity in relation to naturalistic task demands, and suggest that these changes may vary as a function of individual differences in IC and internalizing behaviors.

2-A-93 Cognitive outcome is related to functional thalamo-cortical connectivity after pediatric stroke

Leonie Steiner[1]

[1]University of Bern

The thalamus has complex connections with the cortex and is involved in various cognitive processes. However, little is known about thalamo-cortical connections after pediatric arterial stroke (AIS). Therefore, the aim was to investigate thalamo-cortical connections and their association with cognitive performance after AIS. Twenty patients after pediatric AIS in the chronic phase (≥ 2 years after diagnosis, diagnosed <16 years; aged 5-23, mean 15.1 years) and twenty age- and gender-matched healthy controls were examined. Cognitive performance (selective attention, inhibition, working memory, cognitive flexibility) was assessed and resting-state functional magnetic resonance imaging was performed to examine functional thalamo-cortical connectivity. Cognitive performance (selective attention, inhibition and working memory) was significantly reduced in patients compared to controls. Network analyses revealed significantly lower thalamo-cortical connectivity strength for the motor, auditory, visual, default mode network (DMN), salience, left/right executive and dorsal attention network. Further, higher thalamo-cortical connectivity strength was found in the DMN, posterior DMN, dorsal attention and the left executive network in patients compared to controls. Multivariate linear regression, with lesion size and age as covariates, revealed significant associations between cognitive performance (selective attention, inhibition and working memory) and the strength of thalamo-cortical connectivity in the motor, auditory, visual, DMN, posterior DMN, salience, left/right executive and dorsal attention network. Our data may provide evidence that the interaction between different sub-nuclei of the thalamus and multiple cortical networks is crucial for post stroke cognitive functions. The variability in cognitive outcomes after pediatric AIS might be explained by functional thalamo-cortical connectivity measures.

2-A-94 Testing the comparative predictive validity of neural structure versus suicidal ideation history for prediction of Suicide Stroop Task performance

Kinjal Patel[1], Olivia Pollak[1], Margaret Sheridan[1], Matteo Giletta[2], Paul Hastings[3], Matthew Nock[4], Karen Rudolph[5], George Slavich[6], Leah Somerville[4], Mitchell Prinstein[1], Adam Miller[1]

[1]University of North Carolina, Chapel Hill, [2]Ghent University, [3]University of California, Davis, [4]Harvard University, [5]University of Illinois, Urbana-Champaign, [6]University of California, Los Angeles

This study aims to investigate associations between neural structure and performance on the Suicide Stroop Task (SST). The SST detects attentional biases to suicide-related stimuli by measuring interference (slower reaction times to suicide-related words vs. neutral or emotional words) and may provide objective markers of suicide risk (Cha et al., 2010). However, a recent, large investigation of SST data found that SST performance did not differentiate suicide attempters, ideators, or controls, suggesting poor concurrent validity of the SST (Wilson et al., 2019). While poor psychometric properties may be due to task design, an alternative hypothesis is that performance is primarily driven by general executive functioning abilities (vs. suicide-specific attentional bias). We hypothesize that SST performance is dependent on factors related to general cognitive abilities and that SST performance may be impacted by neural structure. While prior studies demonstrate a robust relationship between cognitive function and brain structure (He et al., 2020), associations between neural structure and suicide-related interference (i.e., SST performance) have yet to be examined. Second, we aim to test the comparative predictive validity of neural structure vs. suicidal ideation (SI) history for prediction of SST performance. We outline these aims in a preregistration on collected data that has not yet been analyzed (osf.io/grwy9). A clinically high-risk sample of 138 girls ages 9-16 (M=12.53) completed a structural MRI scan, the SST, and a measure of SI history. Freesurfer was used to estimate cortical thickness of a priori neural regions (e.g., insula, inferior frontal gyrus, dorsolateral prefrontal cortex). By examining associations between SST performance and neural structure in regions implicated in attentional shifting, inhibitory control, and regulation, we seek to better understand neural markers that may underlie performance on a suicide-specific behavioral task.

2-A-95 Early onset consumption of coca paste associated with executive-attention vulnerability markers linked to caudate-frontal structural and functional abnormalities

Laura Alethia de la Fuente[1], Sofia Schurmann Vignaga[2], Pilar Prado[2], Rosario Figueras[2], Lucia Lizaso[2], Facundo Manes[2], Marcelo Cetkovich[2], Enzo Tagliazucchi[3], Teresa de la FuenteTorralva[2]

[1]IFIBA/INCyT, [2]INCyT, [3]IFIBA

Coca paste is the most popular form of smoked cocaine (SC) in Latin America and also the most widespread among adolescents in vulnerable sectors of society, thus representing a significant public health concern. Despite evidence suggesting that abnormal executive-attention function is predictive of addiction to stimulant drugs, no study to date has compared clinically relevant neuropsychological (NPS) and physiological variables between individuals with histories of smoked cocaine dependence (SCD) and insufflated cocaine hydrochloride dependence (ICD). In this study we evaluated 25 SCD and 22 ICD subjects matched by poly-consumption profiles, and 25 healthy controls (CTR) matched by age, gender, education, and socioeconomic status. An exhaustive NPS battery was used to assess cognitive domains (attention, executive functions, fluid intelligence, memory, language and social cognition). We complemented this assessment with structural (MRI) and functional (fMRI) neuroimaging data. We found that executive function and attention impairments could be explained by the administration route of cocaine, with strongest impairments for the SCD group. SCD also presented reduced grey matter density relative to ICD and CTR in the bilateral caudate, a key area for executive and attentional function. Functional connectivity between left caudate and inferior frontal regions mediated the association between brain structure and behavioral performance. Our results highlight the relevance of assessing the route of administration of stimulants, both in clinical and research settings.

2-A-97 A test of implicit emotion regulation in children: a modified emotional go/nogo fmri task

Stepheni Uh[1], Roma Siugzdaite[1], Alexander Anwyl-Irvine[1], Edwin Dalmaijer[1], Giacomo Bignardi[1], Tess Smith[1], Duncan Astle[1]

[1]Cambridge University

An important domain of emotion regulation that has only recently gained theoretical and empirical emphasis is implicit emotion regulation: automatically and adaptively triggered emotional processing without explicit intention. As there is a lack of neuroimaging studies investigating implicit emotion regulation in children, our objective was to further explore the neural bases subserving implicit emotion regulation, utilizing a modified emotional Go/NoGo fMRI task, and individual differences in children. This study included 40 child participants (50% female) aged 7-9 years old (M = 8.65; SD = 0.77) from Cambridgeshire. We adapted Ho and colleagues' (2018) emotional Go/NoGo block design with happy, sad, neutral, and scrambled faces as implicit distractors from the actual Go/NoGo cues. We used a relatively standard preprocessing pipeline via fMRIprep, with T-contrasts for response inhibition and emotional effects. A nonparametric multiple comparisons procedure, based on permutation testing for our group-level analysis, was applied. Task behavioral results (dprime, average response times) were also computed. Significant contrasts included: larger NoGo vs Go activation in the IFG, insula, and MCC/ACC; greater activation in the IOG/FFG for Faces vs Control; right putamen for Sad NoGo vs Sad Go; and right putamen and pallidum for Happy Go vs Sad Go. The strongest relationship between beta values from the significant activations of these contrasts and our measures of individual differences was a negative correlation between the Sad NoGo vs Sad Go beta values and self-reported anxiety (RCADS GAD), tb = -0.22, p = 0.05. However, this weak relationship did not survive after correcting for multiple comparisons (FDR). Further understanding implicit emotion regulation at the neural level is especially important as detecting and adaptively responding to implicit socioemotional cues early in development is increasingly thought essential for psychosocial wellbeing.

2-B-100 Longitudinal association between children's neural response to facial affect and anxiety symptoms

Dana Glenn[1], Jordan Mullins[1], Kalina Michalska[1]

[1]University of California, Riverside

Children with anxiety display biases in emotion recognition, including a tendency to label ambiguous emotional facial affect as negative or threatening (Reeb-Sutherland et al., 2015). Longitudinal designs permit for the examination of the developmental course of emotional difficulties in anxiety, which onset during middle childhood when neural networks underlying emotion processing are developing. We plan to test longitudinal effects of aberrations in emotion recognition during this sensitive developmental period on anxiety symptoms in early adolescence. At Wave 1 (W1), 49 girls (Mage = 10.0 + 2.3 years) completed an in-scanner implicit emotion recognition task adapted from Blair et al. (2001), during which they labeled the gender of 10 actors' happy and fearful face emotion pictures at 0%, 33%, 67%, and 100% emotion intensities. We measured hemodynamic response to fearful and happy faces varying in emotional intensity in four a priori anatomically-defined brain regions implicated in emotion processing (amygdala, ventrolateral prefrontal cortex, ventromedial prefrontal cortex, anterior cingulate cortex). At W1 and two years later, at Wave 2 (W2), children and their parents reported on children's anxiety symptoms on the Child Behavior Checklist (Achenbach, 1991). We hypothesize that the degree of emotion intensity-modulated signal in these regions to fearful expressions will (1) be associated with concurrent anxiety and, (2) prospectively predict anxiety symptoms two years later. Hemodynamic response will be parametrically modulated as a function of emotion intensity for each emotion spectrum (fear, happy). We will test longitudinal associations between hemodynamic response to emotional facial affect at W1 and anxiety symptoms at W2. For each brain region, multiple linear regression modeling will be performed with emotion intensity-modulated neural response as predictors and W2 anxiety symptoms as the dependent variable, controlling for W1 anxiety symptoms.

2-B-101 Whole Brain Longitudinal Changes in Adolescent Social Reward and Punishment Processing

Jessica Flannery[1], Nathan Jorgensen[1], Caitlin Turpyn[1], Seh-Joo Kwon[1], Mitchell Prinstein[1], Kristen Lindquist[1], Eva Telzer[1]

[1]University of North Carolina, Chapel Hill

Adolescence is a pivotal period of social-affective learning. Reward and punishment processing are important for learning and associated with individual differences in risk-taking behaviors. However, the expected neural trajectories implicated in reward versus punishment, as well as during the anticipation versus receipt phase of social processing remains mixed. Common approaches to studying developmental changes in reward processing have focused on cross-sectional comparisons between children, adolescents, and adults, or specific a priori regions of interests (ROIs) implicated in reward processing (e.g., ventral striatum; VS). Therefore, the current preregistered study, used a 3 wave longitudinal design to assess how neural response to both the anticipation and receipt of social reward and punishment change across adolescence (11-13 years old at wave 1; n=178). Participants completed a social incentive delay task which is designed to assess reward processing, specifically as it relates socially relevant stimuli, using age-matched peers faces. By using a whole brain longitudinal modeling approach, we aimed to identify patterns of activation than change and may account for the heterogeneity across studies that assess only specific ROIs. Developmental change was measured by linear and quadratic effects of age and puberty. Across age and puberty, we saw expected patterns of heightened activation implicated in social processing (e.g., VS); however, this pattern did not change over time. Across valence, amygdala activation showed an U-shape age-related trend to the anticipation of social feedback, whereas the right hippocampus and subgenual anterior cingulate cortex showed an inverted U-shape age-related trend to the receipt of social feedback. Puberty, sex, and reward and punishment specific effects as well as the implications for these findings to our understanding of social processing across adolescence will be discussed.

2-B-102 Adolescents Display Distinct Self-Referential Biases in Memory and Perspective Taking

Maximilian Scheuplein[1], Gabriele Chierchia[2], Saz Ahmed[2], Lucy Foulkes[2], Cait Griffin[2], Sarah-Jayne Blakemore[3]

[1]Leiden University, [2]University College London, [3]University of Cambridge

Self-referential processing, the appraisal of how information relates to oneself, and perspective taking, the ability to take another person's point of view, undergo continued development throughout adolescence. Research suggests a link between these processes in adults, but little is known about their relationship in adolescents. The current study assessed age-related differences in, and relationship between, self-referential processing and perspective taking in adolescence and early adulthood. Participants (N = 97) aged 11-35 years performed a self-referential memory task in which they rated how well a series of self-related adjectives (e.g., "joyful") described themselves and how well a series of town-related adjectives (e.g., "touristy") described London. During a subsequent surprise memory task, younger participants displayed increased memory accuracy and confidence for self-related adjectives, compared to town-related adjectives, and a memory bias that disadvantaged recognizing town-related adjectives, compared to self-related adjectives. This heightened sensitivity to self-related information diminished with age: older participants showed no differences in memory accuracy, confidence ratings and memory bias between self- and town-related adjectives. Participants also completed the Director task, a measure of perspective taking. Results showed continued improvement in task performance from adolescence to adulthood. Across all ages, there was no significant relationship between the memory domain of self-referential processing and perspective taking. Overall, our findings show that adolescents display heightened self-referential biases in memory and perspective taking, but we found no evidence that these two processes are related.

2-B-103 Children with a history of maltreatment show a rumination-like spontaneous thoughts network potentially highlighting increased depression risk

Ferdinand Hoffmann[1], Roman Linz[2], Claudia Buss[1], Claudia Calvano[1], Lea Bentz[1], Jan Warncke[1], Sibylle Winter[1], Sonja Entringer[1], Christine Heim[1]

[1]Charité Universitätsmedizin, Berlin, [2]Max Planck Institute for Human Cognitive and Brain Sciences

OBJECTIVE: Childhood maltreatment has been associated with major depressive disorder (MDD). Atypical self-generated thoughts (SGT), with predominantly negative content and a lack of positive content--a feature of ruminative thinking--might represent one vulnerability factor for developing depression and have been previously identified in adolescents who experienced maltreatment. In this study we used a novel way of investigating SGTs abnormalities in young children with a history of maltreatment via investigating children's spontaneous thoughts network and its properties and its relation to depressive symptomatology. METHODS: As part of the Kids2Health project, 6-12-year-old children with maltreatment history (MT: N = 45) and with no maltreatment history (NMT: N = 43) performed an established mind-wandering task. Participants made nondemanding number discriminations during which intermittent questions probed their SGTs that were classified as off-task, positive, negative, self-related, other-related, past-oriented, or future-oriented. Regularized partial correlation networks were computed and compared between the groups. RESULTS: Relative to NMT children MT children exhibited more other-related thoughts, as well as more extreme and fluctuating negative thoughts, which were associated with depressive symptoms. Network analyses indicated marked differences in MT children's thought network relative to NMT children, in terms of an increased clustering of past and negative thoughts, while positive thoughts were not integrated in the network. CONCLUSION: Children with a history of maltreatment show differences in their spontaneous thoughts network relative to children with no history of maltreatment, highlighting a ruminative clustering of thought dimensions likely representing a risk factor for developing depression later in life. FUNDING: This work was funded by the Federal Ministry of Education and Research (BMBF) (FKZ 01GL1743B). Internal funding to CH.

2-B-105 Cortical Response to Mother and Stranger Emotional Voices in Newborn Infants

Genevieve Patterson[1], Shannon Powers[1], Xu Han[2], Alexander Dufford[3], Tom Yeh[2], Pilyoung Kim[1]

[1]University of Denver, [2]University of Colorado Boulder, [3]Yale University

OBJECTIVE: Infancy is a time of rapid brain growth underlying social, emotional, and language development. Maternal voice is a particularly salient stimuli during infancy and has been associated with differential brain response. We will examine neonate cortical response to mother and stranger voices speaking in different emotional tones to investigate early neural response to relevant socioemotional stimuli. METHODS & HYPOTHESES: 46 newborn infants (<1 month old) from socioeconomically diverse backgrounds listened to their mother and a control voice speaking non-sense sentences in happy and angry tones during natural sleep while undergoing functional near-infrared spectroscopy (fNIRS). Measurements of maternal mood, income-to-needs ratio, and stress were assessed at each trimester during pregnancy and after birth. We will use MATLAB and NIRS Toolbox (Huppert & Barker, 2015) to conduct preprocessing and whole brain data analysis comparing activation between conditions (mother vs stranger and happy vs angry tone). HYPOTHESIS 1: Infants will show stronger activation in left lateralized frontal and temporal language regions in response to mother speech compared to stranger speech. HYPOTHESIS 2: Infants will show greater activation to angry voices compared to happy voices in cortical regions related to threat and emotion processing such as the ventromedial and dorsolateral prefrontal cortex. Additional exploratory analyses will be performed regressing prenatal maternal stress and mood measures onto infant neural activation during the task. IMPLICATIONS: While there are a growing number of studies looking at infant brain response to social and emotional stimuli, these processes in neonates are still poorly understood. Understanding the earliest neural responses to emotional information in neonates can lead to a greater understanding of the mechanisms underlying infant development more broadly, as well as indicate pathways that may be influenced by environmental stressors.

2-B-106 Neural correlates of emotional state flexibility: A developmental perspective

Stephanie Novotny[1], Evan Burdette[1], Beatriz Yepes[1], Jennifer Britton[1]

[1]University of Miami

Flexibility to adapt to changing environments is important for successful navigation of life-stage transitions. Throughout childhood into emerging adulthood, failure to flexibly switch emotions may impact mental health and lead to emerging psychopathology. Some studies have examined the cost of switching between non-emotional and emotional tasks. However, this study is the first to examine the neural development of switching between emotional states. In this fMRI study, 78 healthy 9-20-year-olds (M= 15.94, SD= 3.60) viewed and identified the valence of positive and negative IAPS images. The valence of the images was repeated on successive trials or switched. Trials with no response, inaccurate response or reaction time (RT) less than 250ms were excluded. Repeated measures ANOVAs were used to examine the effect of previous trial valence (PreVal; positive vs. negative), trial type (switch vs. repeat) and age on RT and neural activation in a priori selected ROIs. A significant 3-way interaction among age, trial type and PreVal was detected in the right amygdala (19, -6, -11), $p < 0.005$, k=32, which survives multiple comparison correction. A similar 3-way interaction on RT approached significance, $F(1, 76) = 3.205$, $p = 0.07$. Preliminary post-hoc analyses indicated that RTs for switching to positive emotions increased with age and this was accompanied by decreased activation in the amygdala. Follow-up analyses will be conducted to further examine activation patterns in other ROIs (e.g., vmPFC, Thalamus). Understanding the development of flexibility between negative and positive emotions has important clinical implications. These results may provide insight into a developmental mechanism which may be related to the heightened prevalence of mood and anxiety disorders in adolescence and young adulthood.

2-B-107 The structural connectome and internalising and externalising symptoms in individuals born very preterm and full-term

Courtney Gilchrist[1], Deanne Thompson[1], Claire Kelly[1], Christopher Adamson[1], Karli Treyvaud[2], Lillian Matthews[3], Thijs Dhollander[1], Lex Doyle[1], Terrie Inder[4], Mary Tolcos[5], Angela Cumberland[5], Peter Anderson[3]

[1]Murdoch Children's Research Institute, [2]La Trobe University, [3]Monash University, [4]Harvard Medical School, [5]RMIT University

BACKGROUND: The "preterm behavioural phenotype" is characterised by symptoms related to inattention, anxiety and social difficulties. Given that white matter injury and grey matter alterations are well documented in individuals born very preterm (VP), here we applied graph theory to investigate the neurobiological basis of internalising and externalising symptoms in individuals born VP. METHODS: T1 and diffusion MRI data from the VIBeS cohort were used to generate structural connectomes consisting of 80 cortical and subcortical regions. Weighted measures of network integration and segregation were calculated at 7 (VP:73; Full-term [FT]: 17) and 13 years (VP:129; FT:44) using the Brain Connectivity Toolbox. Internalising and externalising symptoms were assessed using the Strengths and Difficulties Questionnaire administered at 7 and 13 years. RESULTS: At 7 years, poor network integration was associated with greater concurrent internalising symptoms, regardless of birth group (characteristic path length: $\beta = 7.222$, $p = 0.015$; global efficiency: $\beta = -4.713$, $p = 0.014$). Network integration and segregation measures were not associated with concurrent internalising at 13 years. At 13 years, associations between network integration and concurrent externalising differed by group (global efficiency: $\beta = 7.511$, $p = 0.035$), with a negative association in the FT group only ($\beta = -8.675$, $p = 0.023$). Associations between network segregation and concurrent externalising symptoms also differed by group at 13 years (local efficiency: $\beta = 63.876$, $p = 0.006$), with a negative association in the FT group only ($\beta = -62.638$, $p = 0.013$). All results persisted after adjustment for sex, age at assessment, intracranial volume and cognitive functioning. CONCLUSIONS: This study provides novel insights into the neurobiological basis of the preterm behavioural phenotype, highlighting the role of the structural connectome in internalising and externalising symptoms in childhood and adolescence.

2-B-108 Proposed Study Design & Analysis to Validate a Novel, Social Negative Reinforcement Learning Task for Use in Adolescence

Logan Cummings[1], Nathan Sollenberger[1], Josefina Freitag[1], Aaron Mattfeld[1], Dana McMakin[1]

[1]Florida International University

BACKGROUND: Negative reinforcement is central to theoretical models of nonsuicidal self-injury (NSSI): self-harm briefly reduces feelings of social pain and negative emotion, which is perceived as rewarding, and increases the likelihood of NSSI in the future. This negative reinforcement cycle may be strengthened in adolescence due to neuromaturational changes that increase sensitivity to social pain and the rewarding outcomes of NSSI. Yet, efforts to test developmental models of NSSI are hampered by an absence of ecologically-valid, fMRI-compatible tasks that measure sensitivity to social negative reinforcement in adolescence. Based on established social rejection paradigms (e.g., Virtual Chatroom) and focus groups with adolescents, we designed a social negative reinforcement learning (SNRL) task that elicits transient negative emotion and subsequent relief (i.e., negative reinforcement) every trial. AIM: To iteratively refine and assess the validity, reliability, feasibility, and engagement of the SNRL task in a large sample (N=120), based on feedback from Flux. PROPOSED METHOD: Participants, 18-20 years old, will complete the SNRL task, established monetary reinforcement learning tasks, and debriefing interview. Participants will rate their emotional response to task stimuli every 20 trials. Q-learning reinforcement models employing a Rescorla-Wagner rule will be fit to individuals' response patterns to estimate learning rates. PROPOSED ANALYSIS: Construct validity: we will test if participants' emotional ratings and response patterns are consistent with negative reinforcement learning. Convergent validity: we will examine correlations between learning rates in the SNRL and other tasks. INTERNAL RELIABILITY: we will examine if reinforcement learning models fit behavioral data using maximum log-likelihood estimation procedures. Test-retest reliability: 20 participants will repeat the SNRL task 2 weeks later and intraclass correlation coefficients will be examined

2-B-109 Early Childhood Emotion Regulation Strategy Generation and Physiological, Neurological, and Psychopathological Correlates

Zachary Bivins[1], Adam Grabell[1]

[1]University of Massachusetts-Amherst

Deliberate Emotion Regulation (ER), the effortful regulation of emotions, is strongly linked to psychopathology. In adults, deliberate ER is often experienced as a self-narrative, such as reappraising a negatively perceived scenario. However, researchers have yet to study how children articulate deliberate ER strategies, whether these strategies relate to real-time ER, and how they are associated with psychopathology. Thus, we sought to examine preschool-aged children's plans to stay calm for upcoming frustration challenges, and related these plans to externalizing behavior problems and subsequent neural and physiological responses to frustration. Our sample included 59 children (Mage= 56.31 months; 34 males, 23 females, two who did not identify). Thirty-four percent of the sample was unable to articulate a strategy, and thus children were sorted into two groups based on whether they could or could not articulate a deliberate ER strategy. Children's lateral prefrontal cortex (lPFC) activation and Skin Conductance Responses (SCRs) were measured in real-time via Functional Near-Infrared Spectroscopy (fNIRS) and Galvanic Skin Response instrumentation, respectively. To assess externalizing symptoms, parents completed the Eyberg Child Behavior Inventory (ECBI), the ADHD Rating Scale-5, and The Multidimensional Assessment of Preschool Disruptive Behavior (MAP-DB) Temper Loss subscale to measure irritability. Results revealed that children who did not articulate any ER strategy had more skin conductance responses ($t(36) = 4.50$, $p = .041$) more symptoms of inattention ($t(53) = 5.28$, $p = .026$), and less activation in the left ($t(88) = 2.49$, $p = .015$) and right PFC ($t(88) = 3.20$, $p = .002$) during the positive-feedback portion of a frustration task compared to those who produced a strategy. To our knowledge, this study is the first to report that children's articulated deliberate ER strategies have distinct neural and physiological correlates and predict behavior problems.

2-B-110 Neural response to peer feedback moderates effects of social stress on depression symptoms among adolescents

David Pagliaccio[1], Rahil Kamath[1], Poornima Kumar[2], Diego Pizzagalli[2], Randy Auerbach[1]

[1]New York State Psychiatric Institute, [2]Harvard Medical School

Peer interactions become increasingly salient during adolescence, a time for increasing onset of internalizing disorders. Social mechanisms are a critical component of internalizing disorders risk - potentially blunted response to peer acceptance in depression and increased response to rejection in anxiety. Alterations in the neural underpinnings of social responsiveness are likely most salient in the context of acute social stress. In line with diathesis-stress models, we hypothesized that potentially deleterious effects of increased neural sensitivity to peer rejection would only manifest when individuals are faced with peer rejection in daily life. The integration of neural and prospective stress measures to understand psychiatric risk has been lacking in the neuroscience literature. Towards filling this gap, data were examined from N=90 psychiatrically healthy adolescents (12-14 years old), either with (n=26) or without (n=64) a maternal history of depression. Teens completed the Chatroom Task during fMRI and provided self-report on stress experience (Adolescent Life Events Checklist) and depression symptoms (Mood and Feelings Questionnaire) up to nine times over the subsequent two years. Voxel-wise linear mixed effects models were fit to test our hypothesis that neural sensitivity to peer feedback would moderate stress effects on depression symptoms. While peer-related social stress was a strong predictor of depression symptoms longitudinally, this interacted with brain response to peer acceptance vs. rejection in scanner (whole-brain cluster corrected). For example, peer stress showed a strong positive association with depression symptoms among teens with lower accept vs. reject activity in the anterior insula but this association was blunted among those with greater contrast activity. These data highlight the combined influence of neural diatheses and social stress in understanding normal variability in subclinical depression symptoms over adolescence.

2-B-111 Concurrent and longitudinal associations between early childhood reward responsivity and irritability

Nicolas Camacho[1], Armen Bagdasarov[1], Amanda Caress[1], Yu Sun Chung[1], Michael Gaffrey[1]

[1]Duke University

Existing literature suggests that irritability can be partially explained as an emotional and behavioral manifestation of aberrant reward processing, positing that individuals with greater reward responsivity are more prone to experiencing irritability. We propose to test this theory in a sample of ~125 young children, ages 4-8 years at baseline. We plan to assess whether Reward Positivity (RewP), an event-related potential associated with neural responsivity to feedback indicating reward gains during a well-validated reward task in children, associates with concurrent and later parent-reported irritability. Differences between the neural responsivity to gain vs. loss (G-L) and gain vs. neutral (G-N) feedback conditions will be calculated to extract two sets of RewP values. We will conduct bivariate correlations to inspect relationships between RewP, irritability, and related psychiatric symptoms. We then plan to use hierarchical multiple regression to test the extent to which both sets of RewP values are associated with concurrent irritability and predictive of irritability one year later, above and beyond demographic covariates and psychiatric symptomatology. We hypothesize that RewP (G-L) will be positively associated with concurrent irritability and that larger RewP (G-L) amplitudes will be predictive of increased irritability. We will then explore whether RewP (G-N) follows the same pattern of results. Given the lack of pediatric studies implementing neutral conditions to calculate RewP, we hold no a priori hypotheses for the relationship between RewP (G-N) and irritability. This study will inform our understanding of irritability as a behavioral manifestation of reward-related neural processes and contributes to a body of literature assessing the feasibility of using reward-related tasks to uncover neural biomarkers of irritability. Finally, we hope to provide initial evidence for the utility of calculating RewP values by studying gain vs. neutral feedback.

2-B-112 Empathy and resting-state functional connectivity in children

Katherine Bray[1], Elena Pozzi[1], Sarah Whittle[1]

[1]University of Melbourne

Empathy, the ability to understand or share others' thoughts and emotions, is recognized to have both cognitive and affective components. Empathy is important for functioning in the social realm, and alterations in both components have been demonstrated in many developmental and psychiatric disorders. While several studies have demonstrated unique neural underpinnings of empathy components in adults, few have investigated this in young people, particularly children. Investigating associations between empathy and brain function, particularly functional connectivity, during childhood is beneficial to begin to build a comprehensive picture of the neural correlates of empathy across the lifespan. 112 children (52% female, mean age 10 years) underwent MRI brain scans including a resting-state sequence and completed an empathy self-report measure (the Adolescent Measure of Empathy and Sympathy), and a measure of empathic distress. Pre-processing and first-level analyses were completed using the ENIGMA HALFpipe reproducible pipeline, and group level analyses were run with FSL randomise. Seed to whole-brain resting-state functional connectivity analyses demonstrated that both affective empathy and empathic distress were associated with decreased connectivity between key hubs of the default mode network (DMN) and other widespread areas in the brain. Analyses of resting-state networks demonstrated that cognitive empathy was associated with both increased and decreased connectivity between dorsal and lateral regions of the DMN and regions outside of the DMN, including the pre and post-central gyrus, and the cerebellum. Affective empathy was associated with increased connectivity between the anterior salience network and the pre and postcentral gyrus. Findings may suggest that individual differences in self-reported empathy in children are related to resting-state functional connectivity. However, more research is required to demonstrate reproducibility of the findings.

2-B-14 Feedback for friends: neural processing of performance feedback in the social context of friends and unfamiliar peers across adolescence

Iris Koele[1], Jorien Van Hoorn[1], Ellen De Bruijn[1], Berna Güroğlu[1]

[1]Leiden University

Learning often requires processing feedback about the results of our actions. The feedback that adolescents receive at school can also have consequences for their peers, such as during a group assignment. However, few developmental studies have examined the mechanisms underlying feedback processing in the social context of peers. The current fMRI study investigated the neural correlates of feedback processing in a social context in children and adolescents aged 9-16 years (N = 85). In the scanner, participants performed the cannonball task in which they had to align a horizontally moving triangle with a square target, leading to performance dependent positive or negative feedback (i.e., monetary gain or loss). In the Solo condition, the participants performed the task alone. In the Social conditions they performed the task together with: i) their best friend (Social-Friend condition), and ii) an unfamiliar peer (a confederate; Social-Unfamiliar condition). The Social conditions consisted of alternating mini-blocks of performing the task and observing the other peer perform, with shared consequences for the self and other peer. Whole brain t-tests in SPM showed increased activation in conflict-related brain regions (pMFC, insula, right dlPFC) during own negative vs positive feedback processing, and increased activation in a reward brain region (putamen) during observed positive vs negative feedback processing. A mixed ANOVA on a predefined ROI (left temporoparietal junction; TPJ) showed significantly higher left TPJ activation while adolescents were observing feedback for unfamiliar peers than feedback for friends. This might indicate that observing feedback processing of a friend compared to unfamiliar peer is less effortful in terms of mentalizing (i.e. lower TPJ activation). The results could have implications for education, as the findings suggest that observing the learning (i.e. feedback processing) of closer peers (friends) is less effortful for adolescents.

2-B-98 Aggressive responses following social evaluation and the underlying motives in middle childhood: an fMRI replication design

Simone Dobbelaar[1], Michelle Achterberg[2], Lina van Drunen[1], Anna van Duijvenvoorde[1], Marinus van IJzendoorn[2], Eveline Crone[2]

[1]Leiden University, [2]Erasmus University Rotterdam

Middle childhood is marked by an increase in social experiences and evaluations. Specifically, negative social evaluations often lead to aggressive responses in children. Prior research showed differential effects of positive, neutral and negative feedback on brain activity during these social evaluations. However, the neural correlates of the subsequent responses to social evaluations are still relatively unknown. Here, we studied the effects of social evaluation on neural activity during aggressive responses. Additionally, we explored the motives underlying aggression following social feedback by focusing on the role of inhibitory control and feedback sensitivity. We aimed to replicate our findings in an independent sample (N=195). Our original sample consisted of 512 participants (7-9 years old). All participants performed the Social Network Aggression Task, in which they received positive, neutral or negative feedback on personal profiles. Subsequently, they could send a noise blast to the peer who provided the feedback. fMRI ROI analyses (N=385) revealed differential effects of social evaluation on medial and lateral prefrontal activity during noise blast: the MPFC and OFC were mainly activated during responses following positive and negative feedback compared to neutral feedback, possibly indicating social saliency. In contrast, the DLPFC and VLPFC showed the most activity during responses following positive feedback and the least following negative feedback, possibly indicating control mechanisms. In addition, our behavioral results showed that children with less inhibitory control showed more aggression in general, whereas children who were more sensitive to feedback differentiated more between aggressive responses to positive and negative feedback. Taken together, these results may point towards neural markers of aggressive behavior in middle childhood and highlight important mechanisms underlying social behaviors.

2-B-99 Neural sensitivity to social status predicts changes in risk-taking and prosocial behavior in adolescence

Jimmy Capella[1], Nathan Jorgensen[1], Seh-Joo Kwon[1], Maria Maza[1], Mitchell Prinstein[1], Kristen Lindquist[1], Eva Telzer[1]

[1]University of North Carolina, Chapel Hill

Adolescence is a sensitive period for social and neural development and a time in which social status is highly valued. Moreover, adolescents more sensitive to peer status tend to be at greater risk for peer influence susceptibility, which can lead to changes in prosocial or risk-taking behaviors. However, even though previous studies have identified neural systems related to peer influence susceptibility and behavioral outcomes, no research has investigated the neural mechanisms by which adolescents track social status. In the current study, we obtained sociometric ratings for participants' classmates along two dimensions of social status, likeability and popularity. Adolescents (n=113, 12-15 years) viewed pictures of their classmates in a block-type fMRI design, wherein images were sorted into high and low likability and popularity groups. We ran whole-brain regression analyses of neural tracking of social status, using sociometric ratings as a parametric modulator, onto behavioral outcomes of prosocial tendencies and risk-taking behavior from one year after the scan. Preliminary results indicate that neural tracking of popularity in the dmPFC predicts longitudinal increases in risk-taking, whereas greater tracking in the insula predicts decreases in prosocial tendencies. For likability, neural tracking in the amygdala predicts increases in risk-taking, whereas greater tracking in the pSTS predicts decreases in prosocial tendencies. Taken together, these results indicate that greater tracking of social status in brain regions associated with social cognition (dmPFC and insula) and salience (amygdala and pSTS) predicts longitudinal changes in behaviors associated with peer influence. Further analyses will examine whether measures of peer influence susceptibility mediate this relationship between neural tracking of social status and behavior.

2-C-113 The influence of encoding strategy on memory integration across development

Zahra Abolghasem[1], Margaret Schlichting[1]

[1]University of Toronto

When new learning is related to prior knowledge, children and adults may have different approaches: While adults may directly link new information into stored memories, children may instead store it separately. This idea is supported by work showing that children struggle with inference tasks that require them to link related memories. Moreover, they show neither behavioural nor neural evidence of a specialized encoding mechanism anchoring new memories to established knowledge. While it appears that children do not engage in such memory integration, the reason why is unclear: is an integration strategy not yet available to them, or rather are they unable to engage in it? We will address this question by comparing the role of encoding strategy on inference ability in children (7-9 years) and young adults. Participants (N=252) will first form strong memories for initial associations (AB; 3 repetitions). We will then manipulate encoding strategy across participants during overlapping BC pair learning by asking them to construct stories about either (a) the current BC pair or (b) all three objects in the ABC triad. Participants will report their story aloud on a small number of catch trials to ensure compliance. We hypothesize that when linking A-C during a later inference test, adults will perform best if they integrated during learning (ABC condition), whereas children will perform best if they encoded the new pair separately (BC). We will also ask whether implicit measures of A-C linking--i.e., facilitated processing of C when preceded by its corresponding A--prior to inference test will reflect AC connections in adults (facilitation) but not in children (no such facilitation). If results are borne out as predicted, we will conclude that children's tendency away from integration is more likely a constraint on the learning mechanism itself than a failure to attempt it. Given our online data collection rates, we anticipate study completion prior to the conference.

2-C-114 Trauma Exposure and Safety Cue Learning in Development

Sahana Kribakaran[1], Stephanie DeCross[2], Paola Odriozola[1], Emily Cohodes[1], Jason Haberman[1], Katie McLaughlin[2], Dylan Gee[1]

[1]Yale University, [2]Harvard University

Trauma exposure during childhood is prevalent and is associated with heightened risk for psychopathology. Changes in threat and safety learning are one potential mechanism underlying the association between trauma exposure and psychopathology such as anxiety and PTSD. Safety cue learning (SCL) is a novel mechanism of fear reduction that is based on conditioned inhibition of fear in the presence of safety. In adults without psychopathology, SCL has been shown to reduce fear and involve an anterior hippocampal-dorsal anterior cingulate cortex (dACC) pathway. Taken together, understanding the associations between trauma exposure and SCL in development may shed light on a potential novel approach to fear reduction for youth with trauma exposure. This fMRI study will examine conditioned inhibition via SCL in a group of youth with and without trauma exposure (ages 10-18; n=130). The SCL task included stimuli representing threat, safety, and a safety compound (i.e., CS and CS- were paired). Trauma exposure was determined using multiple measures (e.g., CTQ, PTSD Reaction Index). fMRI data will be analyzed using FSL for a priori regions of interest (e.g., anterior hippocampus, dACC) activation and connectivity analyses. Statistical analyses will include a general linear model to examine trauma-related differences in neural activation and functional connectivity during SCL. We expect a main effect of trauma on the neural correlates of SCL across development. Specifically, there will be less anterior hippocampal recruitment and anterior hippocampal-dACC functional connectivity during SCL among youth with trauma exposure relative to youth without trauma exposure. Finally, we also predict that that the association between trauma exposure and neural mechanisms of SCL will differ as a function of age.

2-C-115 Unsupervised neuro-cognitive process models reveal individual differences in development of arithmetic problem solving

Percy Mistry[1], Vinod Menon[1]

[1]Stanford University

OBJECTIVES: Develop and validate novel unsupervised neuro-cognitive computational process models characterizing how children solve arithmetic problems. Use this to improve our understanding of developmental changes in mathematical cognition and the functional resolution with which brain-behavior relationships can be identified. METHODS: A latent mixture model was implemented within a Bayesian inference framework that makes unsupervised inferences about the trial-by-trial use of strategies (retrieval, counting, decomposition), as well as parameters characterizing processes that capture the executive control mechanism for switching between strategies, post-error adjustments, strategy-dependent efficiencies, and item-level variations. The model was validated and tested on an experimental study (N=105) with children between the ages of 7-11, each solving 140 problems within the MRI scanner. A subset (N=45) returned for longitudinal assessments. RESULTS: The unsupervised model matches (and supervised version exceeds) traditional supervised methods for predicting strategy use. The model inferred parameters provide a stronger explanation of retrieval use compared to domain specific assessments (WIAT), provide stronger longitudinal predictive power for future assessments of mathematical achievement compared to the current assessments themselves, and reveal strong relationships between strategy efficiency and math related anxiety. Clustering based on parameters reveals distinct clusters with multiple cognitive pathways for differences in performance. Distinct parameters show differential brain-parameter associations, and distinct clusters show distinct brain activation profiles. CONCLUSIONS: Our approach allows superior inference about the neural and cognitive processes underlying mental arithmetic, provides a novel approach for use in similar domains, and (c) can be effective in curating customized predictions and developmental training needs.

2-C-116 Hippocampal and dorsolateral striatal memory systems differentially contribute to probabilistic learning in middle childhood

Johannes Falck[1], Laurel Raffington[2], Christine Heim[3], Yee Lee Shing[1]

[1]Goethe University, Frankfurt, [2]University of Texas, Austin, [3]Charité Universitätsmedizin, Berlin

The hippocampal memory system and the dorsolateral striatal memory system are believed to follow unique developmental trajectories. Previous findings in adult research suggests that both memory systems differentially contribute to probabilistic learning, however their dynamics during childhood remain unclear. Here we examine whether these two memory systems have unique contributions to development of learning in children. In a 2-year longitudinal study, 140 6-7-year-old children, of which 82 had structural brain images, performed a reinforcement learning task, where they learned the preference of cartoon characters and their choice target following a probabilistic reward. The reward was delivered either immediately or after a short delay, which are hypothesized to engage the dorsolateral striatal and hippocampal systems, respectively. A Rescorla-Wagner model that distinguished individual learning rates for immediate and delayed feedback condition provided a better fit to behavioral performance than a single learning rate model. While both types of learning and hippocampal volumes showed increases longitudinally, dorsolateral striatal volumes remained stable over time. Longitudinal latent change score models of brain-cognition couplings indicated that a larger dorsolateral striatal volume at baseline predicted an increased gain in immediate learning rate. Further, a larger hippocampal volume at baseline was correlated with a higher delayed learning rate. Over time, a larger increase in hippocampal volume was associated with less gains in delayed learning rate. Our findings extend evidence from the adult literature to 6-7-year old children that both memory systems differentially contribute to learning and shed new light on its developmental trajectories. While in middle childhood the dorsolateral striatum appears to be structurally mature, the hippocampal volume and both types of learning continue to undergo change.

2-D-117 Failure mindset predicts error-related negativity during a go/no-go task in young adults

Salvador Vazquez[1], Amy Rapp, Patricia Tan[1], Jennie Grammer[1]

[1]UCLA

Research has demonstrated that growth mindset, or belief that one's intelligence can improve, and grit, or the willingness to persist, are associated with academic achievement and later life success. Though there is heterogeneity in the literature, some studies have found positive associations between growth mindset and neural correlates of error monitoring, the error-related negativity (ERN) and error positivity (Pe), indexes of unconscious and conscious error detection, respectively. These findings suggest that students that view moments of failure as surmountable and beneficial to their academic development may have greater attention to error. Yet few studies have explored the link between error monitoring and failure mindset, the view that failures are learning opportunities, which may be more closely related. As such, this study examined relations between failure mindset and error monitoring in a sample of forty-two undergraduate students (Mage=19.83 years, Nmale=10, 29% White, 38% Asian, 33% Latinx). Students completed a Go/No-Go task, where the ERN and Pe were measured, and self-reported on growth mindset, grit, and failure mindset. Correct-related neural activity, gender, and race/ethnicity were included as covariates. Preliminary results indicate that greater failure mindset was associated with larger ERN amplitudes, suggesting that more positive views of failure are related to more error sensitivity, $F(7, 41)=6.166$, $p<.001$. No associations were found between mindsets and the Pe. Neither growth mindset nor grit correlated with failure mindset, though grit was associated with greater growth mindset. Combined these findings suggest that failure mindset, or general perceptions that failure is an opportunity to learn, is a unique aspect of student motivation that may lead to greater unconscious attention to error commission, or close monitoring of performance. More work is needed to investigate whether this close monitoring in turn leads to better learning.

2-D-118 Reward-motivated memory processes and their underlying neural mechanisms change with age

Alexandra Cohen[1], Morgan Glover[1], Xinxu Shen[1], Kristen Avallone[1], Camille Phaneuf[1], Lila Davachi[2], Catherine Hartley[1]

[1]New York University, [2]Columbia University

Motivationally salient events are often prioritized in memory. In adults, memory for high-reward memoranda is related to increased activity and connectivity of the hippocampus, particularly anterior hippocampus, and mesolimbic dopamine systems during and after encoding. More generally, dopamine-dependent plasticity in the hippocampus is critical for memory formation. Converging evidence from studies in rodents and post-mortem humans suggests that dopamine signaling peaks during adolescence, which may lead to stronger memory representations of rewarding events relative to mundane events. To test whether reward associations have a larger influence on behavioral and neural memory processes during adolescence, 89 participants ages 8 to 25 years-old completed a reward-motivated encoding fMRI paradigm with baseline and post-encoding active rest periods and returned 24-hours later for a behavioral memory retrieval test. We find that reward motivation enhances associative memory across age and uniquely improves more general high-reward source category memory during adolescence. Preliminary neuroimaging analyses suggest that reward-motivated encoding is supported by interactions between the prefrontal cortex and mesolimbic dopamine systems across age, while post-encoding consolidation mechanisms underlying reward-motivated memory benefits change with age. In summary, we find age-invariant enhancement and non-linear change in reward-motivated memory and the underlying neural mechanisms across age. The present study will shed light on the neural mechanisms supporting reward-motivated memory enhancements across age.

2-D-119 Longitudinal changes of reward anticipation activation in adolescent girls: evidence for accelerated neurodevelopment in depression

David Baranger[1], Morgan Lindenmuth[1], Amanda Guyer[2], Kate Keenan[3], Alison Hipwell[1], Erika Forbes[1]

[1]University of Pittsburgh, [2]University of California, Davis, [3]University of Chicago

INTRODUCTION: Major depressive disorder (MDD) may be associated with differential neurodevelopment of reward circuitry in adolescence, though there are limited data testing this hypothesis. METHODS: Adolescent girls (N=183, 58 of whom had a lifetime diagnosis of MDD) underwent repeated scans from ages 16-21 (n=477 scans, 1-4 per participant) in which they completed a card-guessing fMRI task with monetary rewards. Whole brain fMRI data was parcellated to n=414 regions. Mixed-effect models tested whether MDD moderated the association of age with regional activation during reward anticipation. RESULTS: MDD was associated with differential neurodevelopment in 46 regions (11.11% of regions; pFDR<0.05). This was driven by regions in the frontoparietal control and dorsal attention networks, as well as reward regions such as the OFC and rostral ACC. Across all regions, adolescents with MDD showed a group-level trajectory with a steeper linear decrease and a more negative curvilinear effect. It was additionally observed that the distribution of regional mean activation was less variable in older than younger participants (t=24.9, p<2.2x10-16). This effect was significantly smaller in participants with MDD (β=-0.32, pperm=1.1x10-16). CONCLUSIONS: Results are consistent with the hypothesis that the neurodevelopment of adolescent reward processing is accelerated in MDD. While this effect is partially driven by differential development of reward regions, results point to the importance of executive function and attentional processes, which contribute to goal-directed behaviors. Reduced inter-regional variation as participants age may be a normal by-product of neurodevelopment, possibly reflecting increased information processing efficiency. We propose that accelerated neurodevelopment in MDD may be adaptive, but that it could come at the cost of efficient processing, potentially leaving individuals vulnerable to further insult.

2-D-120 Behavioral and brain differences between younger and older adolescents Performing a delay discounting task

Yael Cycowicz[1], Diana Rodriguez-Moreno[2], Xiaoxiao Sun[1], Kelsang Bista[2], Lawrence Amsel[1], Christina Hoven[1]

[1]Columbia University / New York State Psychiatric Institute, [2]New York State Psychiatric Institute

Delay discounting (DD) tasks measure preferences between smaller rewards available sooner (SS) and larger rewards available later (LL). DD tasks have been used to assess reward impulsivity present in different forms of psychopathology. During adolescence preference for immediate rewards is associated with mal-adaptive decision making. Theories of brain mechanisms suggest a developmental imbalance between monitoring systems that control impulsivity but mature slowly, and reward areas that develop earlier. Prior studies on age-related discounting compared children, adolescents and adults, but not younger versus older adolescents. We have compared younger (ages 12-14.9 (n=47)) and older (ages 15-17 (n=52)) adolescents and found that older adolescents chose SS rewards significantly more often than the younger ones. Furthermore, with longer delays the older group was even more likely to choose SS, compared to the younger group. BOLD activity associated with SS choices revealed regions that were more active in the older (n=46) than in the younger (n= 43) group (p<.001, extent threshold = 50). Contrary to expectation, these were not in specific reward valuation areas, suggesting that the differences in SS choices are not due to increased reward sensitivity with age. Rather, these regions included prefrontal clusters in the left DLPFC (BA 9, 46), the left supramarginal and angular gyri in the parietal lobe (BA 40), the bilateral thalamus, left globus pallidum, and bilateral occipital regions (calcarine, lingual gyrus and fusiform). This pattern of fronto-parietal activity suggests that although older adolescent make more impulsive choices than younger ones, their brain regions associated with the monitoring of decisions are already active, as observed when adults perform DD tasks. These findings support the idea that these brain areas with long maturation trajectories may be beginning to monitor decisions but not yet exerting behavioral control over impulsive choices.

2-D-121 Unique neural profiles underlying social motivation and psychopathology in adolescent girls

Andrea Pelletier-Baldelli[1], Margaret Sheridan[1], Kinjal Patel[1], Matteo Giletta[2], Paul Hastings[3], Matthew Nock[4], Karen Rudolph[5], George Slavich[6], Leah Somerville[4], Mitchell Prinstein[1], Adam Miller[1]

[1]University of North Carolina, Chapel Hill, [2]Ghent University, [3]University of California, Davis, [4]Harvard University, [5]University of Illinois, Urbana-Champaign, [6]University of California, Los Angeles

BACKGROUND: Adolescence is characterized by increased social motivation (i.e. drive for social connection) that plays a critical role in healthy development and the manifestation of anxiety and depression, and may be particularly relevant to adolescent girls. These social motivation changes reflect developmental shifts in underlying neural circuitry, and yet the neurobiological underpinnings of altered social motivation and links with psychopathology remain unclear. OBJECTIVE: This study will identify unique neural connectivity profiles (subtypes) that relate to social motivation and clinical symptomatology in a diverse clinical sample of adolescent girls at risk for suicidal ideation and depression to test 3 hypotheses: (1) Unique connectivity subtypes exist, (2) subtypes will diverge based on social achievement goals (a component of social motivation), and (3) Given that social achievement goals have predicted psychopathology, subtypes will be further differentiated based on clinical symptom presentation. METHOD AND ANALYSIS: Analyses will be conducted on 120 adolescent girls (aged 9-17) recruited for enhanced risk for depression and suicidal ideation who underwent an fMRI social anticipation/evaluation task. Group Iterative Multiple Model Estimation will be used to model task-based connectivity by generating contemporaneous and lagged connections and utilizing a community detection algorithm to identify neural subtypes. Social achievement goals/symptomatology will be derived from self-report questionnaires. Hypothesis (1) will be evaluated by determining whether unique subtypes manifest as predicted. Hypotheses (2) and (3) will utilize regression and t-tests to compare social achievement goals and symptomatology across subtypes. IMPLICATIONS: This study has the potential to inform adolescent neurobiological models of social motivation and developmental risk markers of psychopathology.

2-D-122 Grenading the gorilla: Self-oriented contributions to safety computations

Sarah Tashjian[1], Dean Mobbs[1]

[1]California Institute of Technology

For humans, the inability to identify safety is a hallmark of anxiety, which is linked to poor health (Felger, 2018) and psychological outcomes (Mennin et al., 2005). Existing computational accounts fail to fully explain why individuals suffering from anxiety have difficulty identifying safety. This lack of understanding may be due, in part, to existing focus on external threat detection. This perspective presumes that deficits in safety recognition are a result of threat overestimation, but fails to consider circumstances in which threat is accurately estimated, but safety is unrecognized. Safety may instead reflect independent computations related to the self that mediate threat estimates (Tashjian et al., 2021). The proposed research partitions the complexity of safety recognition into two main evaluative components: an external focus on threat and an internal focus on self-competence. Behavioral data will be collected from 250 participants online (ages 12-40) using Prolific and Children Helping Science. fMRI data will be collected from an additional sample of 30 participants (ages 12-25). Participants will complete a series of decisions about how much protection they need to combat various threatening animals. Participants will be endowed with a weapon that fluctuates in protective strength. In order to obtain additional protection (i.e., increase safety), participants must complete a cognitive task with difficulty based on the level of additional safety requested. Psychophysical curves will be compared to test the hypothesis that participants become more risk averse when external threats increase versus when self strength decreases, suggesting heightened attending to external factors over internal factors when evaluating safety. More anxious participants are hypothesized to choose suboptimal protection when the cognitive task is required due to underestimations of competence.

2-E-123 Functional connectivity of cognitive control and learning systems in English learners

Tehila Nugiel[1], Damion Demeter[1], Mackenzie Mitchell[2], AnnaCarolina Garza[1], Jenifer Juranek[3], Jessica Church[1]

[1]University of Texas, Austin, [2]University of North Carolina, Chapel Hill, [3]University of Texas, Houston

Non-native English speakers with limited English proficiency are a rapidly growing population in US schools with varied language experience and unique learning needs. English reading difficulties are highly prevalent in English learners (ELs), and these reading difficulties are often comorbid with math difficulties. Reading and math processes recruit common brain systems, such as cognitive control systems, which support the rapid retrieval of information. Cognitive control systems may be especially important for ELs, as they flexibly process and retrieve information in a non-native language. The current study tested how resting-state functional connectivity (RSFC) between reading, math, and cognitive control brain regions relates to academic skills in a group of Hispanic middle school ELs (N=45, 22 F). To capture heterogeneity of cortical activation, we localized functional regions of interest (ROIs) per individual, from neuroimaging tasks of reading, math, and cognitive flexibility. Graph metrics indexing global and nodal properties of RSFC across reading, math, and cognitive control ROIs at rest were related to measures of academic skills. We found that connectivity across all regions, as well as connectivity of the cognitive control ROIs were positively related to several measures of reading skills but not math skills. We also compared this individualized ROI approach to more common group-level ROI analysis methods. Additionally, individualized methods of ROI selection revealed stronger brain-behavior relationships than group-level ROI selection approaches. These results suggest specificity of brain-behavior relations at rest. This work presents evidence for the role of functional connectivity between cognitive control and learning-related brain regions on standard reading measure scores for an understudied group of students. Further, it suggests that individualized ROI approaches may capture more variance in brain systems underlying learning heterogeneity.

2-F-124 Effects of prefrontal cortex maturation on verbal memory development

Clara Ekerdt[1], Nadia Klijn[1], Willeke M. Menks[2], Guillén Fernández[1]

[1]Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Centre,
[2]Donders Institute for Brain, Cognition and Behaviour, Radboud University

While it is established that memory improves with age from childhood into adulthood, the role of brain maturation on this trajectory is of increased interest. The two-component model of episodic memory development proposes that while the associative component of memory, supported by the MTL, is mature early in development, the strategic component, supported by the PFC exhibits a protracted developmental trajectory and is the reason for children's poor memory performance when compared to adults. It has been previously shown that while the developmental decrease in cortical volume of the right DLPFC mediates the effect between age and mnemonic strategy use, it does not mediate the relation between age and number of words recalled in an intentional encoding verbal memory task. In the current study, we compared the relationship between brain structure of the PFC and MTL and performance on an incidental, shallow-encoding, verbal learning task in three age groups. We hypothesized that the late maturation of the PFC contributes to the increase in memory performance from childhood to adulthood. Children, adolescents and adults completed an incidental, shallow-encoding, verbal learning task. We used d-prime (d') to quantify memory performance and acquired T1-weighted images to estimate cortical thickness (CT) in the regions of bilateral PFC and MTL. We tested if CT mediated the age group differences in memory performance on the verbal memory task (d'). We found that cortical thickness in the right inferior frontal gyrus, right rostral middle frontal gyrus and left parahippocampal gyrus mediated the differences between age groups in memory performance on the incidental verbal learning task. Since the participants in the current study did not know that their memory would be tested, our results show that when removing adults' advantage in strategic encoding, the developmental cortical thinning of the PFC and MTL play a role in the age differences in memory performance.

2-F-125 Linking changes in excitatory and inhibitory balance through adolescence with working memory

Maria Perica[1], Finnegan Calabro[1], Will Foran[1], Victor Yushmanov[1], Hoby Hetherington[1], Beatriz Luna[1]

[1]University of Pittsburgh

Recent work has shown that there may be a shift in the balance of excitation and inhibition (E/I) through adolescence. Therefore, this means that mechanisms of critical period (CP) plasticity may be present, thus suggesting that adolescence may be a CP for the development of executive functions, such as working memory. To investigate this, we used 7T Magnetic Resonance Spectroscopic Imaging to probe age-related changes in the balance of the primary excitatory neurotransmitter glutamate and the primary inhibitory neurotransmitter GABA in multiple regions of prefrontal cortex through adolescence. We defined E/I balance as the correlation between GABA and Glutamate, and examined whether balance changes with age in two ways. First, we considered age as a continuous variable, and quantified a per-participant 'mismatch' of glutamate and GABA by taking the residual of the model looking at the association between Glutamate and GABA. In only the ACC, residual values decreased with age ($B = 0.24$, $p = 0.007$), indicating greater glutamate and GABA match with increasing age. Second, we binned participants into three age groups of roughly equal size and looked at the r value within groups. Correlation comparison between age groups revealed that the 10-16 year old group was significantly different from the older groups in both the ACC ($p < 0.05$) and MPFC ($p < 0.05$). Finally, we examined whether age-related changes in balance were associated with improvements in working memory accuracy. We observed a significant interaction between residuals and age on performance ($B = 0.19$, $p = 0.0012$). Follow-up tests in the abovementioned age groups revealed that in the youngest age group, higher residual value was associated with worse working memory accuracy ($B = 0.51$, $p = 0.017$), with no association between residuals and accuracy in the older two groups. Taken together, this suggests that adolescence may be a critical period for the development of executive function.

2-F-126 Examining prefrontal contributions to successful memory formation in 5- to 7-year-old children

Kelsey Canada[2], Lingfei Tang[2], Christina Lee[2], Roya Homayouni[2], James Wairagu[2], Noa Ofen[2]

[1]University of Maryland, [2]Wayne State University

Dramatic changes in children's memory ability have been observed between the ages of 5 and 7 years. However, little is known about the neural correlates supporting these changes. Functional MRI (fMRI) studies with older children, adolescents, and young adults highlight the role of the prefrontal cortex (PFC) in supporting age-related improvements in memory. Subsequent memory fMRI studies (e.g., Tang et al., 2018) identify two complementary patterns by which PFC supports age-related improvement in memory formation: (i) an increase in positive subsequent memory effects (SME) (higher activation for items later remembered compared to items later forgotten), that may reflect strategic control of mnemonic content; and (ii) an increase in negative SME (higher deactivation for items later remembered compared to items later forgotten), often identified in regions of the default mode network, that thus may reflect more efficient thought suppression benefitting external stimuli processing. Because there is limited evidence of negative SME in young children (Nolden et al., 2021), we hypothesize that negative SME contribute to the robust increases in memory between 5-7 years of age. We will use fMRI data collected from 45 children aged 5-7 years who completed the subsequent memory paradigm with scenes as mnemonic stimuli. Planned analyses are designed to investigate positive and negative SME in the PFC based on group-level activation maps and ROIs defined from prior studies with older children and adolescents who performed the same task. Additional analyses will use PFC regions as seeds for functional connectivity analyses (psychophysiological interaction) to investigate interactions between PFC and medial temporal lobes (MTL) and between PFC and scene-sensitive regions identified per-participant by a functional localizer. Evidence for our hypothesis will provide key insights into the brain correlates that drive memory development in young children.

2-G-127 From Poverty to Cognition: Examining the Relative Contributions of Environmental, Neural and Genetics Influences

Nourhan Elsayed[1], Sarah Paul[1], Alexander Hatoum[1], Deanna Barch[1]

[1]Washington University, St. Louis

The relative contributions of poverty, brain structure, genetics, and environmental factors to cognition remain unclear. HYPOTHESES (HYP) & OBJECTIVES: 1) examine relative contributions of poverty, environmental, familial, peer/social, prenatal, genetic, and stress factor to general ability, executive function, and learning/memory, hyp 2) Whole-brain neural signatures associated with poverty can reliably distinguish among youth with varying levels of household income; hyp 3) neural metrics (hyp 2) will mediate the relationship between poverty and cognition. METHODS: Data come from Wave 3.0 of the ABCD Study (N=11875). We will examine the contributions of variables assessing poverty (income-to-needs (IN)), educational attainment polygenic risk scores, demographics, prenatal exposures, stress, neighborhood and school factors, parental relationships, age, sex, and global and regional brain structure metrics (gray matter volume, cortical surface area, and thickness; white matter microstructure) to previously derived factor scores of general ability, executive function, and learning/memory components. ANALYSES: Hyp 1) To ascertain the associations of poverty and other contributors (e.g., environment, genetics, brain metrics) to general ability, executive function, and learning/memory components, all variables will be entered into least absolute shrinkage and selection operator regressions (LASSO) with stratified cross-validation predicting cognition. Hyp 2) A LASSO will be fit predicting income-to-needs to train a classifier that distinguishes among youth with varying levels of household income, using MRI data. Hyp 3) Using the results from the brain classifier, we will conduct a mediation analyses to determine if poverty remains necessary in predicting cognition after accounting for neural and other factors (hyp 1). IMPLICATIONS: Analyses will demonstrate the necessity in IN disparities in predicting cognitive abilities, beyond brain and behavioral markers of poverty.

2-G-128 Prospective association of maternal psychosocial stress during pregnancy with newborn hippocampal volume and its implications for infant social-emotional development

Saara Nolvi[1], Nora Moog[2], Theresa Kleih[3], Martin Styner[4], John Gilmore[4], Jerod Rasmussen[5], Christine Heim[2], Sonja Entringer[2], Pathik Wadhwa[5], Claudia Buss[2]

[1]University of Turku, [2]Charité Universitätsmedizin, Berlin, [3]Charité Universitätsmedizin Berlin, [4]University of North Carolina, Chapel Hill, [5]University of California, Irvine

BACKGROUND: Maternal psychosocial stress during pregnancy may impact the developing fetal brain and influence offspring mental health. Animal studies have identified the hippocampus as a key brain region of interest, however, evidence in humans is sparse. Therefore, we examined the associations between maternal psychosocial stress, newborn hippocampal volume, and child social-emotional milestones across the first year of life. METHODS: In a sample of 86 mother-child dyads, maternal perceived stress was assessed in early, mid- and late pregnancy. At 2 to 5 weeks of postnatal age, newborn hippocampal volume was assessed using structural magnetic resonance imaging. Infant social-emotional developmental milestones were assessed at 6- and 12-months age using the Bayley-III. RESULTS: After adjusting for covariates, maternal perceived stress during pregnancy was prospectively and inversely associated with newborn left hippocampal volume (B=-0.26, p=.019). In turn, newborn left hippocampal volume was positively associated with infant social-emotional development across the first year of postnatal life (B=.01, p=.011). Maternal perceived stress was indirectly associated with poorer infant social-emotional development via smaller newborn left hippocampal volume (B=-0.34, 95% CI [-0.97, -0.01]), suggesting mediation. CONCLUSIONS: This study provides prospective evidence in humans linking maternal psychosocial stress in pregnancy with newborn hippocampal volume and subsequent infant social-emotional development across the first year of life. The findings highlight the importance of maternal psychosocial state during pregnancy as a target amenable to interventions to prevent or attenuate its potentially unfavorable neural and behavioral consequences in the offspring.

2-G-129 Childhood adversity minimally impacts fronto-subcortical brain networks and stress-sensitivity in YOUth

Elizabeth Buimer[1], Rachel Brouwer[1], Jacobine Buizer-Voskamp[2], Rene Mandl[1], Pascal Pas[1], Hugo Schnack[1], Coosje Veldkamp[2], Anouk Vroegindeweij[1], Hilleke Hulshoff Pol[1]

[1]Utrecht Brain Center, UMC Utrecht, Utrecht University, [2]Utrecht University

Adverse childhood experiences (ACEs) are associated with structural brain alterations and may impact sensitivity to stress. The aim of this study is to assess the effects of various ACEs on structural brain measures in typically-developing children included in the YOUth cohort study (N=1090, Age: 7 to 11 years old). Additionally, to study if ACE's and associated brain alterations relate to stress-sensitivity, we compared emotional distress during the COVID-19 pandemic compared to 3 months prior in a subset of children (N=309). Prior to the pandemic, we collected T1-weighted MR images and parent-reports on ACEs in the 12 months prior to the MR acquisition. ACEs included bullying, parental (mental) health issues, bereavement, divorce or conflict in the family, financial problems, changes in household or housing, exposure to violence, trouble with authorities and substance abuse in the household. Regions of interests were part of the fronto-limbic and fronto-striatal network implicated in maltreatment. We find that substance abuse in the household is related to larger cortical surface area of the left and right superior frontal gyrus and the left pars triangularis ($p<0.001$, uncorrected). This effect survived correction for the number of brain measures. Because the effect disappeared after correction for total surface area and the regions were implicated in one specific ACE, we did not use this finding in the additional analysis on stress sensitivity and focused on questionnaire data. We found the change in emotional distress during the first lockdown compared to three months prior to be small in general, but more pronounced in children with financial problems at home ($p<0.05$, uncorrected). Overall, structural brain development around 9-years of age seems considerably resilient to ACEs although the influence of the COVID-19 pandemic remains to be investigated.

2-G-130 Parsing heterogeneity in associations between dimensions of childhood stress exposure and white matter microstructure

Lucinda Sisk[1], Audrey Huang[1], Emily Cohodes[1], Sarah McCauley[1], Jasmyne Pierre[1], Paola Odriozola[1], Jason Haberman[1], Sahana Kribakaran[1], Sadie Zacharek[2], Hopewell Hodges[3], Camila Caballero[1], Dylan Gee[1]

[1]Yale University, [2]MIT, [3]University of Minnesota

Stress experienced in childhood can have lifelong impacts on mental health, and delineating the neurobiological mechanisms linking childhood stress with psychopathology is critical to early identification of risk and developing targeted interventions. Stress affects neural processes such as neurogenesis and myelination, and evidence from both animal and human research demonstrates that exposure to stressors is associated with microstructural remodeling of white matter pathways. However, how key aspects of exposure to stressors, such as the developmental period during which the stressor is experienced or the specific type of experience, may uniquely impact the developing microstructure of the brain has yet to be elucidated. Adolescence is a period of dynamic white matter maturation due to globally increasing myelination and synaptic pruning. In this study, I propose to examine whether the developmental timing (i.e., age of exposure) and extent to which stress exposure is characterized by threat or deprivation are associated with white matter microstructure in adults with a history of trauma exposure. I hypothesize that stressors characterized by threat that occurred during adolescence will be associated with decrements in white mater integrity in frontolimbic tracts, while stressors characterized by deprivation that occurred during early childhood will be associated with widespread decrements in white matter integrity across the brain, over an above stressors occurring at other ages. Participants will be adults (ages 18-30) who underwent a 9-minute diffusion weighted imaging scan and completed a modified version of the UCLA Reaction Index interview designed to specifically examine key dimensions (e.g., timing, type) of adversity. Given the high-dimensional nature of both the brain data and stress exposure data, I will analyze associations between microstructural integrity, developmental timing of stress, and type of stress using canonical correlation analysis.

2-G-131 The effects of a 20-week exercise program on blood-circulating biomarkers related to brain health in children with overweight or obesity.

María Rodriguez-Ayllon[1], Abel Plaza-Florido[2], Andrea Mendez-Gutierrez[2], Signe Altmäe[2], Francisco B. Ortega[2], Irene Esteban-Cornejo[2]

[1]Erasmus MC, [2]University of Granada

OBJECTIVE: Exercise seems to affect neurodevelopment in childhood. However, the mechanisms linking exercise with brain health remain underexplored. Therefore, we aimed to investigate the effect of exercise on (i) 5 blood biomarkers selected based on previous evidence (i.e., β-hydroxybutyrate (BHB), cathepsin B (CTSB), kynurenine, fibroblast growth factor 21 (FGF21), and vascular cell adhesion molecule-1 (sVCAM-1)); and (ii) a panel of 92 neurology-related proteins (discovery analysis). We also investigated whether the circulating blood changes in these biomarkers mediate the effects of exercise on brain health (i.e., brain-derived neurotrophic factor, hippocampal structure and function, cognition, and mental health). METHODS: This is a randomized controlled trial was conducted in 81 children (intervention group, n=42) with overweight/obesity (10.1 ±1.1 years, 41% girls). Candidate biomarkers were assessed using ELISA for Kynurenine, FGF21, and CTSB, colorimetry for BHB, and XMap for VCAM-1. The 92 neurology-related proteins were analyzed by the Proximity Extension Assay. RESULTS: Our exercise program had no significant effect on candidate biomarkers (all p>0.08). In the discovery analysis, a reduction in circulating macrophage scavenger receptor type-I (MSR1) was observed (P=0.001). This effect was validated using ELISA methods (standardized differences between groups: -0.3, p=0.01). None of the biomarkers seemed to mediate the effects of exercise on brain health. CONCLUSIONS: Our study does not support a chronic effect of exercise on candidate biomarkers of brain health. Nevertheless, we noted that chronic exercise reduced the levels of blood-circulating MRS1, while it did not seem to mediate the effects of exercise on brain health. Future studies should confirm or contrast our effects on MRS1 and its implications on brain health outcomes.

2-G-132 Demographic and mental and physical health differences between recommended and non-recommended samples for resting-state fMRI analyses in the ABCD Study

Kelly Cosgrove[1], Timothy McDermott[1], Matthew Mosconi[2], Florence Breslin[1], Martin Paulus[1], Amanda Morris[1], Robin Aupperle[1]

[1]Laureate Institute for Brain Research, [2]University of Kansas

OBJECTIVES: Head motion presents significant challenges for resting-state fMRI (rs-fMRI) studies and may relate to participant characteristics (e.g., body mass index [BMI]). Thus, methods for reducing motion effects may inadvertently bias samples. The present study examined demographic and health differences between participants recommended (REC) and not recommended (N-REC) for rs-fMRI analyses in the baseline ABCD Study® sample (NDA Data release 3.0). METHODS: REC included participants with good quality rs-fMRI data and average framewise displacement<0.15mm (n=4,356; N-REC n=7,437). Demographic variables included age; sex; race/ethnicity; parent education, marital status, and income. Physical/mental health variables included BMI, sleep problems (Sleep Disturbance Scale for Children), general cognitive performance and executive function (NIH Toolbox), and five dimensional psychopathology scales (Child Behavior Checklist). Chi-squared analyses and t-tests were used to test for group differences (corrected p=0.003). RESULTS: Relative to N-REC, REC included fewer males; racial/ethnic minorities; and youth with lower parent education, unmarried parents, and household incomes<$50,000 (Odds ratios from 1.32-1.42, ps<0.001). REC youth were also older and had higher general cognitive performance and executive functioning; lower BMIs; fewer sleep problems; and fewer externalizing and neurodevelopmental symptoms than N-REC youth (Cohen's Ds from 0.06-0.30; ps<0.002). No significant differences were found for internalizing, detachment, or somatoform symptoms (ps>0.004). CONCLUSIONS: REC youth appear less diverse and exhibit better cognitive abilities and physical/mental health than N-REC. Thus, recommended rs-fMRI data from the ABCD Study may not be representative of the general population. Further examination of participant characteristics will be important for understanding the limits to generalizability of rs-fMRI outcomes from the ABCD Study and other studies of youth.

2-G-133 Pre-pandemic mental health matters: an examination of youth well-being during early stages of the COVID-19 pandemic

Blaire Porter[1], Ian Douglas[1], Melissa Aristizabal[1], Tyler Larguinho[1], Jessica Church[1]

[1]University of Texas, Austin

Understanding how the COVID-19 pandemic is affecting youth well-being is important because adverse experiences and exposure to disasters can elicit long-lasting negative consequences on well-being. Youth with pre-pandemic mental health difficulties may be especially vulnerable. The current study examined pre-pandemic risk factors (age, SES and mental health), as they relate to pandemic impact on youth and their families. Participants in an ongoing longitudinal study of mental health had 1-4 years of pre-pandemic annual data. Parents (n=78) and youth (n=135, 61 F, ages 9-22, M age =15) filled out an online survey (mid 2020) regarding emotional, social, cognitive, and economic experiences related to COVID-19. We found that older youth experienced worse emotional well-being (R^2 = .04, p < .05) and had more direct pandemic experiences (R^2 = .05, p < .05). Parents with higher educational backgrounds were buffered from economic related stress, and their children experienced less cognitive distress during the pandemic. At the family level, parent and youth emotional well-being were in sync (R^2 = .19, p < .0001). Higher symptom burden on measures of overall mental health and ADHD from the most recent pre-pandemic visit related to worse COVID-19 cognitive well-being in youth, controlling for age (mental health burden:R^2=.06, p <.05; ADHD: R^2=.10, p <.001). When we looked at two previous years of mental health data, we found that worsening ADHD symptoms between timepoints related to worse COVID-19 cognitive well-being, after controlling for youth age and most-recent visit ADHD symptom severity (R^2= .17, p <.05). Recency mattered, as using measures over all 3-4 years were not significant. Our findings suggest age, SES, and trajectory and severity of recent pre-pandemic mental health impacted youth well-being during early stages of the pandemic. Identifying risk factors can potentially assist in more targeted resource allocation to families.

2-G-134 Associations between neighborhood disadvantage, resting-state functional connectivity, and behavior in the Adolescent Brain Cognitive Development (ABCD) Study®: Moderating role of positive family and school environments

Divyangana Rakesh[1], Caio Seguin[1], Andrew Zalesky[1], Vanessa Cropley[1], Sarah Whittle[1]

[1]University of Melbourne

OBJECTIVE: Neighborhood disadvantage has consistently been associated with mental health and cognitive function, in addition to alterations in brain function and connectivity. However, positive environmental influences may buffer these effects. The aim of the present study was to examine the association between neighborhood disadvantage and resting-state functional connectivity (rsFC), the moderating role of positive parenting and school environment, and relationships between disadvantage-associated rsFC patterns and mental health and cognition. METHODS: In this pre-registered study, we tested this hypothesis in a large sample of 7618 children (aged 9-10 years) from the Adolescent Brain Cognitive Development (ABCD) Study. Specifically, we analyzed the relationship between neighborhood disadvantage and system-level FC. We also tested whether positive family and school environmental factors, and sex, moderated effects. Finally, we investigated multivariate relationships between disadvantage-associated rsFC patterns and cognition and mental health. RESULTS: Disadvantage was associated with widespread alterations in FC across both higher-order (e.g., default mode network and dorsal attention network) and sensorimotor functional systems; some of which were moderated by positive environments. Implicated connections showed multivariate associations with behavior, whereby disadvantage-associated rsFC was generally associated with worse cognition and mental health. Disadvantage-associated connections also predicted variation in cognitive scores using machine learning models. CONCLUSIONS: Our findings shed light on potential mechanisms (i.e., alteration of neural circuitry) through which neighborhood disadvantage may affect youth cognition and wellbeing. This work highlights the importance of positive family and school environments in mitigating some of these effects.

2-G-135 A Latent Typological Approach to the Measurement of Adversity and Differential Neural Correlates

Landry Huffman[1], Rachel Brown[1], Cory Carvalho[1], Assaf Oshri[1]

[1]University of Georgia

Growing research suggests that adversity is a dimensional construct that confers differential neurocognitive risks to youth. The three main categories of adversity encompass environments characterized by threat, deprivation, and unpredictability. However, these dimensions are rarely independent and often exist in various co-occurring patterns of severity, and traditional variable-centered statistical approaches render them unobserved (latent). As such, the present study employs a person-centered approach (latent profile analysis; LPA) to identify latent dimension of adversity according to individuals' severity patterns. To further validate the resulting dimensional typology, we tested it across values of resting-state functional connectivity (RSFC) within and between major cortical networks. We used prospective data from the Adolescent Brain & Cognitive Development sample at T1 and T5 (NT1=11,876; Mage=9.5). LPA classification was based on: youths' and parents' reports of school and neighborhood safety, family conflict, parental acceptance, school quality, family predictability and deprivation. Demographic controls were included in all analyses. Predefined RS networks (T1 and T5) consisted of the fronto-parietal (FPN), cingulo-opercular (CON), ventral attention (VAN), dorsal attention (DAN), salience (SN), and default mode networks (DMN). The optimal adversity class solution included 4 profiles: (1) high threat (n=835), (2) high deprivation(n=844), (3) high unpredictability(n=1228), and (4) low risk (n=8969). Compared to the low risk profile, the high unpredictability profile exhibited less FPN, DAN, DMN, and DMN-CON RSFC at both T1 and T5; the high deprivation profile exhibited less DMN RSFC at both T1 and T5; and the high threat profile exhibited less DMN-CON at both T1 and T5. Results support the need for pattern based approaches in the measurement of adversity and suggest that dimensions of adversity confer differing neurodevelopmental effects among youth.

2-G-136 Family Material Hardship, Youth Future Orientation, and Perseverance: The Protective Role of Resting-State Functional Connectivity

Zehua Cui[1], Linhao Zhang[1], Cory Carvalho[1], Landry Huffman[1], Assaf Oshri[1]

[1]University of Georgia

Youth living in deprived family environments are at increased risk for socioemotional and behavioral maladjustment, including poor future orientation (FO). Many youth, however, develop healthy FO and persist to achieve goals despite early deprivation--a process underlying resilience. Less is known of the neural mechanisms that foster positive FO and goal-oriented behaviors among youth living in adversity. This study aims to test the protective role of resting-state functional connectivity (rsFC) within and between major cortical networks, linked to cognitive control and FO, in the effect of family material hardship on future planning and perseverance. We hypothesized that increased rsFC will attenuate the detrimental effects of family material hardship on youths' future planning and perseverance. A subset of data from the ABCD study (after quality control of the fMRI data) were used (N = 9130). Material hardship was measured via the Parent Demographics Survey. Youths' future planning and perseverance were measured through reverse coded items from the UPPS-P Impulsive Behavior Scale. Within and between network rsFC were drawn from pre-processed ABCD fMRI data and included the frontoparietal (FPN), salience (SN), and default mode networks (DMN). Structural equation modeling was used to conduct analyses. Demographic covariates, in-scanner motion, family level dependence were controlled for. Family material hardship was not associated with future planning (β = -.03, p = .11) or perseverance (β = -.02, p =.27). However, DMN-FPN rsFC significantly mitigated the negative effects of material hardship on youths' future planning (β = .06, p < .05) and perseverance (β = .05, p < .05). SN rsFC also reduced the negative effects of material hardship on youths' future planning (β = .08, p < .05), but not perseverance (β = .01, p = .87). Overall, the current study highlights potential neural mechanisms promotive of resilience among youth living in deprived environments.

2-G-137 Critical windows of metal mixture exposure on functional connectivity in adolescents

Elza Rechtman[1]

[1]Icahn School of Medicine at Mount Sinai

BACKGROUND AND AIM: Exposure to neurotoxic metals occurs as a mixture, yet most studies consider single exposures, potentially missing the combined effects of environmental metals. Further, health impacts of mixtures may be missed if studied at a single developmental timepoint. In this study, we investigated associations between early life exposure to a mixture of neurotoxic metals and developmental trajectories of brain networks associated with executive functions (EF) among young adults. We hypothesize that associations between early-life metal mixture exposure and developmental trajectories depend upon the timing of exposure and the developmental stage of the outcome. METHODS: In preliminary analysis of 32 subjects enrolled in the Public Health Impact of Metals Exposure (PHIME) study, we generated prenatal (2nd week of gestation to birth), early postnatal (birth to one year) and childhood (1-6 years of age) concentrations of 5 toxic and nutritive metals including manganese, lead, zinc, copper and chromium in naturally shed deciduous teeth using laser ablation-inductively coupled plasma-mass spectrometry. We acquired resting state functional magnetic resonance imaging scans at ages 16-22 years. We used weighted quantile sum regression to examine associations between metal mixtures at each developmental timepoint and functional connectivity in resting state networks. RESULTS: We observed a significant inverse association between the postnatal metal mixture and connectivity in the attention network, i.e., higher metals associated with reduced connectivity (β = -0.029 [95% CI - 0.046, -0.012]). Mn (29%) and Cu (42%) contributed most to the mixture association, suggesting both that these metals were key components and that Mn does not act alone on the brain but is a key part of a larger mixture. CONCLUSIONS: Our preliminary results suggest that postnatal Mn disrupts the trajectory of development in the neural circuitry supporting EF and that the association may b

2-G-138 Violent crime exposure during pregnancy alters white matter microstructure in neonates

Rebecca Brady[1], Christopher Smyser[1], Barbara Warner[1], Deanna Barch[1], Joan Luby[1], Cynthia Rogers[1]

[1]Washington University, St. Louis

BACKGROUND: Living in a high crime area contributes to poor health outcomes and alters brain connectivity. The timing of exposure to violence seems to be important though. Early childhood exposure relates to brain connectivity more than exposure during adolescence. Thus, we hypothesize that exposure to violence in-utero may be particularly important given that pregnancy is a crucial time for brain development. STUDY OBJECTIVE: Examine the effects of prenatal exposure to neighborhood violence on white matter microstructure in the neonatal brain. METHODS: 395 pregnant women were recruited as part of Early Life Adversity and Biological Embedding study at Washington University. Prenatal addresses were collected and coded by census tract. Crime data was obtained from Applied Geographic Solution's CrimeRisk Database, which is a commercial dataset that combines data from over 16,000 law enforcement agencies. In the neonatal period (mean GA at scan=42 wks), 304 non-sedated, healthy, term-born infants (male=59%, mean GA=39 wks) were scanned using a diffusion MRI sequence (TR 2500ms; TE 79.4ms; (1.75) 3 mm3; 114 b-vals) on a Prisma 3T scanner. Multi-level models were used to examine the effects of census-tract level crime on the fractional anisotropy (FA) of hypothesized white matter tracts [cingulum bundle, uncincate fasciculus, anterior limb of the internal capsule (ALIC), and inferior fronto-occipital fascicle], controlling for GA at scan. RESULTS: Exposure to violent crimes during pregnancy was related to the FA of the right ALIC (p=0.04). This association was specific to living in a census tract with high levels of rape (p=0.04) and assault (p=0.01) as opposed to murder (p=0.05) and robbery (p=.24). CONCLUSIONS: Living in a high crime area during pregnancy may alter prenatal brain development, specifically white matter microstructure in the right ALIC. This is a crucial finding that indicates potential intergenerational effects of living in a high crime neighborhood.

2-G-139 The associations and interactions between prenatal alcohol exposure and prenatal tobacco exposure on adolescent brain structure in the PASS cohort

Andrew Marshall[1], Stefanie Bodison[2], Kristina Uban[3], Deborah Jonker[4], Weslin Charles[4], Shaomin Zhao[1], Shana Adise[1], Babette Steigelmann[5], Eric Kan[1], Shantanu Joshi[6], Katherine Narr[6], Kirsty Donald[4], Dan Stein[4], Elizabeth Sowell[1]

[1]Children's Hospital of Los Angeles, [2]University of Florida, [3]University of California, Irvine, [4]University of Cape Town, [5]Maastricht University, [6]University of California, Los Angeles

Retrospective reporting of exposure to prenatal substances, like tobacco and alcohol, has been correlated with altered brain structure and function. As retrospective report is plagued by memory recall issues, the present study focused on examining these relationships in a cohort of expectant mothers from a community sample living in Cape Town, South Africa (n=225), who were enrolled in a longitudinal study. Here, we focus on the relationships between prenatal substance exposure and neuroimaging structural data (e.g., cortical thickness, surface area, and volume) from when the youth were ~10-yrs-old. Linear regressions assessed the relationship between 68 regions of interest (ROIs) and substance exposure while controlling for age, sex, and intracranial volume, correcting for multiple comparisons. Prenatal alcohol exposure was correlated with reduced parahippocampal thickness, while prenatal tobacco exposure correlated with reduced surface area and volume (e.g., bilateral superior and inferior temporal cortices). There was also a significant interaction between prenatal alcohol and tobacco exposure on the cortical surface area of the frontal pole. Analyses also showed that while bilateral precuneus volume and left-hemisphere frontal pole surface area decreased with total alcoholic drinks, there were bilateral increases in superior parietal thickness with increases in cigarettes per day, along with several other regions unilaterally, thus reflecting the importance of investigating the quantity of prenatal neurotoxicant exposure within exposed groups. Our results advance our understanding of the effects of prenatal alcohol and tobacco exposure in a sample of children living in the Cape Town Flats in South Africa. Further study of such exposure in such extreme conditions provide opportunities to disentangle the independent effects of different environmental factors on neurodevelopment.

2-G-140 Networks of adversity in childhood and adolescence and their relationship to adult mental health

Ayla Pollmann[1], Jessica Fritz, Delia Fuhrmann[1]

[1]Kings College London

BACKGROUND: Adverse events before the age of eighteen are common and include diverse experiences ranging from sexual abuse to parental divorce. These stressful events have been linked to physical and mental health issues. Previous research has focused mainly on childhood and adverse experiences in family environments, and few have considered what types of adversity may be particularly harmful in adolescence. METHOD: This project capitalised on the Avon Longitudinal Study of Parents and Children sample (ALSPAC, N = 15,643) to understand adolescents' adverse experiences. Using network analysis, we modelled networks of adversities in childhood (age 1-11 years) and adolescence (age 12-23 years). We analysed which adversities cluster together and which were especially connected to early adulthood mental health. RESULTS: In the childhood and adolescence networks, we found two clusters related to direct abuse and adverse family factors. In both age groups, mental abuse inside the family context was linked to mental health in early adulthood. For adolescence, we identified a third cluster of educational and social adversities. Here, educational issues and abuse by a romantic partner were particularly connected to mental health issues later on. CONCLUSION: We found a difference in the relevance of adverse experiences at different developmental stages: During childhood, adversities in the family context were more central, while during adolescence, adversities related to social and educational issues became more relevant. This has implications for intervention development and mental health policy: It highlights the need to consider a different set of adversities in adolescence compared to childhood.

2-G-141 Neural markers of self-regulation attenuate links between institutional caregiving and sensory over-responsivity

Adriana Méndez Leal[1], João Guassi Moreira[1], Yael Waizman[1], Natalie Saragosa-Harris[1], Emilia Ninova[1], Jennifer Silvers[1]

[1]UCLA

Youth who have experienced institutional caregiving (e.g. orphanage care) display heightened levels of sensory over-responsivity (SOR), a pattern of intensified or extended reactions to sensory stimuli that has been linked to various forms of psychopathology in youth (Wilbarger et al., 2010; Reynolds & Lane, 2008). Recent findings suggest SOR is associated with diminished emotion regulation capacity (McMahon et al., 2019; Green & Wood, 2019), and with decreased recruitment of prefrontal regulatory regions during a joint tactile stimulation and social attention task (Green et al., 2018). To explore the relationship between SOR and self-regulation, we examined the relationship between neural markers of affective ("hot"; cognitive reappraisal) and non-affective ("cold"; attentional) self-regulation and parent-reported SOR symptoms in previously institutionalized (PI) and comparison adolescents. Pilot analyses in 40 comparison and 23 PI youth suggest that increased affective self-regulation ability (capacity) is associated with decreased SOR across groups. Additionally, inferior frontal gyrus recruitment during affective regulation (cognitive reappraisal) moderates the relationship between PI status and elevated SOR symptoms. Specifically, increased inferior frontal gyrus recruitment is linked to less heightened SOR symptoms for PI youth, relative to comparison youth ($\beta_{PI*IFG} = -11.886$, $t = -2.524$, $p = .016$). Notably, inferior frontal gyrus recruitment during non-affective regulation did not moderate the relationship between PI status and SOR symptoms. Planned follow-up analyses in a larger sample will apply pattern expression analysis to evaluate links between SOR and similarity between individual activation patterns during these tasks and publicly accessible maps of "hot" and "cold" self-regulation.

2-G-142 Socio-economic status and the wiring economy of the developing brain

Roma Siugzdaite[1], Danyal Akarca[1], Amy Johnson[1], Edwin Dalmaijer[1], Alexander Irvine[1], Stepheni Uh[1], Tess Smith[1], Giacomo Bignardi[1], Duncan E. Astle[1]

[1]Cambridge University

The quality of a child's social and physical environment is a key influence on brain development and educational attainment. As a group, children facing socio-economic adversity can experience poorer outcomes in terms of cognitive and brain development, although this relationship is highly variable. We deployed a computational model of structural brain development, based upon the wiring economy of the brain. This biophysically grounded model simulates the growth of whole-brain neural networks at the level of the individual participant. The purpose of our study was to test whether a child's socio-economic status is significantly associated the parameters that govern this network growth over development. Data were collected from 145 children (aged from 6.8 to 12.8 years old) from an intentionally socio-economically diverse sample. For each child we had a range of parental questionnaires, cognitive and educational assessments, and anatomical DTI scans. Our generative network models confirmed that structural brain networks can be accurately modelled as a trade-off between minimizing wiring costs and maximizing topological features. Furthermore, both brain wiring parameters were significantly associated with environmental measures. This implies that a child's environment is associated with the economic trade-off that governs brain development. In supplementary analyses we explored whether and how these wiring parameters are specifically associated with the processes of network integration and segregation, and how they covary with regional gene expression.

2-G-143 Prenatal and postnatal maternal depressive symptoms and longitudinal changes in limbic structure in young children

Claire Donnici[1], Jess Reynolds[2], Madison Long[1], Deborah Dewey[1], Nicole Letourneau[1], Gerald Giesbrecht[1], Bennett Landman[3], Yuankai Huo[3], Catherine Lebel[1]

[1]University of Calgary, [2]University of Western Australia, [3]Vanderbilt University

INTRODUCTION: Perinatal maternal depressive symptoms are associated with child limbic brain structure, but studies to date have been predominantly cross-sectional. Thus, associations between perinatal depression and development of these brain regions remains unclear. We sought to characterize developmental changes in amygdala, hippocampus and uncinate fasciculus structure in children and study associations between these changes and pre- and postnatal maternal depressive symptoms. METHODS: Depressive symptoms were measured during the 2nd trimester and 12 weeks postpartum with the Edinburgh Postnatal Depression Scale. Longitudinal structural MRI data were collected in children between ages 2.5-8 years. 98 (346 scans) and 87 (305 scans) participants had T1 and DTI data respectively, as well as maternal depression information. T1-weighted images were segmented to obtain amygdala and hippocampus volume. ExploreDTI was used to obtain uncinate fractional anisotropy (FA) and mean diffusivity (MD). Linear mixed effects models were tested in R. RESULTS: The interaction between a quadratic age term and prenatal maternal depressive symptoms was significantly associated with right ($p=0.03$; $F=4.55$) and left ($p=0.01$; $F=4.45$) amygdala volume, controlling for postpartum symptoms. Children exposed to higher symptoms had a more curvilinear trajectory, with larger volumes between ages 3-6 years than children exposed to less symptoms. Controlling for prenatal symptoms, children exposed to higher postpartum depressive symptoms had slower age-related change in left uncinate FA ($p=0.02$; $F=4.14$). CONCLUSIONS: The curvilinear relationship we observed aligns with reports of higher levels of prenatal maternal depression and larger amygdala volume in children aged 4.5 years; however, our data suggest this effect may change after age 6. Development of uncinate microstructure appears to be sensitive to postnatal influence, which may relate to mechanisms such as decreased maternal sensitivity.

2-H-144 Development of chronotype in adolescence: Implications for brain development and psychopathology

Rebecca Cooper[1], Maria Di Biase[1], Sarah Whittle[1], Vanessa Cropley[1]

[1]University of Melbourne

INTRODUCTION: A preference for eveningness (sleep-wake behaviour characterized by late sleep and rise times) increases across adolescence; in addition, eveningness is associated with both internalizing and externalizing psychopathology. Here, we aimed to investigate the longitudinal relationships between the trajectory of eveningness preference, internalizing and externalizing psychopathology, and white matter development, across adolescence. METHODS: N=245 Adolescents (51% female) were assessed longitudinally at four separate time-points between 12 and 19 years of age. Internalizing and externalizing symptoms and preference for morningness/eveningness were assessed at each time point. MRI DTI scans were conducted on a subset of participants (75%) at the final two time-points. Utilising a linear mixed model (LMM) approach, a random slope was extracted for each participant, which represented the individual change in eveningness over time. This random slope was then inputted into a series of linear regression models to assess the influence of change in eveningness on psychopathology and white matter development at late adolescence. White matter development was assessed using tract-based spatial statistics (TBSS) in order to estimate the global mean fractional anisotropy (FA) of each participant, and to calculate the change in FA across late adolescence. RESULTS: Across the sample, a preference for eveningness became more predominant by 19 years of age. A steeper slope towards eveningness significantly predicted greater severity in externalizing symptoms, but did not predict internalizing symptoms, at 19 years of age. A change towards morningness predicted greater increases in global mean FA across late adolescence, while a change towards eveningness predicted attenuated increases in FA. CONCLUSION: This study provides insight into the role of changes in eveningness on late adolescent psychopathology and brain development.

2-H-145 Hippocampal structural covariance differs between children and adolescents: a multi-cohort study

Anna Plachti[1], Robert D. Latzman[2], Somayeh Maleki Balajoo[3], Felix Hoffstaedter[3], Kathrine Skak Madsen[1], William Baare[1], Hartwig R. Siebner[1], Simon B. Eickhoff[4], Sarah Genon[4]

[1]Danish Research Centre for Magnetic Resonance, Centre for Functional and Diagnostic Imaging and Rese, [2]Department of Psychology, Georgia State University, Atlanta, GA, USA, [3]Institute of Neuroscience and Medicine (INM-7), Research Centre Juelich, Juelich

The hippocampal-cortical networks play an important role in neurocognitive development. We applied a connectivity-based parcellation (CBP) approach to structural covariance (SC) data to identify a topological organization of brain co-maturational processes within the hippocampus. T1-weighted images from three cross-sectional cohorts (CMI-HBN, eNKI and PNC datasets) were included and three groups were extracted: late childhood (6-10 age, n = 316), early adolescence (11-14 age, n = 328), and middle adolescence (15-18 age, n = 361). GM tissue was obtained with CAT12.5, modulated for non-linearly transformations only, smoothed (8mm FWHM) and harmonized across sites. Whole-brain hippocampal SC profiles were computed using Pearson's correlation on which CBP with k-means clustering (from k=2 to k=7) was applied. Optimal clustering was identified by stability measures (split-half cross-validation) and silhouette values. Voxel-wise GLM analysis was performed to elucidate which SC patterns drove the clustering. Obtained SC networks were behaviourally characterized using NeuroSynth. In all age groups, the hippocampus was divided into three stable subregions: anterior, medial, lateral. Children's hippocampal differentiation pattern mainly expressed clustering along the anterior-posterior dimension, whereas in adolescence, clustering followed the medial-lateral dimension. In childhood, the anterior hippocampus covaried with a broad brain network including a wide range of behaviour such as perception, emotion and higher cognition. This is in line with previous evidence that the anterior hippocampus plays an important role in memory and language functions during development. In early adolescence, the medial

subregion appeared more widely integrated into motivation and reward system. In adolescence, co-plasticity of hippocampus' medial subregion appears to become more prominent which is consistent with previous findings of volume increase of hippocampus' body after middle childhood

2-H-146 Associations between amygdala structure and anxiety symptoms in children with and without autism spectrum disorder

Heather Yarger[1], Christine Wu Nordahl[2], Elizabeth Redcay[1]

[1]University of Maryland, [2]UC Davis Health

Anxiety is one of the most common co-occurring conditions in people with autism spectrum disorder (ASD). The amygdala has been identified as related to anxiety in populations with and without autism, yet associations in autism were based on relatively small or developmentally constrained samples, leaving questions as to whether these results hold in a larger, more robust sample. Participants included 294 (206 male) children aged 5.32 - 13.80 years old (M = 10.02, SD = 1.81) with (n = 123) and without (n = 171) a diagnosis of ASD. Participants were from the University of Maryland and three sites from the Autism Brain Imaging Data Exchange. Anxiety symptoms were assessed via the DSM-5 Anxiety Scale of the Child Behavior Checklist parent-report forms for ages 1 ½ - 5 years and 6 - 18 years, depending on the child's age. Standardized residuals for left and right amygdala volumes were computed by controlling for age, sex, Full Scale IQ (FSIQ), hemispheric volumes, and site. Results of separate one-way analyses of variance indicated that the presence of clinically significant anxiety did not differentiate left [$F(2, 230) = 1.73$, $p = .18$] or right [$F(2, 230) = .95$, $p = .39$] amygdala volumes between groups (i.e., autism and anxiety, autism no anxiety, no autism or anxiety). Bivariate correlations indicated no significant association between left or right amygdala volumes within the sample of individuals with autism (ps > .05). Findings were supported using a random effects meta-analysis and when examining Bayes Factor estimations (left = 10.22, right= 8.40). Age, sex, and FSIQ did not moderate associations. Autism severity approached significance as a predictor of left ($\beta = .96$, $p = .09$; interaction: $\beta = -.012$, $p = .17$) and right ($\beta = 1.10$, $p = .07$; interaction: $\beta = -.014$, $p = .11$) amygdala volumes. No relation between amygdala volumes and anxiety symptoms in children with autism was observed in the largest sample to investigate this question.

2-H-147 Characterizing long-term effects of preterm birth on brain structure in 9- to 10-year-old children

Niloy Nath[1], Winnica Beltrano[1], Logan Haynes[1], Signe Bray[1]

[1]University of Calgary

The World Health Organization estimates that 15 million newborns around the world are born preterm. Preterm birth puts children at elevated risk for psychiatric and behavioural challenges. Thus, it is important to understand the long-term impact of preterm birth on the brain. The aim of this study was to characterize the associations between gestational age at birth (GA) and birthweight with cortical and subcortical structure in 9- to 10-year-old children. Participants were part of the baseline cohort of the Adolescent Brain Cognitive Development (ABCD) Study, a longitudinal US study collected across 22 sites. We applied linear mixed effects regression to model associations between GA and birthweight, and thickness and surface area of cortical regions as well as the volumes of subcortical regions, controlling for the fixed effect covariates of age, sex, race/ethnicity, household income, parental education level, and twin/triplet status and random effect covariates of family and data collection site. We found widespread positive associations between GA and superior frontal, superior-middle temporal, and superior occipital cortical thickness, along with inferior temporal and inferior occipital cortical surface area (FDR-corrected $p < 0.05$). However, these associations were not significant in models accounting for birthweight. In contrast, associations between GA and subcortical volumes (caudate, amygdala, nucleus accumbens and ventricular regions), remained significant with or without accounting for birthweight (FDR-corrected $p < 0.05$). These results suggest that the specific long-term effects of preterm birth on brain morphology of children is most prominent in subcortical structures and that alterations to cortical structures may be a function of low birthweight rather than GA. Consequently, infants born preterm and/or with low birthweight may have long-term functional consequences mediated by altered early subcortical or cortical development.

2-H-148 Effects of bilingual language experience on structural language networks in the pre-adolescent brain

Lauren Wagner[1], Leanna Hernandez[1], Susan Bookheimer[1], Mirella Dapretto[1]

[1]University of California, Los Angeles

OBJECTIVE: The cortex undergoes marked structural developments during adolescence with hormone-mediated effects (Herting et al, 2015). While typical age-dependent trajectories are well characterized, research has only begun to examine the effect of experiential factors, such as bilingualism, on cortical structural development (Pliatsikas et al, 2020). We thus propose to investigate associations between bilingualism and brain structure of canonical language-related regions in 9/10-year-old youth who took part in the baseline assessment of the ABCD Study. METHODS: The sample contains 8,734 monolinguals and 2,850 bilinguals according to responses on a language use questionnaire. Regions of interest (ROIs) will comprise 7 bilateral language-related cortical areas. We will use linear mixed effects models to predict cortical thickness, surface area, and volume from bilingual status and frequency of bilingual language use, with age, sex, SES, ethnicity, family relatedness, and whole brain volume as covariates. Results will be FDR-corrected for multiple comparisons. H1: Bilingual status will predict thinner cortex (Claussenius-Kalman et al, 2021), greater surface area, and greater volume (Pliatsikas et al, 2020) in language-related ROIs. H2: Within the bilingual group, higher rates of bilingual language use will predict even thinner cortex, greater surface area, and greater volume within our ROIs, reflecting advanced maturation. IMPLICATIONS: These analyses will assess the effects of bilingual language experience on structural development in language-related cortical regions in a large youth cohort. Future work will utilize longitudinal data to assess how bilingualism and age-related brain development interact with puberty across adolescence, as well as investigate how these individual differences in brain structure affect language skills and behavior. Results may inform bilingual education policies that maximize learning and cognitive outcomes during adolescence.

2-H-149 Relationships among Choline, white matter structure and reading in children

Meaghan Perdue[1], Roeland Hancock[1], Fumiko Hoeft[1], Kenneth Pugh[2], Nicole Landi[1]

[1]University of Connecticut, [2]Haskins Laboratories

Research on the neural underpinnings of reading mainly focuses on brain function and structure. Recent work reveals links between reading ability and neurometabolite levels, but mechanisms linking neurochemistry to reading ability are unclear. Choline (Cho), a neurometabolite that has many functions in the brain including maintenance of white matter (WM), has been linked to reading and reading-related skills. A potential mechanism of this relationship is that elevated Cho levels are associated with increased turnover of the myelin sheath, and thus less efficient signaling across the brain and poorer reading skills. We examined relationships among Cho, WM structure, and reading ability in children to gain insight to the plausibility of this mechanism. 27 children ages 7-11 completed behavioral testing and MR-spectroscopy (MRS) and diffusion MRI (dMRI) scans. Cho concentration was measured from a left temporo-parietal (TP) region. Relationships between reading ability and Cho concentrations were tested using partial correlations. Multi-shell dMRI was processed using constrained spherical deconvolution and fixel-based analysis was performed using MRtrix3 to test correlations between WM structure and reading ability, and between WM structure and Cho levels. Cho levels were negatively correlated with reading ability. Cho levels were negatively correlated with WM structure (fiber density and cross-section) in the left TP region (superior longitudinal and/or arcuate fasciculus). Whole brain analysis of WM structure-reading ability relationships revealed significant positive effects in bilateral inferior fronto-occipital fasciculi, but not in TP tracts. Elevated Cho levels were associated with poorer reading ability and reduced WM tract capacity in the left TP region. This supports our proposed mechanism that the relationship between Cho and reading ability may be explained by inefficient WM functioning in tracts that connect cortical areas involved in reading.

2-H-150 The role of neurobiology in the association between pubertal timing and depression risk in early adolescence: A registered report study design

Niamh MacSweeney[1], Xueyi Shen[1], Stella Chan[2], Breda Cullen[3], Rebecca Reynolds[1], Alex Kwong[1], Stephen Lawrie[1], Liana Romaniuk[1], Heather Whalley[1]

[1]University of Edinburgh, [2]University of Reading, [3]University of Glasgow

OBJECTIVES: Early pubertal timing (PT) has been associated with depression in adolescence. Neuroimaging studies implicate robust structural brain differences in individuals with depression. Yet, whether brain structure mediates the relationship between pubertal timing and depression remains unclear -- this is the aim of the current registered report. METHODS: We will examine associations between PT (physical and hormonal measures), brain structure (BS) (cortical metrics and white matter microstructure) and depression ratings (DR) (binary and continuous measures) in adolescents from the Adolescent Brain and Cognitive Development (ABCD) Study (N=~7,000; aged 9-11 years (timepoint 1, T1), 11-13 years (timepoint 2, T2)). Given inconsistent findings in the PT~BS association, we will use a separate "model building sample" of ABCD participants (N=~4,000) using T1 data to conduct exploratory analysis (EA) at Stage 1 to identify regions of interest for our later mediation model (at Stage 2). HYPOTHESES: H1: Early PT is associated with increased DR. H1a) We hypothesise the largest effect sizes for the PT ~ DR association will be for physical PT measures and both binary and continuous DR. We will not make hypotheses about differences in timing measured using hormones (estradiol, DHEA and testosterone) due to inconsistent findings. H2: The early PT and increased DR association is mediated by brain structure (ROIs specified from EA). DATA ANALYSIS: We will use generalised linear models to test PT ~ DR (H1) and PT ~ BS (EA) associations at T1. We will use structural equation modelling to investigate whether brain structure at T1 mediates the association between PT at T1 and DR at T2 (H2). COVARIATES: age, ethnicity, BMI, site, head motion, hemisphere, parental mood. FDR correction will be applied. Models will be stratified by sex. IMPLICATIONS: Understanding the neural mechanisms underpinning the PT~DS association may help identify novel intervention targets.

2-H-151 Individual estradiol variability, internalizing symptoms, and the mediating role of brain structure in female adolescents

Isabel Zwaan[1], Sarah Whittle[1], Kim Felmingham[1]

[1]University of Melbourne

Females are twice as likely to experience an anxiety disorder compared to males, a disproportional burden also evident in adolescence. Individual differences in pubertal factors may partially underlie this disparity, potentially via the role of pubertal hormones in shaping brain development. While research has examined links between female estradiol levels and brain structure, individual variation in estradiol across a cycle has not been considered. Using data from 44 adolescent females (age M = 11.7), we examined associations between both mean and SD estradiol (each individual's standard deviation in estradiol over four samples collected across one month), anxious (Spence Children's Anxiety Scale) and depressive (Children's Depression Inventory) symptoms, and the mediating role of brain structure. We also investigated the prediction of symptoms approximately 2 years later (age M = 13.3). We used both a whole-brain and region of interest (ROI) approach focused on the vmPFC, and in all models controlled for menarche status, age, and body mass index. There were no significant associations between mean or SD estradiol and internalizing symptoms. ROI analyses revealed a significant negative association between SD estradiol and thickness of the right medial orbitofrontal cortex (OFC, β = -0.39, FDR corrected p = .010). While associations were found between SD estradiol and the right rostral anterior cingulate (p = .025) and the left medial OFC (p = .042), they did not survive correction. No relationships were found between ROI thickness and internalizing symptoms at baseline or follow-up. Our results indicate that increased variation in estradiol levels across a cycle is associated with decreased cortical thickness in a brain region implicated in emotion processing, although implications for mental health are unclear. Findings, however, highlight the importance of considering individual variation in estradiol when examining links to brain development.

2-I-152 Prediction of Early Adolescent Functional Connectivity Development based on Preadolescent Structural Connectivity

Sin Kim[1], Jaeseung Jeong[1]

[1]Brain Dynamics Lab

Adolescence is a key neurodevelopmental period during which functional brain networks, especially ones related to higher cognitive functions, become more refined and modular. It is also the period during which psychiatric disorders commonly emerge, and many psychiatric symptoms has been correlated with deviations in functional connectivity. Thus, to diagnose vulnerability to such future deviations, we seek to build a model that predicts adolescent functional connectivity based on preadolescent brain connectivity, genetic, and environmental features. In particular, we hypothesize that preadolescent structural connectivity can predict changes in functional connectivity, generalizing results of Wendelken et al. (2017) on frontoparietal networks, and that additional genetic and environmental features can improve this prediction. We will use the ABCD dataset, which is a 2-year longitudinal study of over 4000 youths measured at ages 9-10 and 11-12. Structual connectivity (SC) is defined as average fractional anisotropy of DTI atlas tracts. Functional connectivity (FC) is defined as correlation between resting-state networks defined by Gordon et al. (2016). As genetic features, we will use imputed SNP data with focus on SNPs located in genes related to psychiatric disorders discovered by the Psychiatric Genomics Consortium (2013). As environmental features, we will include socioeconomic, family environment, and neighborhood safety metrics. We will first replicate and generalize results from Wendelken et al. (2017) using linear stepwise regression to predict change in FC from baseline FC and SC. Then, we will conduct sparse multiple canonical correlation analysis (smCCA) to discover SC, genetic, and environmental features that are correlated with specific changes in FC. Finally, we will use those features to train a neural network that predicts early adolescent FC based on preadolescent features.

2-I-153 Controllability of structural brain networks and the waxing and waning of negative affect in daily life

Amanda McGowan[1], Linden Parkes[1], Xiaosong He[1], Ovidia Stanoi[2], Yoona Kang[1], Silicia Lomax[1], Peter Mucha[3], Kevin Ochsner[2], Emily Falk[1], Danielle Bassett[1], David Lydon-Staley[1]

[1]University of Pennsylvania, [2]Columbia University, [3]University of North Carolina

The waxing and waning of negative affect in daily life is normative, reflecting an adaptive capacity to respond flexibly to changing circumstances. Here, we provide insight into facets of brain structure that may enable negative affect variability in daily life. We use diffusion spectrum imaging data from 95 young adults (M = 20.19 years, SD = 1.80; 56 women) to construct structural connectivity networks that map white matter fiber connections between 200 cortical and 14 sub-cortical regions. We apply network control theory to these structural networks to estimate the degree to which each brain region's pattern of structural connectivity facilitates the spread of activity to other brain systems (i.e., the region's average controllability). We examine how the average controllability of functional brain systems relates to negative affect variability, computed by taking the standard deviation of negative affect self-reports collected via smartphone-based experience-sampling twice per day over 28 days as participants went about their daily lives. We find that high average controllability of the cingulo-insular system is associated with increased negative affect variability. Our results highlight the role brain structure plays in affective dynamics as observed in the context of daily life.

2-K-155 (Un)common space in infant neuroimaging studies: a systematic review of infant templates

C. Alice Hahn[1], Silvia Gini[1], Alexis Alfano[2], Hannah Peterson[1], Saloni Mehta[1], Alexander Dufford[1], Dustin Scheinost[1]

[1]Yale University, [2]Quinnipiac University

OBJECTIVE: In neuroimaging, spatial normalization is an important step that maps an individual's brain onto a template brain permitting downstream statistical analyses. Yet, in infant neuroimaging, there remain several technical challenges that have prevented the establishment of a standardized template for spatial normalization. Thus, many different approaches are used in the literature. To quantify the popularity and variability of these approaches in infant neuroimaging studies, we performed a systematic review of infant MRI studies from 2000 and later. METHODS: A PubMed search was performed to gather relevant articles. We excluded duplicate articles, articles from before the year 2000, case reports, articles written in languages other than English, articles for animal studies, methodological articles, reviews articles, articles using subjects older than 18 months, articles using fetal MRI, and articles using imaging modalities other than MRI. Here, we present results from the first 377 papers meeting inclusion criteria. Articles were classified into 1) processing data in native space, 2) creating a study specific template, or 3) using a predefined template. RESULTS: Our preliminary analysis shows an even distribution across the three approaches (native space: n=115 (30.5%), study specific: n=122 (32.36%); predefined: n=140 (37.14%), X2=1.37, p=.50). Of predefined templates, the UNC Neonate Atlas was the most commonly used (n=31). The preferred approach varied over time. Studies published prior to 2009 primarily used native space compared to using a template--either predefined or study specific [native space: n= 7 (70%), template: n=3 (30%), X2=3.2, p=.07]. In contrast, studies published after 2009 primarily used a template [native space: n=108 (29.43%), template: n= 259 (70.56%), X2=1.24, p=.27]. CONCLUSIONS: Using a systematic review of infant neuroimaging studies, we highlight a lack of an established template brain in these studies.

2-K-156 Correspondence of simultaneously collected fMRI and full-head fNIRS signals across language and visual paradigms

Sara Sanchez-Alonso[1], Rebecca Canale[1], Richard Aslin[1]

[1]Haskins Laboratories

Cognitive function has been extensively studied in the adult brain via functional magnetic resonance imaging (fMRI). However, fMRI is often not practical for studies conducted in naturalistic contexts or for use with clinical populations. An alternative to fMRI is the use of portable methodologies that are more cost-effective and robust to motion, such as functional near-infrared spectroscopy (fNIRS). fNIRS has been used with infants and toddlers to assess brain function across a range of cognitive domains. Despite its wide applicability, there are no studies comparing fMRI and fNIRS signals collected simultaneously from the same subjects with full-head coverage to validate ROI activations and functional connectivity against the fMRI "gold standard". Thus, we are collecting both fMRI (Siemens 3T PRISMA) and fNIRS (NIRx NIRScout-XP) signals in 36 young adults (18- to 35-year-olds, 15 subjects collected to date) during language (i.e., story-versus-math) and visual (i.e., flashing-checkerboard) paradigms. The fNIRS data will be processed via NeuroDot pipelines to create anatomically registered maps of cerebral hemodynamics (Wheelock et al., 2019). The fMRI data will be processed via Human Connectome Project pipelines (Glasser et al. 2016). In turn, we compare two co-registration methods for optode localization: a structure-light 3D scanner for photometric digitization and a direct mapping of optode locations to the T1 image via vitamin E capsules. We aim to assess how these two methods affect the accuracy of i) light modeling for each source-detector pair and ii) processing of light-level time series data. We hypothesize strong correspondence between fMRI and fNIRS signals within the same individual and particularly when averaging at the network level. We also expect the results will highlight the benefits of using structure-light 3D scanners along with age-appropriate MRI templates for anatomical co-registration given their affordability and fast digitization.

2-L-157 Validating the Juvenile Macaque Social Responsiveness Scale: Reverse translation of the SRS for rapid assessment of behavioral variability in developing rhesus macaques (Macaca mulatta)

Natalie Pilgeram[1], Zsofia Kovacs-Balint[2], Trina Jonesteller[2], Jabari Wesson[2], Mar Sanchez[3], Jocelyne Bachevalier[3]

[1]Emory University, [2]Yerkes National Primate Research Center, [3]Yerkes National Primate Research Center, Emory University

The Social Responsiveness Scale (SRS) is widely used in diagnosing children with Autism Spectrum Disorders (ASD), providing a quantitative measure of traits associated with ASD (Constantino et al., 2003). These traits are continuously distributed in the general population. Similarly, rhesus macaques exhibit stable individual differences in social behavior. OBJECTIVE: The SRS has been modified for use in translational studies of macaques (Feczko et al., 2016; Talbot et al., 2020), but has not yet been successfully adapted for young, developing animals. The aim of the current study is to validate a version of the SRS as an instrument to rapidly assess behavior in infant and juvenile macaques. We will score fifteen male rhesus macaques at three months, at six months, and at one year of age. At each developmental timepoint, we will also conduct focal behavioral observations. Infants will be typically developing and will be raised by their mothers in outdoor compounds at the Yerkes NPRC Field Station. ANALYSES: The jmSRS developed by our group contains 14 items that are summed to yield a global measure of social responsiveness. We expect to observe a robust correlation between jmSRS scores and the frequency and duration of behaviors such as grooming and social play. We will also perform exploratory factor analysis in order to determine the factor structure of the jmSRS, which we predict will be generally consistent across the three timepoints. Overall, we expect that scores within individuals will increase with age, while relative interindividual differences will be maintained. Our planned analyses will include conducting repeated measures ANOVAs on individual items as well as on total scores. IMPLICATIONS: We anticipate that the jmSRS will show sufficient sensitivity to allow for identification of macaques that may be exhibiting atypical social development. Validating the jmSRS as a screening tool will thus enhance the value of future translational research.

2-L-158 Pediatric Anxiety during the COVID-19 Pandemic: The Role of Family-Level Factors

Elizabeth Kitt[1], Emily Cohodes[1], Sarah McCauley[1], Grace Hommel[1], Cristina Nardini[1], Sadie Zacharek[1], Alyssa Martino[1], Tess Anderson[1], Hannah Spencer[1], Paola Odriozola[1], Georgia Spurrier[1], Carla Marin[1], Wendy Silverman[1], Eli Lebowitz[1], Dylan Gee[1]

[1]Yale University

The COVID-19 pandemic has caused pervasive disruptions to family life. Given the theoretical role of parent-child dynamics in the maintenance and treatment of pediatric anxiety, examining how family-level factors moderate anxious youths' responses to COVID-19 will be crucial to understanding the full impact of the pandemic. Prior to the pandemic, 28 children with anxiety disorders (ages 6-12) completed an fMRI task probing amygdala reactivity while in the presence or absence of a parent (order of two runs counterbalanced). In early summer 2020, parents completed questionnaires on their family's COVID-19-related stress exposure, their child's COVID-19-related fears and behaviors, and their own functioning. We propose two hypotheses in this pre-registration. First, we hypothesize that a data-driven approach will isolate meaningful patterns among family-level factors in the context of a major stressor (e.g., greater parental anxiety will be associated with greater family accommodation). Second, we hypothesize that family-level factors assessed both pre-pandemic (e.g., child reliance on parental presence to reduce amygdala reactivity) and mid-pandemic (e.g., family accommodation) will moderate the association between children's COVID-19-related stress exposure and their COVID-19-related fears and behaviors, such that the association between exposure to COVID-19-related stress and fears and behaviors will be relatively weaker among children whose parents endorse more prototypically protective factors (e.g., lower parental anxiety). All analyses will be completed before the conference. This study takes a multilevel, multimodal approach to assess how family-level factors affect anxious children during the ongoing pandemic. Better understanding of the ways in which distinct family-level factors moderate the effect of COVID-19-related stress on anxious children may critically improve our ability to respond to pandemic-related symptomatology in this high-risk population.

2-L-159 Altered neural activity in response to native vs. non-native language in 9-month-old infants at high and low familial risk for ASD

Rebecca Altshuler[1], Nana Okada[1], Lauren Wagner[1], Janelle Liu[2], Tawny Tsang[1], Kaitlin Cummings[1], Jiwon Jung[1], Genevieve Patterson[3], Susan Bookheimer[1], Shafali Jeste[1], Mirella Dapretto[1]

[1]University of California, Los Angeles, [2]Cedars-Sinai Medical Center, [3]University of Denver

INTRODUCTION: Autism spectrum disorder (ASD) often involves language delays and impairments which are present early in childhood (Sperdin et al., 2016). In toddlers with ASD, these language difficulties are related to atypicalities in neural responses to speech (Lombardo et al., 2015). However, it remains unknown how these brain-based differences may emerge in infancy, before the onset of overt behavioral symptoms. OBJECTIVE: We examined brain responses in 9-month-old infants at high (HR) and low (LR) familial risk for ASD during exposure to native vs. non-native language to assess whether the risk groups differed in their degree of attunement to their native language at this early age. METHODS: Infants (38 HR; 19 LR) underwent functional magnetic resonance imaging (fMRI) while presented with alternating blocks of English (native) and Japanese (non-native) during natural sleep. Groups were matched on age, sex, maternal education, English language exposure, and head motion. RESULTS: LR infants exhibited greater neural activity in response to each language condition relative to HR infants. Specifically, in response to English, LR infants showed greater activity in left temporal language regions compared to HR infants. In response to Japanese, LR infants exhibited more widespread activity across prefrontal and left temporal and subcortical regions compared to the HR group. Within each group, LR infants exhibited overall greater activity in response to Japanese than English, suggestive of a novelty effect, whereas HR infants did not show differential activation for their native vs. non-native language. CONCLUSION: In infancy, LR infants may be generally more attuned to linguistic inputs than HR infants, and may exhibit neural differentiation between their native vs. an unfamiliar language. This suggests that native-language specialization may be delayed in HR infants, possibly contributing to the developmental language delays common in ASD.

2-L-160 White and grey matter microstructural alterations and increased free-water content 13 years after very preterm birth

Claire Kelly[1], Thijs Dhollander[1], Ian Harding[2], Wasim Khan[2], Richard Beare[1], Jeanie Cheong[1], Lex Doyle[1], Marc Seal[1], Deanne Thompson[1], Peter Anderson[2]

[1]Murdoch Children's Research Institute, [2]Monash University

OBJECTIVE: Very preterm (VP) birth increases risk for brain injury and cognitive and motor impairments. However, the precise underlying neurobiological mechanisms remain unclear. In this study, we performed a unified investigation of the effects of VP birth on the microstructural and free-water composition of the whole-brain parenchyma including the white matter (WM) and grey matter (GM). METHODS: Adolescents born VP (<30 weeks' gestation; n=130) and full-term (FT; ≥37 weeks' gestation; n=45) underwent diffusion MRI at age 13 years. Single-Shell 3-Tissue Constrained Spherical Deconvolution was performed to estimate WM, GM and cerebrospinal fluid (CSF) compartments. Each compartment image was aligned to a study-specific template and divided by the sum of all three compartments to generate WM-like, GM-like and CSF-like tissue signal fraction maps. Statistical analysis of the tissue signal fractions was performed using voxel-based analysis, with statistical significance defined as $p<0.05$, FWE-corrected. RESULTS: The VP group exhibited microstructural alterations in substantial parts of the WM compared with the FT group, with a shift from a WM-like signal towards a more CSF-like or GM-like signal, possibly reflecting reduced axon density and increased extra-axonal free-water content or other cells (note "GM-like signal" does not imply biological resemblance to GM). The VP group also exhibited microstructural alterations in portions of the cortical GM, with a shift from a GM-like signal towards a more CSF-like signal, possibly reflecting reduced cell density and increased free-water content. These patterns of alterations were related to neonatal brain injury and poorer concurrent cognitive and motor outcomes. CONCLUSIONS: VP adolescents exhibit diverse microstructural alterations and increased free-water content across the brain parenchyma, which are associated with neonatal brain injury and cognitive and motor impairments.

2-L-161 Predicting Depression from Self-Evaluation in Adolescents: A MVPA Machine-Learning Approach

Victoria Guazzelli Williamson[1], Samantha Chavez[1], Danielle Cosme[2], Robert Chavez[1], Jennifer Pfeifer[1]

[1]University of Oregon, [2]University of Pennsylvania

BACKGROUND: Adolescence is characterized by neural and cognitive changes in self-development and vulnerability to depression--particularly among girls. Self-evaluation is altered in girls with depression. Yet, predicting which girls will develop depression has proved difficult. MVPA machine-learning approaches--which capture patterns of neural activation--offer a novel technique aptly suited to predict depression from aberrant self-evaluation representations. For instance, MVPA has revealed that positively- and negatively-valenced information is represented differently in the brain and classifiers built to distinguish valence information can distinguish self from others. AIM: Predict prospective depression diagnosis via a MVPA machine learning approach to assessing self-evaluative processing. HYPOTHESIS: Distinct domains of self-evaluation (social status, antisocial, and prosocial) will all elicit vmPFC activity but multivariate patterns elicited by these domains will differentially, prospectively predi depression diagnosis. METHOD: A unique opportunity to advance this essential research is provided by the Transitions in Adolescent Girls (TAG) study, which has multiple waves of neural indices of self-evaluation (N=174, initial ages 10.0-13.0, 18 months between waves). In a self-evaluation fMRI task, participants decide whether traits from three domains (describe them. Depression is diagnosed via clinical interviews. Patterns of activation in vmPFC during self-evaluation will serve as the neural predictor. Data from the first wave will be randomized into a testing and training dataset each comprising 50% of the sample. Within the training dataset, we will use cross-validated MVPA to train a classifier to predict depressive diagnoses from vmPFC activity. Parameters will be adjusted as needed and models that exhibit good fit will be tested on a holdout sample. In order to minimize researcher degrees of freedom, interim results are not presented in this abstract.

2-L-162 Frontolimbic network topology associated with risk and presence of depression in adolescence: A study using a composite risk stratification score in Brazil

Leehyun Yoon[1], Fernanda Rohrsetzer[2], Lucas Battel[3], Mauricio Anés[4], Pedro Manfro[2], Luis Rohde[4], Anna Viduani[2], Zuzanna Zajkowska[5], Valeria Mondelli[5], Christian Kieling[4], Johnna Swartz[6]

[1]Center for Mind and Brain, University of California, Davis, [2]Hospital de Clínicas de Porto Alegre, Universidade Federal do Rio Grande do Sul, [3]Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, [4]Hospital de Clínicas de Porto Alegre

BACKGROUND: There have been significant challenges in understanding functional brain connectivity associated with adolescent depression, including the need for a more comprehensive approach to defining risk, lack of representation of participants from low- and middle-income countries, and the need for network-based approaches to model connectivity. The current study aims to address these challenges by examining resting-state functional connectivity of frontolimbic circuitry associated with the risk and presence of depression in adolescents in Brazil. METHODS: Adolescents in Brazil aged 14 to 16 were classified into low-risk (n=50), high-risk (n=50), and depressed groups (n=50) using a clinical assessment and composite risk score that integrates 11 sociodemographic risk variables. Resting-state functional MRI data were collected from 150 adolescents (50% female). We compared group differences in frontolimbic network connectivity using ROI-to-ROI, graph theory, and seed-based connectivity analysis. Associations between self-reported depressive symptoms and frontolimbic network connectivity were also explored. RESULTS: Adolescents with depression showed higher global efficiency of the dorsal anterior cingulate cortex and lower local efficiency of the subgenual anterior cingulate cortex compared to the two other groups. The depressed group also exhibited lower local efficiency of the posterior medial orbitofrontal cortex compared to the low-risk group. Depressive symptoms were associated with a greater average path length of subregions of the orbitofrontal cortex. CONCLUSIONS: These findings highlight altered nodal efficiency of frontolimbic network connectivity as a potential neural correlate of developing depression in adolescents in Brazil. This study broadens our understanding of the neural connectivity associated with adolescent depression in a global context.

2-L-163 Subclinical anxiety modulates neural and behavioral response to safety decisions in early adolescence

Amanda Baker[1], Namita Tanya Padgaonkar[1], Tara Peris[1], Adriana Galván[1]

[1]University of California, Los Angeles

Brain and behavioral developments in adolescence often contribute to the emergence of clinical anxiety. While anxiety has been linked to persistent avoidant behavior, adolescence as a developmental period is typically characterized by approach behaviors such as risk taking and exploration. Safe choices in adolescence are not inherently negative; however, overly safe decision-making can become reinforcing and habitual and only worsen anxiety symptoms, especially during this formative developmental time. Despite the prevalence of anxiety in adolescence and its relevance for adolescent behaviors, strikingly little is known about how anxiety influences adolescent safety decisions, nor how anxiety may differentially affect safety decisions in conditions of risk taking vs. cognitive control. Here, we examined brain and behavioral data from a sample of 141 youth ages 9-13 (MAge = 11.28, 63F, race/ethnicity: 34.3% white, 22.1% Latino, 20% Asian, 14.3% Black, 9.3% Mixed) as they played a task involving risky decision-making and cognitive control during fMRI. Anxiety severity was assessed using the Screen for Child Anxiety Related Disorders. Reaction time differences between safe choices during risk taking vs. cognitive control were related to anxiety such that higher anxious youth spent longer making cautious choices as compared to inhibiting when instructed, whereas youth lower on anxiety showed the opposite pattern. Overall, the group showed widespread salience network activation in response to voluntary cautious choices vs. instructed inhibition. However, this activation was negatively related to anxiety such that higher anxious participants showed greater response to instructed vs. voluntary inhibition. Taken together, results suggest that anxiety may differentially influence different types of safety decisions in adolescence. Future longitudinal analyses will probe how these behaviors relate to anxiety manifestation as youth progress through adolescence.

2-M-166 Brain functional topography in infancy is associated with the early development of attention control

Sebastián Moyano[1], Josué Rico-Picó[1], Ángela Conejero[1], Ángela Hoyo[1], María de los Ángeles Ballesteros-Duperón[1], M. Rosario Rueda[1]

[1]University of Granada

AIM: During the first months of life, brain functional connectivity evolves towards a small-world topology (SWI), promoting local specialization and reducing integration cost (path length). The ability to disengage attention from a focused stimulus and switch to a different one is an early marker of attention control associated with fronto-parietal circuits. Early control to disengage attention is observed in infants from four months of age on. However, research on the association between brain functional connectivity and early attention control is scarce. In this longitudinal study, we focus in gamma band (21-45Hz), which has been previously associated to attention and learning. METHOD: A resting EEG protocol was employed at 6-months to register infant's brain activity. For attention control, a Gap-Overlap task in combination with eye-tracking was employed, computing Disengagement Cost (DC), using saccade latencies, and Disengagement Failure (DF) scores for overlap and gap conditions. Valid data in both, EEG at 6 months and eye-tracking at 6 (n=78; mean age=193.84, SD=7.76, 39 females), 9 (n=67; mean age=284.98, SD=8.73, 40 females) and 16-18-month-old (n=44; mean age=513, SD=22.32, 32 females) was obtained. RESULTS: Indices of brain network topology (SWI) at 6 months in low-gamma (21-30 Hz) correlated with DF at 6 ($r=.40$, $p< .001$), 9 ($r=.25$, $p=.04$) and 16 months ($r=-.34$, $p=.02$). Likewise, path length at 6 months correlated with DF at 6 ($r=-.28$, $p=.01$) and 9 ($r=-.25$, $p=.04$), but not at 16 months. DC correlated with SWI ($r=-.33$, $p=.03$) and path length ($r=.38$, $p=.01$) only at 16 months. CONCLUSION: Our data show that SWI topology, paired with high integration (reduced path length) at 6 months, is associated with more failure to disengage attention in early infancy. However, SWI together with high integration (reduced path length) is associated with increased attention control at 16 months (reduced disengagement cost and less failure to disengage).

2-N-167 Detection of Language Lateralization using High-Density EEG

Kerry Nix[1], Beattie Goad[1], Fiona Baumer[1]

[1]Stanford University School of Medicine

OBJECTIVE: Spectral analysis of magnetoencephalogram can lateralize language, but it is not clear if such analysis of high-density electroencephalogram (HD-EEG) yields similar information. This pilot study assessed if lateralized brain responses to a language task can be detected with spectral analysis of high-density EEG. METHODS: Fourteen right-handed, neurotypical adults (30+/-8 years; 4 males) performed a language (verb-generation [VG]) and a control (passive listening) task while EEG was recorded with a 257-channel cap. Both tasks began with the auditory presentation of a noun; in the VG task, participants then generated a related verb. The event related spectral perturbation (ERSP; a ratio of task:baseline EEG power) of the alpha frequency band was calculated for 3 regions of interest (ROIs) bilaterally, including 2 language (superior temporal and inferior frontal gyri [STG, IFG]) and 1 control (occipital [OCC]) ROI. A lateralization index (LI) was calculated for each ROI by subtracting the right from the left ERSP; a positive LI indicates relatively greater alpha power over the left vs. right hemisphere. The effects of task and ROI on LI were assessed with repeated measures ANOVA. RESULTS: There was a significant effect for task ($F(1,13)=6.45$, $p=0.03$) and a significant interaction between task and ROI ($F(2,26)=5.45$, $p=0.01$) on LI. During the VG task, there was relative suppression of alpha power in both the left STG (LI=-0.44 +/-0.55) and left IFG (LI=-0.31 +/-0.53) and a small increase in alpha power in the left OCC (LI=0.08 +/-0.64) compared with the right ROIs. Only the difference between the STG and OCC was statistically significant ($p=0.04$). There were no significant differences in LI between ROIs during the control task. CONCLUSIONS: Verb generation is associated with left hemispheric alpha suppression specifically in a region important for language processing. Spectral analysis of HD-EEG should be further explored as a language lateralizing technique.

2-N-168 Atypical functional connectivity patterns of the left fusiform gyrus in infants at familial risk for developmental dyslexia

Xi Yu[1], Silvina Ferradal[2], Danielle Sliva[3], Jade Dunstan[4], Clarisa Carruthers[4], Joseph Sanfilippo[4], Jennifer Zuk[5], Yangming Ou[4], Lilla Zöllei[6], Borjan Gagoski[4], P. Ellen Grant[4], Nadine Gaab[7]

[1]Beijing Normal University, [2]Indiana University, [3]Brown University, [4]Boston Children's Hospital, [5]Boston University, [6]Massachusetts General Hospital, [7]Harvard University

Developmental dyslexia is a heritable learning disability characterized by specific difficulties with reading, spelling, and decoding abilities. It has a familial prevalence of 0.4-0.6, compared to a general prevalence of < 0.1. Several dyslexia-susceptibility genes have been identified that play an important role in brain development in utero. Moreover, infants with a familial risk (FHD) have shown alterations in white matter structure important for reading, as well as atypical auditory processing that shapes subsequent phonological and reading skills. However, the early development of neural network mechanisms of dyslexia is rarely studied so far. To address this question, 95 infants (49 females, 34 FHD / 61FHD-, 8.4 ± 2.3 months) were selected from our ongoing longitudinal project. Their structural and resting-state functional MRI data were collected during natural sleep. Machine learning techniques were applied to identify brain regions that showed distinctive whole-brain functional connectivity patterns between FHD and FHD- infants. Ten seed regions were pre-defined given their key roles in long-term language and reading development, which included the inferior frontal (orbitofrontal, triangular, and opercular), precentral, temporoparietal (Heschl's, inferior parietal, supramarginal, and angular gyri), and ventral temporal (inferior temporal and fusiform) regions. Results revealed significantly distinctive functional connectivity patterns of the left fusiform gyrus (LFFG) between FHD and FHD- infants. Combined with our earlier findings of the prospective associations between infant functional connectivity of LFFG and school-age phonological skills, these results suggest that a familial risk of dyslexia might be associated with alterations in the early emergence of the functional network underlying the long-term development of the foundational literacy skills that are critical for subsequent reading acquisition.

2-O-169 Alcohol and marijuana use are associated with altered brain response during processing of negatively valanced emotional stimuli in adolescents

Amanda Del Giacco[1], Scott Jones[1], Bonnie Nagel[1]

[1]Oregon Health and Science University

Alcohol and marijuana use have been associated with emotional dysregulation, which may in turn influence subsequent use patterns. Understanding the neurobiology of emotional processing, as it relates to substance use in adolescence, a period during which emotion regulation is developing, may be beneficial for preventing future use. This largely cross-sectional study included healthy participants aged 11-21 years old (N = 135) and aimed to investigate the effects of alcohol and marijuana use on emotional stimuli processing and inhibitory control using an Emotional Go-NoGo task during functional magnetic resonance imaging. The task consisted of three conditions: two where target (Go) stimuli were either happy or scared faces, with non-target (NoGo) facial stimuli of calm affective states, and one with calm-only male/female Go/NoGo facial distinction. Lifetime drinks and marijuana use were measured using the Customary Drinking and Drug Use Record. Substance use was not related to task accuracy; however, lifetime alcohol use was negatively associated with reaction times across all task conditions. Whole brain linear mixed effects analyses (controlling for age and sex) showed that consumption of more lifetime drinks was associated with greater Go trial response in the right middle cingulate cortex during the scared vs. calm condition. In contrast, less Go trial neural activation in the right middle cingulate and middle/inferior frontal cortices during the scared vs. calm condition was associated with more lifetime marijuana use. These findings reveal that during processing of negatively valenced emotional stimuli, youth show altered brain response in regions associated with attentional monitoring and cognitive control, which differed as a function of the substance used, and highlight the need for more research to better understand the potential influence of early substance use on emotional functioning.

2-O-170 Low Infant Functional Connectome-based Identification Accuracy Across the First Year of Life

Alexander Dufford[1], Stephanie Noble[1], Siyuan Gao[1], Dustin Scheinost[1]

[1]Yale University

The uniqueness and stability of the adolescent and adult functional connectome has been demonstrated to be high (80¬-95% identification) using connectome-based identification (ID) or "fingerprinting". However, it is unclear if comparable ID rates can be achieved in infancy, a developmental period of rapid and unparallel brain development. In this study, we examined connectome-based ID rates across the first year of life using a longitudinal infant dataset, using both resting-state and task-based functional connectomes at 1 month and 9 months of age. We also calculated the test-retest reliability of functional connectomes across the first year of life. We hypothesized that both connectome-based ID accuracy and test-retest reliability of functional connectomes between-session would be low (and nonsignificant for ID accuracy) and moderately higher (and significant for ID accuracy) for within-session analyses. We found support for our hypothesis that within-session ID rates would be highest (between 48.94% and 70.83%). However, ID rates for Session 2 were not higher than Session 1 as hypothesized. Between-session ID rates were very low and mostly nonsignificant with the highest rate being for Task1-Task 2 (26.6%). For test-retest reliability as measured by edge-level ICC, within-session mean edge-level D-coefficients (ICC) are consistently higher than between-session mean edge-level D-coefficients. The analysis suggests that both functional connectome-based ID and edge-level test-retest reliability across the first year of life is low. In support of our hypothesis, the analysis found that within-session ID rates are significant (above chance) and between-session ID rates were not. These findings suggest a lack of uniqueness and stability in functional connectomes across the first year of life; the low ID may reflect the unparalleled developmental changes in the functional organization of the brain during this period.

2-P-171 Sex differences in advanced measures of white matter microstructure among 9- to 10-year-old children in the ABCD study

Katherine Lawrence[1], Emily Laltoo[1], James McCracken[2], Paul Thompson[1]

[1]University of Southern California, [2]University of California, Los Angeles

White matter microstructure is altered in a range of childhood- and adolescent-onset mental health conditions which exhibit sex differences. Our understanding of the neural basis of such conditions may substantially benefit from a thorough characterization of normative white matter sex differences. Here we examined sex differences in white matter microstructure using diffusion-weighted magnetic resonance imaging (dMRI) methods in a sample of community-based 9- to 10-year old children from the ABCD study (discovery/replication cohort: 4,451/4,449 children, 46.6/48.4% female). Microstructure was assessed using an advanced diffusion model, restriction spectrum imaging (RSI), and a traditional model, diffusion tensor imaging (DTI). Metrics derived from RSI included intracellular and extracellular isotropic, anisotropic and total diffusion. Measures calculated using DTI included fractional anisotropy (FA) and mean, axial and radial diffusivity (MD, AD, RD). We assessed the effect of participant sex on 21 white matter regions of interest (ROIs), with age and scanner included as covariates. Significant and replicable sex differences were observed in every white matter ROI examined. As a whole, girls typically exhibited greater intracellular isotropic, anisotropic and total diffusion on average than boys, suggesting that girls may exhibit increased white matter cellularity and neurite density (Cohen's d=0.03-0.43). Compared to girls, boys generally displayed increased extracellular isotropic and total diffusion on average, as well as greater MD, AD and RD (Cohen's d=0.04-0.46). Results were largely similar when controlling for intracranial volume. Together, our results expand on prior conflicting DTI work in developmental populations by demonstrating robust white matter sex differences in both traditional (DTI) and advanced (RSI) microstructure measures. These findings provide an important foundation for the study of brain-based disorders in developmental populations.

2-P-172 Long lasting regional and edgewise functional connectivity alterations in adults born very preterm

Laila Hadaya[1], Frantisek Vasa[2], Serena Counsell[1], A David Edwards[1], Sukhwinder Shergill[3], Robert Leech[4], Chiara Nosarti[1]

[1]Centre for the Developing Brain, Department of Perinatal Imaging and Health, Faculty of Life Science,
[2]Department of Neuroimaging, Institute of Psychiatry Psychology and Neuroscience, King's College Lond,
[3]Psychosis Studies, Institute of Psychiatry Psych

Very preterm (VPT) birth has been associated with alterations in resting state functional connectivity (FC) from foetal to adult life. However, most studies in adults investigated region specific FC patterns. We aimed to compare whole-brain FC in adults born VPT and full-term controls (FT) at different levels of spatial resolution: global, regional and edgewise. Participants were 116 VPT adults (<32 weeks gestation; median age =29.31 years) and 89 FT born adults (median age =31.49 years). Images were parcellated into 358 cortical and 16 subcortical bilaterally symmetric regions. FC matrices were calculated as Pearson correlations between pairs of all regional timeseries. To measure global FC we averaged the FC across all regions. To calculate regional FC strength between and within cortical and subcortical regions we averaged the FC of a region with all other cortical and/or subcortical regions. Edgewise FC was calculated as the FC between each pair of regions. We used linear models correcting for age, sex and mean framewise displacement to test for differences in global, regional and edgewise FC between VPT and FT groups, and False Discovery Rate to correct for multiple comparisons. VPT adults compared to FT controls had higher regional FC strength between the right frontal operculum and all other cortical regions (B=0.024 p=0.034), between the left temporo-parieto-occipital junction, bilateral dorsolateral prefrontal cortex and all subcortical regions (B=0.056 p=0.048; left: B=0.048 p=0.048; right: B=0.053 p=0.048 respectively). Between group differences in edgewise FC were further noted in multiple individual frontal, temporal and parietal cortico-cortical and cortico-subcortical edges (p<0.05). The FC alterations observed in VPT adults implicate brain circuitry associated with executive function and socio-emotional processing. Our results may increase our understanding of underlying mechanisms linking VPT birth and its cognitive and mental health sequalae.

2-Q-173 ABCD-ReproNim: A free online course providing training for reproducible analyses of Adolescent Brain Cognitive Development (ABCD) Study data

Jessica Bartley[1], James Kent[2], Elizabeth Levitis[3], Dustin Moraczewski[3], Kristina Rapuano[4], Adam Richie-Halford[5], Taylor Salo[1], Jean-Baptiste Poline[6], Satrajit Ghosh[7], David Kennedy[8], Angela Laird[1]

[1]Florida International University, [2]University of Texas, [3]National Institute of Mental Health, [4]Yale University, [5]University of Washington, [6]McGill University, [7]Massachusetts Institute of Technology, [8]University of Massachusetts Medical School

The ABCD Course on Reproducible Data Analyses is a free, open, and virtual educational program based on active learning educational approaches and a project-based hackathon model. Most educational programs in neuroimaging rely on teaching over a short intensive period. Reproducible analytics, however, requires absorbing a significant amount of diverse technology-oriented content, and achieving mastery of such material is challenging over short time periods. ABCD-ReproNim creates a new form of an inverted classroom for hackathons: a fully virtual 13-week course with asynchronous and synchronous activities integrating pre-recorded video presentations, live Q&As with ABCD Study and reproducibility experts, access to teaching assistants, data exercises, a Slack community for crowdsourced knowledge, and a hackathon-style ABCD project intensive week built upon reproducible analysis practices. ABCD-ReproNim training is targeted to students, postdocs, and early career faculty and was designed to provide a comprehensive background to ABCD Study data while delivering hands-on, interactive instruction to enable reproducible analyses. The course was designed to achieve six learning outcomes: 1) Compare different data types and resources in the ABCD dataset, 2) Compare different ReproNim computational tools and services, 3) Demonstrate the ability to access and analyze ABCD data, 4) Demonstrate the ability to access and use open source software, 5) Describe and motivate best practices in reproducible neuroimaging, and 6) Develop and participate in collaborative ABCD data projects. In its first year, ABCD-ReproNim supported 714 students (95 Enrolled, 619 Observer) and resulted in 14 team-based projects across 55 students. Join us for the next offering of ABCD-ReproNim! ABCD-ReproNim is a partnership between ABCD investigators and ReproNim.org and supported by an award from the National Institute of Drug Abuse (R25-DA051675). For more information visit https://ABCD-ReproNim.org.

3-A-174 Socioeconomic Context, Polygenic Scores for Educational Attainment, and Neurocognitive Skills in Children and Adolescents

Jordan Strack[1], Hailee Hurtado[1], Budhachandra Khundrakpam[2], Uku Vainik[2], Michael Thomas[1], Emily Merz[1]

[1]Colorado State University, [2]University of Tartu

Socioeconomic status (SES) is one of the most powerful predictors of a number of neurocognitive skills in children. Environmental transmission is often presumed to explain these associations. However, genetic factors, which are correlated with both the environments of children and their neurocognitive outcomes, have not been accounted for in most studies. Recently, genome-wide polygenic scores created from summary findings of large-scale genome-wide association studies (GWAS) have been validated as a method of accounting for variance in cognitive skills due to genetic factors. In this study, we examined the unique contributions of SES and polygenic scores for educational attainment across a range of neurocognitive skills in children. Participants were typically-developing children and adolescents (3-17 years; 54% male; N = 441). SES was operationalized as the average of family income, parental educational attainment, and parental occupational attainment. Data from the largest recent GWAS were used to compute genome-wide polygenic scores for educational attainment in the sample. Children completed tasks assessing executive function, language, reading, processing speed, and memory. Results indicated that SES remained significantly positively associated with all neurocognitive skills while controlling for polygenic scores for educational attainment. Polygenic scores for educational attainment remained significantly positively associated with vocabulary while controlling for SES. These results are consistent with the notion that higher SES may bolster children's neurocognitive development independent of genetic predispositions to higher educational attainment. Further planned analyses will also allow us to present on the relative contributions of SES and polygenic scores for educational attainment to brain structure and white matter microstructure in this sample.

3-A-175 Can cognitive effort predict who benefits most from distinct types of inhibitory control practice?

Diego Placido[1], Hilary Traut[2], Yuko Munakata[1]

[1]University of California, Davis, [2]University of Colorado, Boulder

OBJECTIVE: We plan to examine whether individual differences in children's cognitive effort exerted during the AX Continuous Performance Task (AX-CPT) predict benefits to inhibitory control following interventions. Proactive children tend to exert more effort (indexed by larger pupil dilation) during an early, anticipatory phase of AX-CPT trials after seeing a cue, whereas reactive children tend to exert more effort just prior to responding, after seeing a probe (Chatham et al., 2009). Individual differences in pupillometric measures may predict who benefits most from different interventions. METHODS: One-hundred-forty-six 7- to 9-year-old children completed a child-friendly adapted version of AX-CPT to measure proactive control (Chatham et al., 2009). Next, they completed the inhibitory control intervention, which differed in proactive monitoring demand (High or Low) and action type (Stop or Go Again). They were asked to help 'Mike' land planes by pressing a button on the same side of the screen on which the plane appeared. Participants then completed a Stop-Signal Test, and were asked to help a baby monkey get bananas (similar to Chevalier et al., 2014) by pressing the button on the same side of the screen that the yellow banana appeared (No-Signal trials). If the banana turned brown, participants were instructed to stop and withhold their behavior. Pupil dilation measures were collected as indices of cognitive effort exerted during AX-CPT. ANALYSIS PLANS: Pupil dilation will be calculated as percent change from baseline to account for individual differences in pupil diameter. Preprocessing and statistical analyses will be performed using R (R Core Team, 2020) and the "PupillometryR" package (Forbes, 2020). This R package allows us to use

an established integrated pipeline to pre-process the pupillometric measures collected in our study and then apply analytic techniques of interest.

3-A-176 Understanding Patterns of Heterogeneity in Executive Functioning during Adolescence: Evidence from Nationally Representative Data

Natasha Chaku[1], Lindsay Till Hoyt[1], Kelly Barry[2]

[1]University of Michigan, [2]University of Pittsburg

Executive functions (EF) evince considerable heterogeneity in adolescence. Although research suggests EF is well characterized by a three factor model of inhibition, working memory, and shifting, most studies assume that relationships between EF skills are stable across individuals. However, the underlying factor structure of EF may demonstrate meaningful quantitative and qualitative differences across individuals. Person-centered approaches can be utilized to capture this heterogeneity and assess unique constellations of EF skills. We use Factor Mixed Analyses (FMA) to identify and characterize latent EF profiles in a large sample of adolescents and to examine differences in the underlying factor structure of EF across these emergent profiles. The study included 11,875 participants (52.1% male; Mage = 9.91) from the Adolescent Brain Cognitive Development (ABCD) Study. Three EF skills (inhibitory control, working memory, cognitive flexibility) were utilized to estimate the latent profiles. A three-profile solution provided the best fit to the data. The first profile (25%) demonstrated strong performance on all three EF skills. The second profile (42%) demonstrated strong working memory, but weak inhibitory control and cognitive flexibility. The third profile (33%) demonstrated poor performance across all three EF skills. Associations between EF skills and the latent construct were allowed to vary across profiles: In the first profile, (the latent construct of) EF was most strongly associated with cognitive flexibility. In the second and third profile, EF was most strongly associated with inhibitory control. Results suggest that EF can be characterized by unique constellations of skills, differing primarily in performance level and factor structure. These findings illustrate important patterns of heterogeneity in EF often obscured by linear, variable-driven approaches and suggests that EF unfolds in meaningfully different ways in adolescence.

3-A-177 Neural correlates underlying successful response inhibition following methylphenidate administration in medication-naive children with attention-deficit hyperactivity disorder

Arianna Cascone[1], Cleanthis Michael[1], Mackenzie Mitchell[1], Teague Henry[2], Margaret Sheridan[1], Jessica Cohen[1]

[1]University of North Carolina, Chapel Hill, [2]University of Virginia

Deficits in response inhibition in children with attention-deficit hyperactivity disorder (ADHD) have been associated with altered functional connectivity relative to typically developing children. The psychostimulant methylphenidate attenuates these differences and improves response inhibition in individuals with ADHD. However, differences in functional connectivity during successful versus failed attempts at response inhibition are currently unknown. Uncovering the neural substrates underlying these behavioral variations will further our understanding of the precise mechanisms through which methylphenidate improves response inhibition. To examine this, medication-naïve children with ADHD (n=23) participated in a double-blind, randomized, placebo-controlled, crossover methylphenidate challenge during which they completed a Go/No-Go (GNG) task in the MRI scanner to assess response inhibition. We will conduct a beta-series functional connectivity analysis to examine functional connectivity among inhibition-related brain regions during successful versus unsuccessful no-go events on/off methylphenidate. We hypothesize that connectivity among task-relevant regions will be stronger during trials in which inhibition is successful relative to trials in which inhibition fails. We predict that this stronger connectivity will be associated with fewer commission errors during the GNG task. We also hypothesize that methylphenidate will further increase connectivity among these regions during trials in which inhibition is successful. Finally, we predict that greater increases in functional connectivity following methylphenidate administration will be associated with greater reductions in commission errors. The proposed analyses will uncover patterns of functional connectivity that underlie response inhibition and further characterize the mechanisms through which methylphenidate ameliorates behavioral deficits in children with ADHD.

3-A-178 Age differences between children and adults in the neural mechanisms of sustained and transient control during task switching

Sina Schwarze[1], Corinna Laube[1], Neda Khosravani[1], Silvia Bunge[2], Ulman Lindenberger[1], Yana Fandakova[1]

[1]Max Planck Institute for Human Development, [2]University of California, Berkeley

The ability to flexibly switch between tasks enables individuals to adapt their behavior to changing environments. Two types of improvement in task switching are commonly observed over middle childhood. First, adults show stronger engagement of sustained control during task switching than children. This is manifested in smaller mixing costs, defined as the performance decrement in blocks of trials comprising different tasks relative to blocks of trials of a single task. Second, adults show stronger transient increases in control related to the switch itself. This is manifested in smaller switch costs, defined as the performance decrement associated with switching to another task relative to repeating the same task within mixed blocks. Age differences are particularly pronounced for mixing costs, presumably reflecting the protracted development of neural mechanisms of sustained control. We tested this hypothesis in an fMRI task switching study in 88 children aged 8 to 11 years, and 53 adults aged 20 to 30 years, who performed single versus mixed blocks. Children showed higher mixing and switch costs than adults. Drift diffusion models revealed lower drift rates and higher response thresholds in children, reflecting slower evidence accumulation and greater response caution. The inferior frontal junction (IFJ) and superior parietal lobe (SPL) were involved in both sustained and transient control. Adults showed enhanced sustained activation during mixed relative to single blocks in IFJ and SPL, but no such modulation was observed in children. Transient activation increases related to switching were similar across groups in IFJ, and also in the anterior insula, thalamus, and putamen, areas that were uniquely associated with transient control. Results point to

age differences in the neural basis of sustained control, and will be explored further with functional connectivity measures, seeding the IFJ and SPL, as regions involved in both sustained and transient control.

3-A-179 Patterns of Brain Connectivity Associated with Executive Function are Globally Distributed among Higher Order Heteromodal Areas

Gracie Grimsrud[1], Nora Byington[1], Michael Mooney[2], Michaela Cordova[2], Olivia Doyle[2], Robert Hermosillo[1], Eric Earl[2], Anders Perrone[2], Lucille Moore[2], Alice Graham[2], Joel Nigg[2], Wesley Thompson[3], Eric Feczko[1], Oscar Miranda-Dominguez[1], Damien Fair[1]

[1]University of Minnesota, [2]Oregon Health & Science University, [3]University of California, San Diego

Executive function (EF) encompasses processes involved in the control of rule-driven behavior and cognition in non-automatized task navigation. Understanding how the brain manifests EF could unveil potential mechanisms for developing new interventions for developmental disorders like ADHD. While some prior research identifies frontal-subcortical circuits associated with EF, it is likely that additional brain regions also participate. To test this hypothesis, we used a polyneuro risk score (PNRS) of EF based on the weighted contribution of distributed, whole-brain functional connectivity and contrasted the performance of the whole brain PNRS to PNRS models per functional circuits. Utilizing the Adolescent Brain Cognitive Development study (N=11,877, ages 9-10) as two split-half samples, we built and validated a PNRS model of EF and ruled out the effect of head motion. We then tested this model on an independent ADHD-enriched sample to determine whether or not EF was associated with an ADHD composite score. We observed a negative correlation between the whole brain PNRS of EF and the ADHD composite scores (r = -0.135). The most predictive connections were across the entire cortex, but belonged predominantly to the cingulo-opercular (CiO), default mode (Def), ventral-attention (VeA), and frontal-parietal (FrP) networks. Further analysis calculating PNRS scores per functional network pairs revealed that models trained with connections from the CiO and FrP, CiO and VeA, and Def networks rendered similar results to PNRS trained using data from the entire cortex. These findings support the notion that an individual brain region or circuit does not fully instantiate EF control, per se. Rather, patterns of brain connectivity covering several higher order heteromodal circuits, as opposed to a unique brain circuit, drive this association between EF and ADHD composite scores. This approach may strengthen the potential for neural biomarkers of ADHD and EF risk and outcome.

3-A-180 Segregation of task-positive and negative functional neural networks uniquely relates to children's executive control in middle childhood

Caron Clark[1], Amelia Miramonti[2], Donna Chen[2]

[1]UNL, [2]University of Nebraska-Lincoln

Middle corresponds with the honing of task positive frontoparietal and dorsal attention functional neural networks (DAN) and the task-negative default mode network (DMN). Confirmatory factor analysis studies of executive control (EC) tasks also show changes in EC's latent structure in this period, although the overlap in these neural and behavioral changes is unclear. Our preregistered hypothesis was that the segregation (anticorrelation) of positive and negative networks would correspond with higher latent EC. We selected 441 representative 9 to 10 year-olds from the ABCD study wave 1 (only one sibling; 53% male, 47% female; 58% White, 21% Black, 15% Hispanic, 2% Native American, 2% Asian). Cognitive tasks included the NIH Toolbox Flanker, Card Sort, Picture Vocabulary, Oral Reading, Picture Sequence and List Sorting subtests and the Rey Auditory Verbal Learning-delayed score. We characterized functional connectivity during resting fMRI using seeds in medial prefrontal (DMN), inferior parietal (DAN) and dorsolateral prefrontal (frontoparietal) cortex. Fisher-transformed connectivity measures were extracted from resulting clusters. The preferred model for the cognitive tasks included correlated EC and 'g' factors, χ^2=12.24 (12), p=.43, RMSEA=.01; CFI=1. Children with higher within-DMN connectivity showed higher DAN and frontoparietal connectivity, r=.35 & r=.43, p<.001. DMN connectivity (r =-.12, p=.01) and age (r=-.11, p=.01) corresponded with higher DMN to DAN anticorrelations. Importantly, stronger DAN to DMN anticorrelations linked uniquely to higher EC, β=-.15, p=.02. DMN connectivity (ß=.26, p <.001) and more anticorrelated DMN to frontoparietal connectivity (ß= -.14, p =.03) correlated with g. Findings indicate that the divergence of neural networks supporting outward and inwardly directed attention is uniquely tied to children's EC and provide a starting point for charting the relation of network anticorrelations to adolescent self-regulation trajectories.

3-A-181 Joint effects of functional connectivity and executive function on autistic traits in a cohort of very preterm and full-term 9- to 10-year-old children

Joseph Dust[1], Rachel Lean[1], Jeanette Kenley[1], Peppar Cyr[1], Christopher Smyser[1], Cynthia Rogers[1]

[1]Washington University, St. Louis

BACKGROUND: Very preterm children (VPT, born at <30 weeks GA) demonstrate high rates of Autism Spectrum Disorders (ASD). Prior work in full-term (FT) children suggests that executive function (EF) deficits and altered functional connectivity (FC) may underlie ASD, but these relationships have not been explored in VPT children. METHODS: VPT children (n=69) were recruited from a level IV NICU and returned for a follow-up assessment at age 9-10 years, alongside 32 FT controls. EF was assessed via the NIH Toolbox Flanker, List Sorting, and Dimensional Change Card Sort tasks and NEPSY Semantic Fluency task. ASD traits were rated by Social Responsiveness Scale-2 reports from parents (SRS-P) and teachers (SRS-T). Fifty-two VPT and 26 FT children also had at least 5 minutes of low-motion fcMRI data. Mean resting state network composites were chosen for analysis based on correlations with both EF and ASD traits, which included sensorimotor-hand (SMH) and visual (VIS) networks. T-tests examined birth-group differences in EF, FC, and ASD scores. Linear Mixed Models (LMM) adjusted for social background tested for independent and joint effects of EF and FC on ASD traits. RESULTS: VPT children had worse EF task performance and global EF skills than FT children, but did not differ on ASD traits or FC. We determined that higher SRS-T scores correlated with poorer

NEPSY Semantic scores (p=0.01) and reduced SMH vs VIS FC (p=0.01). Additionally, using LMMs, a main effect for SMH vs VIS FC (p=0.008), but not for NEPSY Semantic scores, related to SRS-T scores. There was an interaction effect between SMH vs VIS FC and NEPSY Semantic scores (p=0.01). CONCLUSIONS: These results suggest that alterations in resting state networks underlying motor function and visual processing are related to semantic fluency, which encompasses language and learning skills. The combination of sensory and cognitive deficits may elicit autistic traits observed by teachers in a structured school setting.

3-B-182 Longitudinal behavioral and neural trajectories of risk taking for parent and peer across adolescence

Seh-Joo Kwon[1], Jessica Flannery[1], Caitlin Turpyn[1], Mitchell Prinstein[1], Kristen Lindquist[1], Eva Telzer[1]

[1]University of North Carolina, Chapel Hill

Parents and peers are two powerful social figures in adolescents' lives. As youth's risk-taking behavior rises and their perspective-taking abilities improve, risky decisions likely impact close others around them. Yet, little is understood about how adolescents take risks that directly affect their parents and peers, and how this shifts across adolescence. The valuation system (ventral striatum [VS] and ventromedial prefrontal cortex [vmPFC]) may modulate how adolescents differentially encode social information about their parents and peers during risk taking. The current preregistered (https://osf.io/j7gsa/) study investigates changes in behavioral and neural processing of risk taking for parent and peer over adolescence. 173 participants completed between 1-3 sessions across three waves (433 behavioral and 403 fMRI data points) during which they participated in a risk-taking task during fMRI where they made uncertain decisions to win money for their parents and best friend. Unconditional growth models revealed that adolescents similarly took risks for their parent and best friend from 6th through 9th grade. Further, the VS and vmPFC were similarly activated during risk taking for their parent and best friend from 6th through 9th grade. Exploratory longitudinal whole-brain analyses using AFNI 3dLMEr revealed that there are longitudinal increases in the posterior insula when adolescents took risks for their parents relative to their best friend. Thus, while there are no behavioral differences between risk taking for parent and best friend, risk taking for parent may be increasingly salient to youth. These findings underscore the importance of utilizing longitudinal methods to enrich our understanding of neurodevelopment beyond a priori regions, as well as the role of socioaffective salience regions in distinguishing various social contexts.

3-B-183 Shifting qualities of negative affective experience through adolescence: Associations with functional outcomes

Katherine Grisanzio[1], Patrick Mair[1], John Flournoy[1], HCP-D Consortium, Leah Somerville[1]

[1]Harvard University

Studies show that among healthy adolescents, there is an increase in the frequency of daily negative affect, and this normative change is paralleled by increasing risk for the onset of psychopathology. However, research is limited in characterizing qualitative differences in the type of negative affect experienced during adolescence beyond the positive-negative valence dimension. In the current study, we establish the relationship between different forms of negative affective experience and functioning outcome measures (i.e., social functioning and life satisfaction) and examine whether qualitative subtypes of negative affective experience are differentially prevalent across late childhood and adolescence. 700 participants aged 8-16 years completed self-report measures that assessed a wide range of negative affective experiences. A factor analysis on the negative affect items revealed a 4-factor solution that characterized the dimensions of affective experience, with factors reflecting general anxiety, anger, sadness, and evaluative anxiety. Linear regression models revealed that anger and evaluative anxiety showed negative associations with certain domains of social functioning and life satisfaction, sadness was negatively associated with all functioning domains examined, and general anxiety did not relate to any functioning outcomes. Linear and generalized additive models revealed that general anxiety and sadness showed non-linear changes with age with accelerated change in mid-adolescence, evaluative anxiety increased linearly with increasing age, and anger remained stable across the age range studied. These results show that subsuming these subtypes of negative affect under a singular concept may obscure meaningful relationships between affect, age, and functioning. Exploring types of negative affect in this detailed way may help refine theories of emotional development and ultimately inform windows of risk for psychopathology.

3-B-184 Neural sensitivity to social context moderates the association between daily social media use and affective states

Maria Maza[1], Jimmy Capella[1], Seh-Joo Kwon[1], Nathan Jorgensen[1], Kristen Lindquist[1], Mitchell Prinstein[1], Eva Telzer[1]

[1]University of North Carolina, Chapel Hill

Adolescence is characterized by heightened neural sensitivity to social contexts particularly for peer evaluation, influence, and status. Yet, the emergence of digital-social contexts which allow for frequent and quantifiable feedback metrics (e.g., likes, followers, comments), may be altering the meaning and value of social status within peer interactions. Furthermore, individual differences in how youth respond, emotionally and behaviorally, to digital-social contexts may arise from neurobiological differences in the brain. The current study examines whether variability in neurobiological sensitivity to social status moderates individual differences between daily digital status seeking behaviors and daily affect. 130 adolescent participants (Mage=13.66 years, SDage=.6 years) completed an fMRI task to measure the neural correlates of perceiving popularity as a dimension of social status. During the task, participants saw pictures of their high- and low- popular peers based on peer-nominated sociometric ratings. In a later wave of data collection, 123 participants (Mage=15.88 years, SDage=.59 years) completed a two-week daily diary in which they self-reported their affective state and digital media use. We plan to conduct an exploratory whole-brain analysis to determine the brain regions that track peer status and subsequently explore if variability in sensitivity to social status within these brain regions moderates the association between digital status seeking behaviors and daily affect. We expect adolescents who are highly neurobiologically sensitive to peer status will show a stronger association between digital status seeking behaviors and daily affect; such that on days when they engage in more digital status seeking behaviors, they

experience more negative affect. Findings from this study will provide a mechanistic understanding of how brain function may impact emotional and behavioral responses to digital-social contexts during adolescent development.

3-B-185 EEG Delta Activity Response to Peer Feedback in Young Children is associated with Internalizing Problems

Marisa Lytle[1], Alicia Vallorani[1], Santiago Morales[1], Koraly Pérez-Edgar[1]

[1]The Pennsylvania State University

Early social competence and peer rejection are linked to the development of internalizing problems (Bornstein et al., 2010; Gazelle & Ladd, 2003). However, the underlying mechanism for this link in young children remains unknown. Recent work in adults suggests that time-frequency EEG-derived delta activity is sensitive to both primary reward valence, as well as secondary reward characteristics (Bernat et al., 2015). Additionally, anxiety is linked with relatively larger delta activity differences between positive and negative reward feedback, while differences are smaller with increases in depressive symptoms (Foti et al., 2015; Jin et al, 2019). This study investigates if (1) differences in delta activity to reward are present in young children and (2) differences in neural response to peer feedback relate to internalizing problems. 83 children (Mage = 6.06, SD = 0.75, 43 girls) sorted images of similar-aged peers into whether they would, or would not, like to play with them. Participants then completed a task which provided simulated peer feedback from the sorted images. Peers either "accepted" or "rejected" playing with the participants. Delta power in response to peer feedback was extracted as a measure of social reward processing. We used a multi-level model to assess relations between peer feedback, internalizing problems and delta power with delta power entered as a repeated measures dependent variable. Delta power was higher in response to feedback (positive and negative) from peers that participants wanted to play with, b = 0.14, p = .04. Additionally, we found that higher delta power in response to peer feedback was related to higher levels of internalizing problems, b = 0.05, p = .02. The results suggest that interest in playing with selected peers may be especially salient in young children and that delta power in response to peer feedback may be sensitive to individual differences in internalizing problems.

3-B-186 Effects of household and neighborhood socioeconomic disadvantages on resting-state frontoamygdala connectivity and internalizing symptoms in youth

Lucinda Sisk[1], Ka I Ip[1], Kristina Rapuano[1], Monica Rosenberg[2], Abigail Greene[1], Corey Horien[1], Dustin Scheinost[1], Todd Constable[1], BJ Casey[1], Arielle Baskin-Sommers[1], Dylan Gee[1]

[1]Yale University, [2]University of Chicago

Understanding how socioeconomic disadvantages (SED) affect brain function is critical to elucidate mechanisms by which SED can confer deleterious effects. We propose to use data from the Adolescent Brain and Cognitive Development Study to delineate the direct and indirect effects of household- (i.e., income-to-needs ratio and financial hardship) and neighborhood- (i.e., neighborhood non-safety and area deprivation) related SED on amygdala - ventral medial PFC (vmPFC) resting-state functional connectivity (rs-FC), implicated in emotion regulation, and to understand how they associate with internalizing symptoms at 1-year follow-up. HYPOTHESES: Higher levels of SED will be negatively associated with amygdala-vmPFC rs-FC, consistent with the stress acceleration hypothesis, and will have a direct effect on internalizing symptoms at 1-year follow-up. SED will be indirectly associated with internalizing symptoms through amygdala-vmPFC rs-FC. We do not make any specific hypothesis about the differential effect of different SED variables given the exploratory nature. METHODS: 4163 (49% female) 9-10-year-old preadolescents with rs-FC data from the ABCD Study will be included. Household SED will be assessed using income-to-needs ratio and financial hardship. Neighborhood SED will be assessed using the Area Deprivation Index and neighborhood non-safety. Internalizing symptoms at 1-year follow-up is assessed using the parent-reported Child Behavioral Checklist. Analytical plan. Confirmatory Factor Analysis will first be conducted to examine whether various SED factors can be loaded as a latent construct in Mplus. Factor scores will be extracted to examine the unique effect of various SED factors. Structured equation models will be conducted to examine the associations among SED, amygdala-vmPFC rs-FC, and internalizing symptoms at 1-year follow-up. To account for the multi-site design, we will specify Stratification = Scanner ID. Age and sex will be included as covariates.

3-B-187 Longitudinal associations between social media use and structural brain development across adolescence

Michelle Achterberg[1], Andrik Becht[1], Renske van der Cruijsen[1], Ilse van de Groep[1], Jochem Spaans[1], Eduard Klapwijk[1], Eveline Crone[1]

[1]Erasmus University Rotterdam

There has been an incredible rise of social media platforms in the last decade. As with most new technologies, social media has been particularly attractive for adolescents. Currently, it remains unclear how the social connectedness though social media affects ongoing brain development throughout adolescence, and vice versa. It has been suggested that adolescents heightened emotional sensitivity and protracted development of cognitive control may make them specifically reactive to social media. Individual differences in the pace of cortical thinning in the prefrontal cortex and social brain regions have been related to behavioral outcomes such as depression and impulsivity. Most studies to date have focused solely on the direct association between social media use and well-being, without taking into account the possible underlying brain mechanisms. However, accelerated cortical thinning could be an underlying mechanism driving both the increase in social media use as well as the increase in anxiety and depression across the adolescent population In our preregistered study (www.osf.io/vc79j) we will examine the longitudinal associations between social media use and structural brain development during adolescence. We will specifically focus on regions of interest of the social brain (MPFC, TPJ, pSTS) and a region more strongly involved in cognitive control (LPFC). We will test specificity of the relations between brain change and social media use by a follow up analysis on a lower-order processing region (cuneus). We expect that individuals with relatively higher baseline social media use across time

will show accelerated cortical thinning (stronger decrease of surface area and cortical thickness) in these regions compared to individuals with stable social media use across time. Additionally, we will explore whether heterogeneity in social media use is associated to differences in subjective mental well-being, as social media use may affect individuals differently.

3-B-188 Neonatal functional network predictors of infant affective behavior

M. Catalina Camacho[1], Deanna Barch[1], Rebecca Brenner[1], Sydney Kaplan[1], Jeanette Kenley[1], Rachel Lean[1], Da Yun Lee[1], Joan Luby[1], Cynthia Rogers[1], Tara Smyser[1], Chad Sylvester[1], Barbara Warner[1], Diana Whalen[1], Muriah Wheelock[1], Christopher Smyser[1]

[1]Washington University, St. Louis

BACKGROUND: Children develop sophisticated abilities to interpret socio-emotional information during the infant and toddler years alongside rapid neurodevelopment. It is unclear, however, if there are precursors to socio-emotional abilities present at birth. From a neural function perspective, socially-cued affective processing is computationally complex, thus individual differences in foundational brain function may influence later affective cognitive development. OBJECTIVE: We aim to determine whether functional connectivity patterns present at birth predict affective behavior at age one. METHODS: The final sample includes 262 healthy, full-term infants and their mothers recruited during pregnancy from the St. Louis area and oversampled for low income-to-needs and high area deprivation. Newborn functional connectivity (FC) was obtained using resting state fMRI and processed using rigorous denoising pipelines. At age one, affective behavior is currently being collected from two modalities: eye tracking and parent-child dyadic interaction. Eye tracking data obtained from an emotional faces task will be rigorously processed and quality controlled--engagement and disengagement with each of the five affective faces will be reduced using factor analysis to inform summary measure computation. From three standardized parent-child interactions, infant affective behaviors will be coded by trained raters to create positive engagement and negativity scores. ANALYSIS: We will use enrichment analysis to identify which surface-space parcel-to-parcel neonatal FC is associated with affective behavior at age one, accounting for covariates such as motion and income-to-needs. Follow up analyses will be conducted to characterize any observed associations. HYPOTHESIS: We predict that connectivity within networks that support attentional and social processing--the cingulo-opercular and the medial and lateral frontoparietal networks--will be associated with each later affective behavior.

3-B-189 Resisting aggression in social contexts: individual differences in psychopathic traits influence behavioral and neural responses to social feedback

Ilse van de Groep[1], Marieke G.N. Bos[2], Desana Kocevska[3], Lucres M.C. Jansen[4], Arne Popma[4], Eveline Crone[1]

[1]Erasmus University Rotterdam, [2]Leiden University, [3]Netherlands Institute for Neuroscience, [4]Amsterdam University Medical Center

Most people develop into socially adaptive members of society, but a small proportion of individuals develop persistent antisocial behaviors, which puts them at risk for various negative life outcomes. However, it remains unclear how their aggressive behavior in social contexts - and corresponding neural underpinnings - can be characterized in early adulthood, relative to that of people who desist or have no history of antisocial behavior. Moreover, it has become increasingly clear that antisocial behavior (even within these groups) is heterogenous in its forms, causes, consequences and development. As such, it is important to consider individual differences that influence aggression in social contexts. Therefore, the current pre-registered fMRI study (https://osf.io/9u8kv/) used the Social Network Aggression Task with two goals. First, we aimed to examine the neural correlates of aggression regulation following social feedback in young adults who either persisted or desisted in antisocial behavior (N = 55) and control participants with no history of aggression (N = 40). Our second goal was to test whether individual differences in psychopathic traits influence behavioral and neural responses to social feedback. During the task, participants received positive, neutral, or negative feedback on a personal profile and got the opportunity to retaliate by blasting a loud noise. Preliminary behavioral results show no differences between groups, but do indicate that higher levels of impulsive-irresponsible psychopathic traits were associated with more aggressive responses (i.e., longer noise blasts). We are currently in the process of examining neural responses in line with the pre-registered analyses. Taken together, our behavioral findings hint at the possibility that taking a nuanced individual differences approach, rather than a categorical, group-based approach, might be critical to better understand different developmental trajectories of (anti-)social behavior.

3-B-190 Adolescents' Internalization of Parent and Peer Risk Attitudes: A Longitudinal fMRI Study

Kathy Do[1], Mitchell Prinstein[1], Kristen Lindquist[1], Eva Telzer[1]

[1]University of North Carolina, Chapel Hill

Adolescents define their own risk attitudes in part by learning and internalizing (i.e., adopting) the risk attitudes of their parents and peers, yet little is understood about how perceived parent and peer risk attitudes co-develop and become internalized across adolescence. This preregistered, longitudinal fMRI study aimed to examine the extent to which adolescents use perceived parent and peer risk attitudes to inform the development of their own risk attitudes. 165 adolescents and their parents completed up to three annual fMRI scans starting when adolescents were 11-14 years of age. At each scan, participants rated their own attitudes toward risky behaviors, the perceived attitudes of their parent, and the perceived attitudes of unknown peers. Behaviorally, adolescents reported increasingly risk-permissive attitudes over time and attributed similarly risk-permissive attitudes to their parents and peers over time. Adolescents' own risk attitudes became less discrepant from their perceived peers' risk attitudes and more discrepant from their perceived parents' risk attitudes over time, suggesting stronger internalization of perceived peer over parent risk attitudes from early to mid-adolescence. At the neural level, medial prefrontal cortex (mPFC) and ventromedial prefrontal cortex (vmPFC) tracking of parents'--but not peers'--risk attitudes predicted adolescents' own risk attitudes in early but not mid-adolescence. Specifically, greater mPFC and vmPFC tracking of parents' risk attitudes at the time of adolescents' own decisions was associated with lower than average risk attitudes in early adolescence, an effect that went

away by mid-adolescence. Thus, despite stronger internalization of peers' relatively risk-permissive attitudes over time, the extent to which adolescents consider their parents' risk attitudes when making choices for themselves during early adolescence may buffer against the development of more risk permissive attitudes over time.

3-B-191 How do adolescents use independent choice to learn about themselves?

Madeleine Moses-Payne[1], Douglas Lee[2], Tobias Hauser[1], Jonathan Roiser[1]

[1]University College London, [2]California Institute of Technology

In order to become independent adults, adolescents must learn about and construct their self-concept. Here, we will assess whether adolescents learn about their own preferences using a 'learning by choosing' approach. Our preferences influence our choices (we choose the things we like) but evidence suggests our choices also influence our preferences (we like the things we have chosen). Do adolescents use choice to learn about their own preferences and are they more motivated to do so? In a prior study, we showed that young adults (18-25 years) show a choice-induced preference change, whereby enjoyment ratings of activities increased after participants had chosen the activity but decreased for those not chosen. We found that this effect was strongest when participants were less certain about their enjoyment of activities at first, but were eventually able to reach a confident choice. This lends support to the hypothesis that individuals use choice to reassess and gain certainty over their own preferences. In addition, we found that young adults were willing to forgo monetary reward in order to make preference choices, suggesting they are motivated to learn about their preferences. In this preregistered study, we will examine whether young adolescents are less certain about their preferences and will thus engage more in 'learning by choosing'. Using the same tasks, we expect young adolescents, compared with children and older adolescents, to show a larger choice-induced preference change, and to be willing to forgo more money in order to make preference choices. Power analysis indicates that a sample of ~250 participants will be sufficient to detect an increase in R2 of .05 when adding quadratic age as a predictor above linear age in a multiple regression model. We will recruit 8-25 year olds to span pre-adolescence to emerging adulthood. Through this, we will better understand how adolescents learn about their own preferences to gain insight into their self-concept.

3-B-192 BNST and amygdala responses to unpredictable threat in children

Brandee Feola[1], Jacqueline Clauss[2], Elizabeth Flook[3], Margaret Benningfield[1], Jennifer Blackford[4]

[1]Vanderbilt University Medical Center, [2]McLean Hospital, Harvard Medical School, [3]Vanderbilt University, [4]Munroe-Meyer Institute, University of Nebraska

BACKGROUND: Substantial evidence has identified the amygdala is pivotal for fear and anxiety. Translational evidence demonstrates that the bed nucleus of the stria terminalis (BNST) is also critical for anxiety. In adults, the BNST drives the anticipation of unpredictable threat and is elevated in individuals with anxiety disorders. However, it remains unknown whether the BNST is involved in unpredictable threat in children. METHODS: Forty-two 8-10-year-old children (mean = 9.87; SD = .92) participated in an unpredictable threat fMRI task in which they were trained to associate cues with images. BNST and amygdala activation was assessed in response to cues and images using percent signal change. For cues, linear mixed models were performed with cue type. For images, linear mixed models were performed with image type and image valence. RESULTS: There were no significant effects for the BNST. For the amygdala, there was a significant main effect of cue type ($p = .007$); the amygdala showed a significantly greater response to unpredictable relative to neutral face cues ($p < 0.001$). During images, amygdala activation differed by image valence ($p < .001$), with stronger activation to fear faces compared to neutral images ($p = 0.05$; $p < 0.001$). CONCLUSIONS: In children, unpredictable threat activated the amygdala, but not the BNST. This pattern is opposite of that observed previously in adults. Thus, the BNST's role in unpredictable threat processing may emerge later in development.

3-B-193 Conversational theory of mind and social brain function in autistic and typically developing children and adolescents

Diana Alkire[1], Junaid Merchant[1], Kathryn McNaughton[1], Heather Yarger[1], Elizabeth Redcay[1]

[1]University of Maryland, College Park

Conversation inherently involves theory of mind (ToM), yet few studies have examined the use of ToM in conversation at either the behavioral or neural level. This investigation is especially important in autistic individuals, who often struggle with both ToM and conversation. OBJECTIVE: To explore associations between spontaneous brain activation during peer interaction and the use of ToM in conversation during middle childhood and adolescence, a crucial period of social development. METHODS: To assess conversational ToM (cToM), we established an observational coding system consisting of two scales. cToM Positive captures perspective-taking behaviors such as referring to the partner's mental states. cToM Negative captures ToM-related violations of conversational norms such as statements that are under- or over-informative. We measured cToM during 5-minute, unstructured conversations between age- and gender-matched dyads of autistic and typically developing (TD) children aged 8-16. A subset of participants (38 TD, 16 autistic) also completed a social interaction fMRI task where they chatted with a peer compared to computer. We estimated the relation between cToM scores (Positive and Negative, separately) and whole-brain activation in the contrast between peer and computer. RESULTS: cToM Positive was negatively associated with activation in regions commonly engaged during explicit ToM reasoning, including left temporoparietal junction, dorsomedial prefrontal cortex, and bilateral posterior superior temporal sulcus (pSTS). cToM Negative was negatively associated with activation in bilateral pSTS and inferior frontal gyri. CONCLUSION: cToM Positive and Negative showed different patterns of association with brain activation during peer interaction, suggesting the two scales capture distinct cognitive dimensions. This work can inform our understanding of the mechanisms behind a common area of difficulty for autistic people and others who struggle with social interactions.

3-C-195 Reward volatility modulates the use of multiple learning systems during adolescence

Catherine Insel[1], Jonathan Nicholas[1], Daphna Shohamy[1]

[1]Columbia University

As adolescents navigate their newfound independence, they encounter numerous learning opportunities with varying levels of volatility. However, it remains unclear how reward volatility impacts adolescents' use of distinct learning and memory systems. Here, we examined how changes in volatility modulate two types of learning: episodic learning, the ability to remember single experiences, and incremental learning, the ability to learn gradually over multiple experiences. Participants (N=110) aged 11-25 performed a learning task. On each trial, participants chose between two cards that were drawn from an orange deck and a blue deck. Then they received a monetary outcome between 0¢-$1. The value of the orange and blue decks changed over time, and participants encountered repeated reversals of deck value. There was a distinct image on each card that could reappear later on, and the image value remained constant. Therefore, participants could either use their memory for the image value (episodic learning) or the recent deck value (incremental learning) to make a choice. The task included low volatility and high volatility conditions, which reflected how quickly the deck values changed. To assess episodic learning, we analyzed the likelihood that a participant used memory for the image value to make a choice. To index incremental learning, we analyzed the likelihood of choosing the higher value deck over time. We found that adolescents were more likely to use memory to choose an image associated with a high value outcome, but volatility did not modulate episodic learning. When volatility was high, adolescents exhibited better incremental learning, as evidenced by faster updating after a reversal. Together, these findings reveal that adolescents' incremental learning improved during periods of high volatility, but episodic learning mechanisms remained stable despite changes in volatility.

3-C-196 Prediction Error and Memory Encoding: Insights from a Computational Model

Francesco Pupillo[1], Javier Ortiz-tudela[1], Yee Lee Shing[1], Rasmus Bruckner[2]

[1]Goethe University, Frankfurt, [2]Free University Berlin

Predictive processing accounts suggest that our brain constantly tries to match top-down internal representations with bottom-up incoming inputs from the environment. Stimuli encountered in the environment can either match or violate predictions based on previous encounters of the same or similar stimuli, leading to varying degree of prediction error. Prediction error refers to the extent to which a stimulus deviates from a prediction, and its levels have been linked to dopaminergic and noradrenergic neuromodulation. How does prediction error of stimuli influence the way they are encoded and later remembered is still a matter of debate. The aim of the present investigation is to examine how prediction error at encoding influences recognition memory. We used a contingency-learning paradigm to create two different levels of priors: strong and weak. After that, participants were asked to predict the category of the object that will be presented on each trial, which could either match or violate their previously learned expectations. Finally, participants were asked to complete a surprise recognition test. We modelled participants' prediction using a reinforcement learning computational model in order to derive trial-by-trial levels of prediction error, and to link it to subsequent recognition. Results showed that participants remembered better the images presented in the weak prior condition, compared to the strong one, suggesting a trade-off between prediction and encoding. In addition, the strengthened encoding was proportional to the magnitude of the prediction error experienced when the images were presented. Precisely, the lower the expectations when participants successfully predicted the object category (i.e. positive prediction error), the better was the memory for that object. These results are in line with previous findings suggesting a computationally specific influence of prediction error on memory formation.

3-C-197 The development of numeral processing in the ventral visual stream: A longitudinal fMRI study

Benjamin Conrad[1], Gavin Price[1]

[1]Vanderbilt University

The human occipitotemporal cortex contains a patchwork of category-selective areas that respond preferentially to particular classes of objects. Recent evidence suggests the existence of a bilateral "inferior temporal numeral area" (ITNA) involved in processing Arabic numerals. We hypothesized that the ITNA would become increasingly tuned to numerals over the first years of formal schooling, as children are systematically exposed to symbolic numbers through early math education. We tested this hypothesis in a longitudinal sample of typically-developing children who underwent fMRI while performing a symbol classification task. Participants saw numerals, letters, or scrambled symbols and decided whether they "knew the name" of the stimulus. Usable data was acquired in 86 children (37F), 54 of whom contributed two or more sessions spaced ~1 year apart (age=6.88±0.8, range=5.4-8.8). To assess the categorical preference of the left and right ITNA we measured 1) the mean response to each category and 2) the representational similarity across exemplars of each category, derived from spatial patterns of activity within each region. Linear mixed-effects models were employed to assess the relationship of academic days (AD) in school with each imaging measure. In the right ITNA, we observed an increase over AD in the mean response to numerals relative to other symbols (P=0.0192, df=141), and the representational distinction between numerals and letters (P=0.0186). In the left ITNA, we observed an increase over AD in the representational distinction between numerals and letters (P=0.0013), and further between numerals versus all other symbols (P=0.0020). Taken together, these results indicate that in early school-age children, the ITNAs become increasingly "numeral-biased" in their response profiles and representational geometries. More generally, our study provides novel longitudinal evidence of experience-dependent functional plasticity in the ventral visual cortex.

3-C-198 Foundational number sense training gains are predicted by hippocampal-parietal circuits

Hyesang Chang[1], Lang Chen[2], Yuan Zhang[1], Ye Xie[3], Carlo de Los Angeles[1], Emma Adair[1], Gaston Zanitti[4], Demian Wassermann[4], Miriam Rosenberg-Lee[5], Vinod Menon[1]

[1]Stanford University, [2]Santa Clara University, [3]Sun Yat-Sen University, [4]Inria Saclay Île-de-France, [5]Rutgers University

OBJECTIVE: Mathematical skill development in early childhood relies on number sense, the foundational ability to discriminate between quantities. Previous studies have broadly examined the role of hippocampus in learning and memory, while studies of number sense have focused on the parietal cortex as a locus of quantity representation. It remains unknown whether brain circuits linking these regions influence number sense learning in children. METHODS: We developed a four-week integrative number sense training program, which gradually strengthened children's understanding of the relations between symbolic (Hindu-Arabic numerals) and non-symbolic (sets of items) representations of quantity, for elementary school-aged children (ages 7-10). fMRI scans acquired before training and training-related changes in performance on symbolic quantity discrimination were used to assess integrity of hippocampal-parietal circuits associated with number sense learning. To further determine a broader role of hippocampal-parietal circuits in learning beyond our training context, we conducted a meta-analysis of associations between co-activations of hippocampus and parietal regions and various cognitive functions across a large set of fMRI studies. RESULTS: We found that our training program improves symbolic quantity discrimination ability and the degree of hippocampal functional connectivity with a parietal region predicts individual differences in number sense learning in children. More broadly, a meta-analysis across 14,371 fMRI studies revealed a significant association between hippocampal-parietal functional circuits and learning. CONCLUSIONS: Our findings identify a novel circuit locus of foundational cognitive skill development in children and provide converging evidence for a domain-general role of hippocampal-parietal functional circuits in learning. These findings also provide insights into the development of more effective learning interventions.

3-C-199 Sign-tracking behaviors in children may help identify early risk of psychopathology

Janna Colaizzi[1], Shelly Flagel[2], Martin Paulus[1]

[1]Laureate Institute for Brain Research, [2]University of Michigan

Individuals show remarkable behavioral differences as a consequence of learned stimulus-outcome associations through Pavlovian learning mechanisms. In animal studies, following cue-reward presentations, rodents display two distinct conditioned responses; goal-trackers (GTs) that approach the location of reward delivery and sign-trackers (STs) that approach the cue itself. For rodents, these differences map onto variations in attentional and impulse control, yet the behavioral processes and underlying neural substrates of these differences in humans are poorly understood. We measured sign-/goal-tracking behaviors in psychiatrically healthy 9-12-year-olds (N=60, male=33) by presenting two response boxes; a conditioned stimulus (CS) with an extended lever and an unconditioned stimulus (US) that delivered a $0.20 token upon retraction of the lever-CS. Sessions consisted of 4 blocks with 10 trials each. MATLAB recorded physical contacts with CS/US and DeepEthogram measured proximity to CS/US from video recordings. The Pavlovian Conditioned Approach (PavCA) index was calculated as the propensity to engage with the US/CS, ranging from -1(GT) to 1(ST). Psychopathology was assessed with the Child Behavior Checklist (CBCL). PavCA was successfully measured by both contacts (m=.41, sd=.40, range=-.18-.95) and proximity (m=.06, sd=.32, range=-.6-.7). The two measures were correlated (r=.39, p=.02) but proximity showed increased variability and normality. Higher PavCA (ST) was also associated with increased oppositional defiant tendencies (r=.29, p=.03). Taken together, these results provide preliminary evidence of translational value for the sign-/goal-tracker model. Between the two measurements the increased variability in proximity suggests this may be a more sensitive representation of behaviors. The association between ST and externalizing behaviors suggests this model may be an important avenue to explore in early identification and prediction of psychopathology.

3-D-200 Development of dopaminergic neurophysiology supports improvements in the use of optimal reward learning strategies through adolescence

Finnegan Calabro[1], Ashley Parr[1], William Foran[1], Beatriz Luna[1]

[1]University of Pittsburgh

Heightened reward processing in adolescence may affect learning processes differentially from adult learning. Here, we investigated the contribution of striatal neurodevelopment to adolescent improvements in reward learning using both direct ([11C]Raclopride PET) and indirect (MR-based tissue iron from time-averaged T2* [taT2*]) measures of dopaminergic (DA) neurophysiology. In a 3-wave, longitudinal study (n=144 12-30 year-olds, 310 total sessions) with 18mo visit intervals, participants performed a probabilistic reward learning task during an fMRI acquisition. In 18-30 yo, we simultaneously acquired direct measures of DA signaling using a PET task challenge. A reinforcement learning (RL) model provided learning rates for both positive and negative outcomes, the optimality of these rates (relative to simulated data), and a temperature parameter. Principal component decomposition of individual parameter fits identified a factor which was a significant predictor of both in-task ($p<0.001$) and post-scan ($p<0.001$) learning performance, and increased significantly with age ($p=0.04$). Interestingly, this composite parameter was also associated with both direct (PET, $p=0.05$ among those that demonstrated task learning) and indirect (taT2*, $p=0.01$) indices of DA neurophysiology in the Nucleus Accumbens, the latter of which mediated age-related changes in RL performance ($p=0.002$). Inspection of the factor loadings revealed this composite parameter captured both the optimality of the positive outcome learning rate, and the frequency with which subjects chose the outcome with a higher expected value. This suggests that during adolescence, changes in DAergic functioning are associated with a shift from exploratory to exploitative choice strategies and a commensurate improvement in the identification of task-optimal learning strategies.

3-D-201 Childhood unpredictability, reward processing, and reward-related psychopathology

Yuyan (Lillian) Xu[1], Cassandra Lowe[2], Mingyeong Choi[3], Seth Pollak[1]

[1]University of Wisconsin-Madison, [2]University of Western Ontario, [3]University of Alabama

In addition to environmental harshness and other well-established risk factors, exposure to heightened unpredictability may alter children's reward processing, leading to increased risks for psychopathology. Here, we examined whether altered reward processing mediates the link between unpredictability and depression and anxiety symptoms using the demographically diverse sample in the Adolescent Brain Cognitive Development (ABCD) study (N = 1739). Functional activation during the Monetary Incentive Delay task at baseline was used to assess reward processing, and was included as a mediator in the model. As there are no direct measures for unpredictability in the ABCD study, we approximated an unpredictability composite score using items of parental monitoring, parental psychological and behavioral problems, marital status, residential history, and neighborhood crime. Results indicated that, controlling for harshness, unpredictability was associated with increased depression ($\beta = 0.628$, $p < 0.001$) and anxiety ($\beta = 0.573$, $p < 0.001$) symptoms at baseline and the 1-year follow-up. This effect remained robust after removing parental psychopathology in the composite score. The neuroimaging data revealed that unpredictability was associated with decreased activation in the right caudate during reward anticipation ($\beta = -0.004$, $p = 0.041$), and increased activation in the right amygdala ($\beta = 0.005$, $p = 0.025$) and left anterior cingulate cortex ($\beta = 0.004$, $p = 0.042$) when receiving the loss outcome. But the mediation model was not significant. In conclusion, children who experienced more unpredictability had reduced brain activity when processing reward cues and increased reaction when receiving a loss, possibly suggesting altered reward learning and harm avoidance. Together, findings indicate that childhood unpredictability alters neurodevelopment and increases the risk for depression and anxiety, above and beyond the well-established effect of environmental harshness.

3-D-202 Tissue iron, an indirect marker of striatal dopamine, is associated with delinquency and related personality characteristics in late childhood: Initial findings from the ABCD-Social Development Study

Ashley Parr[1], Finnegan Calabro[1], Will Foran[1], Douglas Fitzgerald[1], Kaylee Klingensmith[1], Duncan Clark[1], Lia Ahonen[1], Beatriz Luna[1]

[1]University of Pittsburgh

Little is known about the relationship between neurodevelopment and delinquency. In adolescence, asynchronous maturation of dopamine (DA) reward- and cognitive-systems contribute to a peak in risk- and sensation-seeking behaviors. We have recently shown that striatal tissue iron, reflecting DA availability, contributes to the maturation of frontostriatal circuitry in adolescence, supporting normative decreases in risk-taking into adulthood. We now leverage this template to understand the role of DA in the emergence and persistence of delinquency behaviors (i.e., adolescent-specific vs life-course persistent). The novel ABCD Social Development study (ABCD-SD) combines longitudinal neuroimaging with assessments of delinquency and victimization experiences, in addition to personality (e.g., fearlessness) and emotion regulation in 2,700 children (age 9-10 at visit 1). We obtained indices of striatal tissue iron (time averaged and normalized T2* weighted images (nT2*w)) in an initial 586 ABCD-SD participants (285 F, age 9-11, visit 1). Relative to females, males endorsed more delinquency ($d=-.55$, $p<.001$), victimization ($d=-.22$, $p< .01$), aggression ($d=-.46$, $p<.001$), psychopathy ($d=-.55$, $p<.001$), and fearlessness ($d=-.51$, $p<.001$). In males, lower tissue iron was associated with increased delinquency ($\beta=-.11$, $p<.05$), psychopathy ($\beta=-.15$, $p<.01$), and fearlessness ($\beta=-.26$, $p<.001$). In females, higher tissue iron was associated with increased victimization ($\beta=.11$, $p<.05$), aggression ($\beta=.10$, $p<.05$), and emotion dysregulation ($\beta=.15$, $p<.01$). Thus variability in DA function in late childhood may confer risk for delinquency. This study takes a critical first step towards characterizing predisposing neurobiological vulnerabilities for delinquency. Predictive models applied at future timepoints will identify patterns among these vulnerabilities and deviations from normative development that differentiate phenotypes of high-risk behaviors and their persistence into adulthood.

3-D-203 Illustrating rsfMRI striatal tissue iron measurements as developmentally sensitive, using neonatal data from the Developing Human Connectome Project to examine pre and postnatal age effects.

Cabral Laura[1], Will Foran[1], Finn Calabro[1], Beatriz Luna[1]

[1]University of Pittsburgh

During the prenatal period there is significant brain maturation, setting up a template that will be refined by postnatal experience, influencing trajectories. Striatal regions, involved in cognition and reward processing, can be vulnerable to prenatal stressors, and the trajectory of striatal function in adolescence is strongly related to reward processing. Obtaining measures of dopaminergic neurophysiology in pediatric samples has been limited by the inability to use PET. We will use an MRI measurement of tissue iron, time averaged t2*, calculated from existing rsfMRI, as an index of dopaminergic functioning. Previous work has shown PET [11C]dihydrotetrabenazine, a marker of presynaptic dopamine, to be related to striatal iron levels. Iron has been measured in infants before, but much of previous work used specialized sequences (e.g., QSM) and small cohorts. With 400 participants scanned neonatally, we will calculate tat2* in the Developing Human Connectome project data by normalizing each rsfMRI voxel to the volume median and then taking the median across time per voxel, with TRS with motion above .3 FD removed. Linear change is hypothesized in the pallidum, nucleus accumbens, caudate and putamen, but should be most pronounced in the pallidum, as it changes the most over the first 2 years. The effect of pre and postnatal experience on iron levels will be individually examined with gestational age (birth age) and days from birth to scan (experience age) as individual terms in a linear model. As prenatal iron levels have been shown to influence inhibitory control, birth age is hypothesized to be related to iron, while limited postnatal experience is not expected to. Uniquely using tat2*, we will characterize striatal iron in a large cohort using existing rsfMRI, validating the method for later use. We will examine the effect of pre and postnatal experience on brain iron to begin determining what portions of development being to impact

striatal trajectories.

3-D-204 Sleep Health Is Associated with Different Patterns of Striatal Response to Rewards in Youth with Anxiety and Healthy Youth

Nathan Sollenberger[1], Stefanie Sequeira[2], Aaron Mattfeld[1], Dana McMakin[1]

[1]Florida International University, [2]University of Pittsburgh

BACKGROUND: Poor sleep health and anxiety disorders are highly comorbid in youth and predictive of depression, which is associated with hyposensitivity to rewards. However, it is unclear how sleep health and anxiety may interact to predict striatal response to rewards. The current study examined the role of sleep health in striatal response to rewards among youth with anxiety and healthy youth with the hypothesis that poor sleep health would be associated with blunted reward response among youth with anxiety. METHODS: As part of the pretreatment battery for a randomized controlled trial, actigraphy- and diary-estimated sleep were collected over five days for 74 youth with anxiety and 31 healthy youth (ages 9-14 years; n = 55 female) in addition to questionnaire-reported sleep problems. Later, participants completed a monetary reward task during an fMRI session. We analyzed effects of multiple dimensions of sleep health, with group (anxiety vs. healthy) as a moderator, on ventral striatum (VS) response to monetary rewards versus losses via three mixed linear models (MLMs) (respectively corresponding to actigraphy, diary, and parent-/child-report measures of sleep health). RESULTS: Actigraphy- and diary-estimated time awake after sleep onset, as well as parent-reported sleep problems, interacted with group to predict VS response to rewards. Post-hoc simple slopes analyses linked actigraphy- and diary-estimated wake after sleep onset to attenuated VS response in youth with anxiety but not healthy youth. CONCLUSIONS: Poor sleep health was associated with blunted ventral striatum response in youth with anxiety but not in otherwise healthy youth. Differential effects of sleep health on reward response in healthy and anxious youth suggest a potential neural mechanism through which poor sleep could contribute to perturbed reward function and reward-related psychopathology in youth with anxiety.

3-E-205 Associations between intrinsic motivation and neural response to reward in Mexican-origin youth

Angelica Carranza[1], Sarah Beard[1], Richard Robins[1], Paul Hastings[1], Amanda Guyer[1], Johnna Swartz[1]

[1]University of California, Davis

BACKGROUND: Intrinsic motivation (i.e., motivation to engage in an activity because it is inherently rewarding) is associated with higher levels of academic achievement. Differences in intrinsic motivation have been linked to activity in striatal regions associated with anticipating and responding to reward cues and prefrontal regions associated with evaluating rewards. Using functional magnetic resonance imaging (fMRI), the present study examined how intrinsic motivation in early (ages 14-15) and later (ages 17-19) adolescence relates to brain activation during a reward processing task. METHOD: Associations were tested in a community sample of 262 Mexican-origin youth (51% female, Mage at fMRI scan=16.89, SD=.59) recruited for the longitudinal California Families Project. Participants underwent fMRI scanning at age 16 while completing a task in which they pressed a button quickly to receive or avoid losing monetary rewards. Participants completed self-report measures of intrinsic motivation across ages 14-19. RESULTS: We found a significant interaction effect between sex and early-adolescent intrinsic motivation on dmPFC (β=-.16, p=.02) and VS (β=-.12, p=.02) activity to monetary gain vs. neutral cues. Follow-up analyses revealed that dmPFC (β=.12, p=.02) and VS (β=.08, p=.05) activity were positively associated with intrinsic motivation for men, but not women. Reward-related neural activity at age 16 did not predict changes in intrinsic motivation levels in late-adolescence. CONCLUSION: For male adolescents only, early-adolescent intrinsic motivation was positively associated with dmPFC and VS activity during reward anticipation. Findings suggest that intrinsic motivation in early adolescence may shape dmPFC and VS activity during the anticipation of reward, but reward-related brain activity is not associated with change in intrinsic motivation later in adolescence. Results can advance our understanding of academic achievement during early versus later adolescence.

3-F-206 How infants carve up continuous experience into neural events

Tristan Yates[1], Lena Skalaban[1], Cameron Ellis[1], Angelika Bracher[2], Chris Baldassano[3], Nick Turk-Browne[1]

[1]Yale University, [2]Max Planck Institute for Human Cognitive and Brain Sciences, [3]Columbia University

In order to structure and scaffold experience, we segment continuous perceptual input into discrete events at multiple timescales across brain regions. This may be especially important for making sense of the world early in life. Yet, event segmentation is typically studied by asking participants to explicitly indicate event boundaries, which is an impossible instruction and task for infants. Recently, fMRI has proven successful at measuring hierarchical event segmentation in adults during task-free, naturalistic perception. Applied to infants, this approach could reveal the level of processing at which level infants segment events, whether based on lower-level sensory features or higher-level narrative information. This approach can also determine the timescale and granularity at which infants segment events and the extent to which infant and adult boundaries align. To address these questions, we collected fMRI data from 25 adults and 25 infants under one year of age while they watched the same short cartoon movie. Neural events were defined by the stability of spatial patterns of activity across voxels. In adults, we replicated prior findings of a hierarchy of event processing, such that the optimal event length was shorter in sensory regions compared to later visual and narrative regions. In infants, longer events were optimal across the brain, suggesting a flat processing hierarchy. Infant event patterns fit adult data and vice versa, but in visual regions and mPFC, infant event patterns better explained neural activity in held-out infants than adults. Adult behavioral boundaries were widely expressed in infant brains, but specific to a posterior medial cluster in adults. We replicated our results showing coarser event structure and a lack of an event processing gradient in infants using a separate, more heterogeneous cohort of infants and a different movie. These results inform the nature of infant experience and timescales of event perception in early life.

3-F-207 Examining whether hippocampal volume at initial recall predicts autobiographical memory retention after a one-year and two-year delay in 4- to 8-year-old children

Jade Dunstan[1], Sanaa Amin[1], Rylee Duncan[1], Carli Fine[2], Tracy Riggins[1]

[1]University of Maryland, College Park, [2]University of Michigan

Despite autobiographical memory (AM) studies showing that 2.5-year-olds can recall events related to the self and retain them as adults (Wang et al., 2017), young, relative to older, children show accelerated forgetting rates (Bauer & Larkina, 2016). This may be due to development in memory-related brain regions, such as the hippocampus, allowing for memory stabilization around 7 years (Bauer & Larkina, 2014). Neural correlates of AM have not been studied prior to 8 years, but general episodic memory (EM) relates to hippocampal function (Geng et al., 2019) and volume (Riggins et al., 2018). Because AM is distinct from EM (Willoughby et al., 2012), relations between AM and the hippocampus in children under 8 years remain unclear. To fill this gap, this study will draw on a sample of 101 children swho completed three AM interviews and MRIs (ages 4, 5, & 6 OR 6, 7, & 8). Narratives were obtained for two parent-nominated events through a researcher led interview with free recall, prompted recall, and specific probes. One event was asked about again at wave 2 and the other at wave 3. Narratives were transcribed in CLAN and scored via the Autobiographical Memory Interview. Hippocampal volume was obtained from a T1-weighted scan (.9mm^3) using Freesurfer and the Automated Segmentation Adapter Tool. After coding the remaining transcripts (12%), we will use multiple regression to determine if hippocampal volume near the time of the event (wave 1) predicts AM retention over a one- and two-year delay. We will explore memory for episodic details and memory for both course and fine-grained time and location details. Analyses will control for wave 1 AM, sex, intracranial volume, and vocabulary. We expect larger hippocampi at wave 1 to be associated with greater AM retention across both delays, and that course and fine-grained details will relate differentially to hippocampal subregions. This study will add critical knowledge about the underlying neural mechanisms of AM.

3-F-209 Developmental refinement of attention impacts semantic memory retrieval through adolescence

Sagana Vijayarajah[1], Margaret Schlichting[1]

[1]University of Toronto

When remembering past experiences, children provide more perceptual details than do adults. While past work speaks to how differences in memory contents or retrieval mechanisms might underlie this effect, here we explore the contribution of potentially shifting attentional biases to this phenomenon. We trained a multivoxel pattern (MVPA) classifier to identify semantic vs. perceptual attentional states on the basis of whole-brain fMRI activation patterns acquired during a cued attention task in adults. The classifier successfully generalized across participants in its ability to discriminate activation associated with selective attention to complex semantic vs. perceptual features of illustrations. We then applied the trained classifier to fMRI data from a separate group of children (10-12 years), adolescents (14-17), and adults (Fynes-Clinton et al., 2019) to measure semantic vs. perceptual attention during different memory retrieval tasks: autobiographical, semantic, and episodic. Retrieval trials were preceded by image cues that repeated across tasks, allowing us to examine attentional biases in preparation for vs. during retrieval. We predicted a correspondence between semantic/perceptual attention and semantic/episodic retrieval that would increase with age. Contrary to our predictions, we found a semantic attention bias in all retrieval tasks and a perceptual bias in the control (visual judgment) task (in all ages). However, examining attentional bias in preparatory vs. retrieval periods showed developmental differences in semantic attention that were unique to the semantic task: adults showed a semantic bias in preparation, whereas adolescents showed such bias only during, retrieval. Our results suggest developmental stability of an overall semantic attention bias, with subtle refinements in semantic retrieval. These findings align with past work showing earlier emergence of detail-rich memories (autobiographical, episodic) and later expansion of knowledge.

3-G-210 Prenatal PM2.5 and subcortical volumes in children with neurodevelopmental disorders

Elza Rechtman[1], Lindsay Alexander[2], Esmeralda Navarro[1], Demetrios Papazaharias[1], Allan Just[1], Robert Wright[1], Michael Milham[2], Chris Gennings[1], Megan Horton[1]

[1]Icahn School of Medicine at Mount Sinai, [2]Child Mind Institute

BACKGROUND: With the growing climate crisis, particulate matter (PM) air pollution is expected to increasingly impact human health with effects magnified in vulnerable populations including pregnant women and young children. Air pollution (particulate matter < 2.5 um; PM2.5) exposure increases the risk for autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD), yet the neural mechanisms underlying these associations are largely unknown. To understand links between prenatal PM2.5 exposure and structural brain changes, we take a transdiagnostic approach in a cohort enriched with ASD and ADHD subjects. METHODS: We used Freesurfer to quantify 14 subcortical volumes from high-resolution structural T1-weighted images acquired from 238 children (5-15 years; 88 females; 4% ASD; 49% ADHD; 11% comorbid ASD/ADHD; 24% other diagnoses, 12% no diagnosis) enrolled in the Healthy Brain Network (HBN); a well-established behavioral and magnetic resonance imaging (MRI) phenotyping biobank. We estimated average prenatal PM2.5 levels using a satellite-based gradient boosting hybrid model at a 1x1 km spatial resolution. We used weighted quantile sum (WQS) regression to generate a subcortical volume index (representing 14 subcortical brain region volumes) and investigated associations between the subcortical index and PM2.5. Models were adjusted for age and sex. RESULTS: PM2.5 was positively associated with the subcortical index (β = 0.19 [95% CI 0.18, 0.20), indicating higher prenatal exposure to PM2.5 is associated with increased subcortical volumes. This association is driven mainly by volumetric changes in the thalamus and pallidum, regions that play key roles in ASD and ADHD. CONCLUSIONS: Prenatal exposure to PM2.5 is associated with changes in subcortical volumes in a pediatric population enriched with ASD and/or ADHD; these results may inform prevention and intervention efforts for reducing PM2.5 exposures.

3-G-211 Developmental and Demographic Correlates of Behavioral Responses and Coping Strategies during the COVID-19 Pandemic

Ian Douglas[1], Blaire Porter[1], Melissa Aristizabal[1], Tyler Larguinho[1], Jessica Church[1]

[1]University of Texas, Austin

Behavioral responses to chronic and acute stressors are often studied in the context of atypical events or amongst non-random groups of highly-exposed populations, such as experiences inducing PTSD or samples of veterans of war. This has left gaps in our understanding of the latent coping skills of individuals who would otherwise not be faced with extreme stress exposure; community-based samples of younger populations are typically not studied under stress. In order to increase our understanding of the varied stress-responses exhibited by youth with and without pre-pandemic mental health burden, we examined the patterns of behavioral responses to the COVID-19 pandemic in a sample of developing children and adolescents, over-sampled for mental health diagnoses (N = 135, 47% Female; mean age = 15.17, range 9.4 - 22.1 years, 47% with at least one diagnosis). We sampled youths' behaviors early in the COVID-19 pandemic (via online survey, May-July 2020) by asking if they engaged in 61 distinct daily activities, pastimes, and coping strategies since the start of the pandemic (from the CASPE). We then conducted an exploratory factor analysis to determine which patterns of behavior youth engaged in during their efforts to cope with the pandemic. Salient behavioral dimensions encompassed sleep, healthful coping, socializing, and stress-related behavioral factors. Controlling for age and sex, sets of factors related strongly and differentially to SES, mental health, and concurrent COVID-19-related indicators. With a second timepoint of COVID-19 data in the same participants (online survey early 2021, N = 94, 51% Female, mean age = 15.14, range 10 - 21 years), 49% with at least one diagnosis), we assessed the similarities and differences in the structure of behavioral patterns and how they relate to pre-pandemic measures and COVID-19 response over time. We discuss the implications these findings have for a better understanding of behaviors by youth during stressful periods.

3-G-212 Higher cingulum fiber density and cross-section predicts resilience to depression symptom increases throughout adolescence, including during the COVID-19 pandemic

Rajpreet Chahal[1], Tiffany Ho[2], Lauren Borchers[1], Ian Gotlib[1]

[1]Stanford University, [2]University of California, San Francisco

The COVID-19 pandemic has exacted a significant toll on adolescent mental health with many teens reporting significant increases in depression (Barendse et al., 2021). We recently reported that internalizing symptom increases from pre- to during the pandemic were less pronounced in youth with higher functional connectivity within the brain executive control network (Chahal et al., 2021). The cingulum bundle is a white matter tract that connects frontal and parietal brain regions, is involved in executive functioning (Bathelte et al., 2019), and has been shown to have lower microstructural diffusion properties in patients with depression (de Diego-Adeliño et al., 2013). Here, we examined whether properties of the cingulum bundle are predictive of longitudinal changes in depressive symptoms across five time-points of adolescence, two of which were during the pandemic. 214 adolescents were recruited for this longitudinal study of 483 observations. Timepoints 1-3 (Mage=11.29, 13.38, 15.54, respectively) were completed prior to the pandemic; timepoints 4-5 were completed during the pandemic (Mage=16.86 and 17.60). At baseline, participants completed a diffusion tensor imaging scan to measure fiber density and cross-section (FDC) of white matter. At all timepoints, participants completed the Child Depression Inventory (Helsel and Matson, 1984). Participants showed increases in depressive symptoms throughout adolescence, though not in youth with higher baseline cingulum FDC (b=-11.47, p=.002). Youth with lower cingulum FDC showed significant increases in symptoms from timepoints 1-3, and steep increases during the pandemic; youth with higher cingulum FDC had relatively low stable symptoms throughout adolescence and no increases during the pandemic. Higher FDC was also associated with higher self-reported resilience during the pandemic (b=.33, p=.016). Morphometric properties of the cingulum bundle reflect differences in resilience in general and during the pandemic.

3-G-213 The importance of social support to mitigate prenatal maternal distress during the COVID-19 pandemic and its effects on infant brain connectivity

Kathryn Manning[1], Xiangyu Long[1], Lianne Tomfohr-Madsen[1], Gerald Giesbrecht[1], Catherine Lebel[1]

[1]University of Calgary

INTRODUCTION: While pregnant women often experience elevated anxiety and/or depression during pregnancy, the COVID-19 pandemic has significantly increased these rates. Prenatal distress is associated with brain alterations in children, but social support is a key factor that may buffer these effects. Here we studied infants from the Pregnancy during the COVID-19 Pandemic Study who underwent MRI in Calgary. We aimed to determine the relationship between infant amygdala functional and structural connectivity and maternal prenatal distress. METHODOLOGY: Pregnant women were recruited to complete an online questionnaire (Edinburgh Depression Scale, PROMIS Anxiety, and Social Support Effectiveness questionnaire (SSEQ)). Standard scores from these instruments were combined into a prenatal distress composite. Women who had delivered infants in the Calgary area at full term were invited to bring their infants (2-3 months) to the Alberta Children's Hospital for neuroimaging (n=55, natural sleep, GE 3T MR750w) including diffusion and resting state functional MRI (rs-fMRI). Diffusion metrics were extracted from bilateral uncinate fasciculi and amygdala-prefrontal fiber bundles (ExploreDTI). Rs-fMRI connectivity between the amygdala and prefrontal regions was calculated (FSL). Linear mixed effects models explored the relationship between MRI and the composite prenatal maternal psychological distress controlling for sex, age, SSEQ and maternal education. RESULTS: The fractional anisotropy (FA) in both tracts was significantly related to the prenatal distress composite score. There was a significant interaction between prenatal distress and SSEQ where mothers with lower SSEQ demonstrated a positive FA-distress relationship where higher prenatal distress was associated with higher FA. DISCUSSION: Premature white

matter microstructural development is related to higher prenatal distress experienced during pregnancy in mothers with relatively lower quality social support.

3-G-214 The Relationship between Functional Connectivity Patterns and Psychopathology in Youth Adopted from Foster Care

Jiwon Jung[1], Kaitlin Cummings[1], Nana Okada[1], Genevieve Patterson[2], Jill Waterman[1], Audra Langley[1], Susan Bookheimer[1], Mirella Dapretto[1], Nim Tottenham[3], Shulamite Green[1]

[1]University of California, Los Angeles, [2]University of Denver, [3]Columbia University

BACKGROUND & OBJECTIVE Early life stress (ELS) is well known to be associated with greater risk for atypical neurodevelopment and psychopathology (McLaughlin et al., 2014). Additionally, youth with ELS experience high rates of sensory processing challenges such as sensory over-responsivity (SOR), but the neurobehavioral effects of ELS on sensory processing are not well understood. Prior research has focused on examining SOR in the context of autism, which has shown an association between SOR and greater salience network connectivity with sensory cortices and amygdala (Green et al., 2016). Here, we will examine the neurobiological correlates of SOR in youth adopted from foster care (AFC) who are often exposed to ELS (e.g., multiple placements, abuse, neglect). METHODS & HYPOTHESES 25 AFC and 25 non-adopted control (NAC) youth aged 8-18 years underwent 8-min resting-state fMRI scans. Parents reported on their child's SOR severity (SenSOR; Schoen et al., 2008). Two seed-based analyses will be run with hubs in salience (anterior insula) and emotion regulation (amygdala) networks to compare the resting-state functional connectivity (rsFC) between AFC and NAC groups as well as associations with SOR. H1: On average, there will be group differences in rsFC as a function of early caregiving history (e.g., altered amygdala-prefrontal connectivity; VanTieghem & Tottenham, 2018). H2: Within AFC, higher SOR severity will correlate with greater rsFC within-network connectivity as well as increased connectivity with the sensory processing regions in line with previous autism research (Green et al., 2016). IMPLICATIONS Youth adopted from foster care commonly experience early life stress, which can impact their neurobehavioral developmental outcomes. Understanding the underlying mechanisms of these outcomes, including atypical sensory processing, can inform interventions that alleviate the impact of early adversity.

3-G-215 The Default Mode Network Resting-State Functional Connectivity as a Protective Factor in the mediating link between Environmental Unpredictability and Impulsivity via Sleep Duration

Linhao Zhang[1], Landry Huffman[1], Zehua Cui[1], Assaf Oshri[1]

[1]University of Georgia

Unpredictable rearing environments are linked to lower sleep duration and heighten impulsive behaviors among youth. Emerging research suggests that increased default mode network (DMN) resting-state functional connectivity (rsFC) is linked to increased self-regulation and decision making. The present study aims to test (1) the indirect link between environmental unpredictability and impulsivity via sleep duration (2) the moderating role of default mode network (DMN) resting-state functional connectivity (rsFC) in this indirect link. We hypothesize that 1) higher levels of environmental unpredictability will be linked to shorter sleep duration and increased impulsivity among youth; 2) shorter sleep duration will mediate the relations between environmental unpredictability and impulsivity; 3) higher DMN rsFC will attenuate the link between low sleep duration and increased impulsivity. Data from Adolescent Brain & Cognitive Development (ABCD) Study will be used. Environmental unpredictability will be measured via the Parental Monitoring Questionnaire, using youth reports on the frequency of family dinners, knowledge of day-to-day plans, and ability to contact parents. The Parent Sleep Disturbance Scale will assess sleep duration for Children. Impulsivity will be measured by the UPPS-P Impulsivity Scale. Pre-processed resting-state fMRI data will be used to assess DMN rsFC. Hypotheses will be tested using structural equation modeling. First, impulsivity and sleep duration are regressed onto unpredictability. Next, the indirect effect of unpredictability on impulsivity via sleep duration will be tested. Finally, a sleep duration X DMN rsFC interaction term is added to the model.

3-G-216 The influence of stressful life events on the development of frontal cortical thickness across adolescence and related depressive symptoms in young adulthood

Lea Backhausen[1], Jonas Granzow[1], Hervé Lemaître, Juliane Froehner[1], Jean-Luc Martinot[1], Michael Smolka[1], Nora Vetter[1]

[1]Technische Universität Dresden

Stressful life events (SLE), spanning e.g. illness, problems in school, or family conflicts regularly occur during childhood and adolescence, a developmental period of dynamic changes. In addition, affective disorders like major depression peak during young adulthood. Alterations in frontal brain regions have been reported in both individuals with major depression and those who experienced highly stressful life events during childhood and early adolescence like maltreatment, abuse, or institutionalization. Currently, longitudinal studies are lacking that focus on the influence of SLE on depressive symptoms in young adulthood and the role of frontal cortical brain development across adolescence. Hence, the aim of this study is to elucidate effects of negatively perceived SLE during childhood and early adolescence (assessed with a life events questionnaire) on the development of frontal cortical thickness from early adolescence into young adulthood in a four-wave investigation in two large European samples as part of the IMAGEN project. Additionally, we aim to explore effects of SLE and brain development on depressive symptoms measured at age 22 with the Center for Epidemiologic Studies Depression Scale (CES-D). We assessed structural magnetic resonance imaging data from 497 adolescents at ages 14, 16, 18, and 22 (307 of which filled out the CES-D at age 22), which we processed using the longitudinal stream of FreeSurfer 6.0.0 and thoroughly quality controlled, yielding a total of 1318 data sets. Data analysis plan: Using R's toolbox lavaan, we will first test the shape of trajectories in cortical thickness of frontal regions during adolescence with univariate latent curve models. Second, we intend to investigate the influence of SLE on frontal cortical brain development during adolescence and explore relations to depressive symptoms in young adulthood.

3-G-217 Socioeconomic disparities in adolescents? hippocampal volume and internalizing problems vary based on the cost of living and antipoverty programs of U.S. states

David Weissman[1], Mark Hatzenbuehler[1], Mina Cikara[1], John Flournoy[1], Deanna Barch[2], Katie McLaughlin[1]

[1]Harvard University, [2]Washington University, St. Louis

OBJECTIVE: More than 20% of U.S. children live in poverty, putting them at increased risk for experiencing adversities that impact their neural development and mental health. Using data from the Adolescent Behavior and Cognitive Development (ABCD) study, we evaluated how state-level macroeconomic factors may mitigate or exacerbate the associations between poverty, brain structure, and mental health in early adolescence. METHODS: Analyses were conducted using linear mixed-effects models to determine the association between income-to-needs ratio and hippocampal volume. State-level moderators included cost of living based on Regional Price Parity, whether or not the state expanded Medicaid after passage of the Affordable Care Act, and cash assistance to low-income families (the mean of the average monthly Earned Income Tax Credit and Temporary Assistance for Needy families benefit). RESULTS: Lower family income was associated with smaller hippocampal volume and more internalizing and externalizing problems, although the magnitude of the association varied significantly across states. Cost of living and generosity of antipoverty programs at the state-level moderated the associations of family income with hippocampal volume and internalizing problems. When cost of living is higher, the strength of the association of income with hippocampal volume and internalizing problems was significantly weaker in states that expanded Medicaid and in states that provided more generous cash benefits for low-income families. CONCLUSIONS: Macroeconomic conditions and state-level policies influence individual-level associations between family income and children's neurodevelopment and mental health. Public policies that increase financial resources to families have the potential to reduce socioeconomic disparities in mental health and neurodevelopment.

3-G-218 Changes in cortisol in youth during the COVID-19 pandemic

Madison Fung[1], Brittany Taylor[1], Rachel Spooner[1], Christine Embury[1], Michaela Frenzel[1], Hallie Johnson[1], Madelyn Willett[1], Amy Badura-Brack[2], Stuart White[1], Tony Wilson[1]

[1]Boys Town National Research Hospital, [2]Creighton University

The Coronavirus Disease 2019 (COVID-19) pandemic has caused massive disruptions to daily life, closing schools and businesses and increasing physical and social isolation, leading to deteriorations in mental health and wellbeing in people of all ages. Under conditions of chronic stress, long-term changes in cortisol secretion are implicated in many stress-related physical and mental health problems, which commonly emerge in adolescence. However, the consequences of the chronic pandemic-related stress on youth development remain understudied. Using hair cortisol concentrations (HCC), we quantified average changes in stress across a 4 month period, capturing cortisol activity before, during, and after the transition to pandemic lockdown conditions. In a sample of healthy, typically-developing youth (n=49), longitudinal changes in HCC were analyzed using linear mixed effects models. Perceived levels of pandemic-related stress were also measured and compared to the biological changes in HCC. We found that cortisol levels significantly increased across the course of the pandemic in children and adolescents. These youth subjectively reported a multitude of stressors during this time, although these perceived stress levels did not predict the physiological changes in HCC. We provide evidence that children and adolescents experienced significant physiological changes in cortisol activity across the COVID-19 pandemic. These widespread elevations in HCC have several implications for the future of youth mental health, as youth within sensitive periods for physical, social, and physiological development may be particularly vulnerable to the deleterious impacts of chronic cortisol exposure during the pandemic.

3-G-219 A multidimensional approach to understanding the emergence of sex differences in internalizing symptoms in adolescence

Bianca Serio[1], Robert Kohler[1], Fengdan Ye[1], Sarah Lichenstein[1], Sarah Yip[1]

[1]Yale University

OBJECTIVE: Women are more vulnerable to internalizing disorders (e.g., depression and anxiety). This study took an integrative and developmental approach to investigate multidimensional factors associated with the emergence of sex differences in internalizing symptoms in early adolescence, using data from the Adolescent Brain Cognitive Development (ABCD) study. METHODS: Indices of sex hormone levels (dehydroepiandrosterone, testosterone, and estradiol), physical pubertal development, task-based functional brain activity, family conflict, and internalizing symptoms (measured with the Child Behavior Checklist; CBCL) were drawn from the ABCD study's 9- to 10-year-old sample (N = 11,878). Principal component analysis was conducted on the CBCL subscales to yield a single and robust measure of internalizing symptoms. Moderated mediation analyses were then used to test for direct and indirect effects of (1) sex hormone levels on internalizing symptoms through amygdala response to fearful faces; (2) family conflict on internalizing symptoms through amygdala response to fearful faces; (3) physical pubertal development on internalizing symptoms through family conflict. RESULTS: Direct and indirect effects were found of physical pubertal development on internalizing symptoms through family conflict, $F(5, 11{,}374) = 37.24$, $p < .001$ and $F(3, 11{,}376) = 19.45$, $p < .001$ respectively, but effects were not moderated by sex. No effects were found of sex hormone levels or family conflict on internalizing symptoms through amygdala response to fearful faces. Furthermore, girls did not report greater internalizing symptoms relative to boys, suggesting that sex differences in internalizing symptoms have not yet begun to surge in females at this age. CONCLUSIONS: Our results highlight the need for further longitudinal investigation of endocrine, neurocognitive, and psychosocial factors associated with emerging sex differences in internalizing symptoms throughout adolescence.

3-G-220 Deviations from typical fronto-amygdala circuit maturation are differentially associated with violence exposure and psychiatric symptoms in youth

Taylor Keding[1], Justin Russell[2], Ryan Herringa[2]

[1]Yale University, [2]University of Wisconsin-Madison

Exposure to violence during childhood is associated with increased prevalence and severity of pediatric psychopathology. Neural correlates also suggest that abnormal maturation of emotion-related brain circuits, such as amygdala prefrontal cortex (PFC), may underlie the development of psychiatric symptoms after exposure. However, which alterations are associated with violence exposure versus psychiatric risk remain unclear. Using data collected from the Philadelphia Neurodevelopmental Cohort (PNC), normative neurodevelopment models of fronto-amygdala resting-state functional connectivity were built using deep learning, trained to predict chronological age. Using the brain age gap estimate (BrainAGE), an index of circuit maturation, patterns of advanced and delayed maturation related to violence exposure and psychiatric symptoms were interrogated. Feature importance in PFC regions driving atypical maturation was analyzed using the Shapley value, a game-theoretic credit allocation metric. Violence exposure was associated with delayed maturation of basolateral amygdala (BLA) - PFC circuits, driven by increased BLA - medial orbitofrontal cortex connectivity, a circuit crucial for extinction learning of threat-related stimuli. Increased psychiatric symptoms, on the other hand, was associated with advanced maturation of BLA - PFC circuits, driven by decreased BLA - dorsolateral PFC connectivity, a circuit crucial for explicit emotion reappraisal. Overall, the neural patterns underlying delayed maturation after violence exposure suggest abnormal development of threat appraisal processes, potentially reflecting greater generalization and reduced extinction (more characteristic of younger children). Increased psychiatric risk related to advanced circuit development suggests that the expression of psychiatric symptoms may be a unique form of adversity, exacerbated by pre-existing vulnerabilities leading to early maturation of fronto-amygdala circuits.

3-G-221 Effects of Racism on Neonatal Resting State Functional Brain Connectivity

Tammi Kral[1], Cathi Propper[2], Camille Williams[3], Kirsten McLaughlin[2], Lindsay Gomes[2], Amanda Wylie[2], Rasmus Birn[3], Sarah Short[3]

[1]University of Wisconsin, Madison; Healthy Minds Innovations, [2]University of North Carolina, Chapel Hill, [3]University of Wisconsin, Madison

Racism is an insidious problem with far-reaching effects on black, indigenous, and people of color (BIPOC). Yet, we are only beginning to understand the impact of racism on mental health, and even less is known about the potential downstream impacts on infants and their neurodevelopment. Perceived racism has been associated with poorer health among adults, which is mediated by depression and anxiety (Brondolo et al, 2011). Maternal depression contributes to fearfulness in infants (Garstein et al., 2010), representing a potential link between maternal experiences with racism and infant well-being. Fear and anxiety are associated with activation and connectivity of the amygdala (Kim et al, 2011; Tromp & Grupe et al, 2012). The current study will examine the effect of maternal, prenatal racism-related experiences on amygdala resting state functional connectivity (rsFC) in a study of n=24 neonates of BIPOC mothers. The Experiences of Racism questionnaire was collected from mothers prenatally. Infants completed resting state functional MRI scans at 2 weeks old. Amygdala seeds were defined anatomically based on the UNC neonatal template (Shi et al, 2011). We conducted whole-brain regression of amygdala seed-based rsFC with behavioral measures included as voxel-wise covariates. More maternal racism-related experiences (prenatally) were associated with stronger amygdala rsFC with primary visual cortex (V1), precuneus, and cerebellum. Prior research indicates a role for increased amygdala-V1 rsFC in traumatic stress and vigilance, consistent with chronic experiences of racism as intergenerational trauma. The results of this research have far-reaching implications for understanding how maternal racism-related stress and experiences get under the skin to alter functional brain networks, and for social policy in terms of racism as a public health concern starting in the prenatal period.

3-H-223 Application of Gaussian Graphical Models to Identify Brain Structures Associated with Children's Appetitive Traits

Alaina Pearce[1], Timothy Brick[1], Travis Masterson[1], Shana Adise[2], Laural English[3], S. Nicole Fearnbach[4], Wendy Stein[1], Bari Fuchs[1], Kathleen Keller[1]

[1]Pennsylvania State University, [2]Children's Hospital of Los Angeles, [3]The Panum Group, [4]Pennington Biomedical Research Center

Appetitive traits are heritable, stable eating behaviors associated with dysregulated eating and risk for obesity. While initial studies suggest some appetitive traits may be associated with neural response to food cues, their neurobiological basis is poorly understood. Therefore, the proposed secondary analysis of 5 studies will use Gaussian graphical models (GGM) to identify structural correlates of 8 appetitive traits (Children's Eating Behavior Questionnaire) in 172, 7-11-year-old children (M=9.02 years, 85 boys, 23 with obesity). MPRAGE T1 scans were previously scored by 2 independent raters on 5 indices (e.g., ringing, blurriness). We will use the SPM12 CAT12 toolbox to extract grey matter volumes (GMV) from regions in the appetitive network: ventral diencephalon, thalamus, ventral and dorsal striatum, hippocampus, insula, orbital frontal cortex, anterior cingulate cortex, and inferior and middle frontal gyri. While GGMs have been used to identify functional connectivity networks, this will be the first time GGMs will be used to identify brain-behavior networks. A GGM approach is proposed because: 1) data are likely highly correlated; 2) our aim is to identify unique brain-behavior associations rather than associations between latent structures; and 3) due to dimensionality of the data, correction for multiple univariate tests would be very conservative. By residualizing, we will adjust for appropriate covariates (e.g. intercranial volume, sex, age). We will use LASSO regularized partial correlation networks to first identify independent appetitive trait and GMV networks and then identify a bipartite network focused on brain-behavior associations. We hypothesize satiety and food responsiveness and subcortical GMV nodes will show the highest betweenness centrality (i.e., number and strength of CEBQ-GMV edges). This study will identify brain structures associated with appetitive traits and demonstrate a novel approach for examining brain-behavior associations.

3-H-224 Anxiety moderates the association between cortical thickness and anticipatory threat responding in Latina youth

Jordan Mullins[1], Rany Abend[2], Kalina Michalska[1]

[1]University of California, Riverside, [2]National Institute of Mental Health

OBJECTIVE: Increased psychophysiological fear responses to anticipated, but not to experienced, aversive events is associated with anxiety and variation in dorsal prefrontal cortex (PFC) neuroanatomy (Abend et al., 2020; 2021). However, the extent to which this association between neuroanatomy and fear responding is generalizable beyond the specific ecology of treatment-seeking, upper middle SES European Americans is unknown. The current study tests the replicability of this association, as well as the moderating role of anxiety severity, in a community sample of Latina girls, an historically underrepresented group exhibiting high levels of untreated anxiety (McLaughlin et al., 2007). METHODS: Fifty-nine pre-adolescent Latina girls (MAge=9.91, ± 1.32 years) completed a structural MRI scan. Participants also completed a differential threat conditioning and extinction paradigm validated in pediatric populations (Lau et al., 2008; Michalska et al, 2017), during which skin conductance responding (SCR) was assessed. SCR indexed psychophysiological anticipatory responding to conditioned threat cues. Anxiety severity was assessed via the Screen for Child Anxiety Related Disorders (Birmaher et al., 1999). RESULTS: Controlling for age and mean cortical thickness, moderation analyses identified a significant interaction between dorsomedial PFC thickness and anxiety severity on children's SCR (ΔR^2=.091, p=.041), such that the thickness-response link was most strongly negative for highly anxious youth. CONCLUSIONS: This study extends evidence of covariation between PFC neuroanatomy and threat-anticipatory physiological responding in previously studied youth to include Latina children. Anxiety symptoms moderate the association between prefrontal cortical thickness and anticipatory threat responding. These findings highlight important considerations for intervention and prevention efforts during a period of heightened anxiety risk when threat neurocircuitry is still developing.

3-H-225 Sensorimotor synchronization ability and brain plasticity: a longitudinal MRI twin study

Lina van Drunen[1], Rebecca Schaefer[1], Lara Wierenga[1]

[1]Leiden University

Sensorimotor synchronization (SMS) is the human ability to synchronize motor action with external events. This is an important skill that children use in many different contexts, for example when playing music, learning motor and language skills, and engaging in social interactions. Specifically, musical ability relies on several functional brain networks, including regions in the motor and emotional network. Recent findings indicate that there are profound individual differences in SMS, given that through intensive training a minority of individuals becomes skilled in musical performance. Here, we will examine whether individual differences in structural brain developmental trajectories of regions in the motor and emotional network are predictive of SMS performance, and to what extent this relationship is driven by environmental experiences or genetic factors. To do so, we will use three biennial MRI assessments of a 7-13-years old longitudinal twin sample (T1: N = 480, T2: N = 394, T3: expected N = 250). We will use a data driven approach to study individual differences in a naturalistic group of children. We aim to identify subgroups of brain developmental patterns, using latent class growth curve (LCGC) analyses. At the third measurement wave (T3), children (aged 11-13) perform a SMS paradigm consisting of in-phase metronome tapping, anti-phase metronome tapping, and music-cued (in-phase) tapping trials. We hypothesize that children that show a fast change in brain development have better SMS performance compared to children who show a small change in brain development. A fast change may be indicative of a prolonged sensitive window in brain development. We further hypothesize that the relation between brain change and performance is environmentally rather than genetically driven. These findings would support the hypothesis that early experience may prolong sensitive windows in brain development.

3-H-226 Examining cerebellum volume and postural stability after paediatric mild traumatic brain injury

Ayushi Shukla[1], Ashley Ware[1], Bradley Goodyear[1], Antonia Stang[1], Stephen Freedman[1], Keith Yeates[1], Catherine Lebel[1]

[1]University of Calgary

INTRODUCTION: Postural instability and balance problems are often reported after pediatric mild traumatic brain injury (mTBI). The cerebellum is involved in the regulation of postural control and gait. Yet no studies have investigated the relation between balance and cerebellar gray matter volumes or differences in cerebellar gray matter volumes in children with mTBI or orthopedic injury (OI) relative to typically developing (TD) children. METHOD: Children (mTBI n=65, OI n=36, TD n=23) aged 8-16.99 (M/SD=12.96/2.34) were recruited from the emergency department and returned for MRI ~9 days post-injury. Voxel based morphometry provided gray matter volume for 10 cerebellar parcellations, balance was assessed using the Balance Error Scoring System (BESS) for injury groups (mTBI, OI). Univariate ANOVA and linear regressions were used to examine group differences in gray matter volumes and relations of gray matter volume with BESS, respectively, with age and sex as covariates. RESULTS: Cerebellar gray matter volume was significantly larger in injury groups than in TD children in lobe I IV and V, vermis crus I and II, vermis VI and VIIb. Multiple linear regressions revealed significant group by cerebellar gray matter volume interactions in all regions when examining the relation of cerebellar volume with BESS tandem stance scores. Follow-up revealed that volume of all regions was negatively associated with tandem stance scores in children with mTBI, but there were no significant associations between BESS scores and cerebellar volumes in the OI group. DISCUSSION: Higher cerebellar gray matter volume in injury groups may reflect a neuroinflammatory response at the post-acute stage of injury. The inverse relation of cerebellar volume with BESS tandem stance in children with mTBI indicates the importance of the cerebellum in postural control and gait, specifically after mTBI. More research regarding the cerebellum could foster diagnostic and prognostic understanding of mTBI.

3-H-228 Longitudinal effects of extreme and rapid weight gain on brain structure in a diverse sample of youth 9-to-12-years-old: findings from the ABCD study

Shana Adise[1], Andrew Marshall[1], Sage Hahn[2], Shaomin Zhao[1], Eric Kahn[1], Megan Herting[1], Elizabeth Sowell[1]

[1]Children's Hospital of Los Angeles, [2]University of Vermont

Despite the growing literature on childhood obesity and the brain, little is known about how rapid weight gain affects brain structure throughout development. We used data from the Adolescent Brain Cognitive Development (ABCD) Study® to determine longitudinal predictors and effects of extreme weight gain (WG) on brain structure (e.g., cortical thickness, surface area, subcortical volume, fractional anisotropy [FA], mean diffusivity [MD]) in a diverse group of youth who did not meet criteria for eating disorders. From baseline (9-10-years [yr]s) to 2yrs later, the WG group (n=225, 44% male) consisted of youth who gained >38lbs and had large BMI z-score changes over a 2yr period (i.e., >0.2SD) compared to the Weight Stable group (WS, <0.2 BMI z-score SD, <70 BMI %ile). Previously, 18 brain regions at baseline predicted WG 1yr later; here, we assessed longitudinal change within these regions after 2yrs of WG using multiple random-factor (e.g., site) nested (e.g., within subject) mixed models adjusted for age, sex, BMI, puberty, race, parental education, and intracranial volume. WG youth had accelerated right frontomarginal gyrus thinning over the 2yrs. Not all youth had WG after 1yr, so, a 5-fold cross-validated elastic net regression identified 18 brain regions predictive of WG over a 2yr period (AUCtest=0.65). WG 2yrs later was predicted at baseline by differences in brain regions involved in executive functioning (e.g., inferior frontal), appetitive control (e.g., accumbens), emotion (e.g., posterior cingulate), and reward (e.g., anterior cingulate), and these regions were distinct from those associated with 1yr WG. At Year 2, WG youth still showed decreased parieto-occipital sulcus FA and accumbens MD, but no other regions showed sustained changes in response to WG onset. This is the first study to assess how the brain changes in response to extreme and rapid WG over a developmental period and highlights brain regions that may predispose youth to unhealthy WG.

3-H-229 Examining longitudinal relationships between white matter organization in infancy and subsequent reading achievement at school age

Jennifer Zuk[1], Kelsey Davison[1], Jolijn Vanderauwera[2], Ted Turesky[3], Kathryn Garrisi[3], Ally Lee[3], Jade Dunstan[4], P. Ellen Grant[4], Nadine Gaab[3]

[1]Boston University, [2]Université Catholique de Louvain, [3]Harvard University, [4]Boston Children's Hospital

The neural basis of decoding (ability to discern unfamiliar words in text) has been specified among school-age children and adults, implicating predominantly posterior left-hemispheric regions and corpus callosum. Interestingly, various dyslexia-susceptibility genes are presumed to play an important role in brain development with expression during prenatal/early postnatal stages. It remains unclear to what extent neural correlates of decoding may be experience-dependent versus shaped by structural foundations established in early childhood. Therefore, the present study investigates how brain structure in infancy relates to emerging school-age decoding abilities. This study draws from an ongoing longitudinal investigation of infants with/without familial risk for dyslexia. Initially, structural neuroimaging was successfully acquired with infants (4-18 months) using a natural sleep technique. Automated Fiber Quantification was employed to estimate white matter properties of reading-related tracts from diffusion-weighted images. Infants were longitudinally enrolled and reinvited for follow-up assessment in kindergarten/first grade (n = 28 to date). Longitudinal multiple regression, controlling for age, reveals that structural organization of the corpus callosum and left inferior fronto-occipital fasciculus in infancy are prospectively associated with school-age decoding. Preliminary findings suggest that white matter organization in these reading-related tracts from infancy contribute to predicting school-age decoding abilities. Moreover, preschool-age phonological awareness abilities (i.e., core behavioral predictor) were positively associated with school-age decoding skills. Therefore, this work suggests white matter organization from infancy as one factor associated with decoding, but also illuminates the need for further specification of respective contributions of white matter in the context of multifactorial pathways that shape reading outcomes.

3-H-230 The role of daytime sleepiness in the association between sleep and brain morphology during childhood

Elie Yu Tong Guo[1], Véronique Daneault[1], Annie Bernier[1]

[1]University of Montreal

Sleep plays a crucial role in physical and psychological health, and increasing evidence suggests its contribution to neural development (Dutil et al., 2018). Beyond actual sleep, subjective feelings of sleepiness during the day may be centrally involved in the negative outcomes typically associated with poor or insufficient sleep (e.g., Dewald et al., 2010). The current study aimed to explore the brain morphometric correlates of sleep duration during childhood according to subjective daytime sleepiness. At 10 years of age, sleep duration was objectively assessed among 62 children (31 boys) using actigraphy for 7 days and a structural magnetic resonance imaging protocol was performed. At the same age, one question of the School Sleep Habits Survey referring to daytime sleepiness was used to create two groups: children who reported frequent daytime sleepiness and those who reported few or no sleepiness. Multiple regressions were used to predict whole-brain regional grey matter volume (GMV) from sleep duration in each group, using CAT12 version 12.7 for SPM12 under MATLAB R2018b (smoothing at 4mm). All results held at $p < .05$, FDR-corrected at cluster level, with an extent threshold of 100 voxels. In children without sleepiness, results show that sleep duration was negatively associated with GMV in the right insula ($T=5.26$, $k=224$) and bilateral inferior temporal gyrus (ITG; right $T=4.59$, $k=224$; left $T=5.48$, $k=241$). The ITG is involved in the processing of visual stimuli and visual memory, while the insula is involved in a large variety of cognitive functions. By contrast, for children with daytime sleepiness, sleep duration is positively associated with GMV in the right cerebellum ($T=5.64$, $k=444$). Besides its contribution in integration of multiple processes, the cerebellum also regulates sleep-wake cycles. Our preliminary findings, using subjective and objective sleep evaluations together, will help revealing the complex contribution of sleep on brain development.

3-H-231 Systematic Review of Structural and Functional Neuroimaging Studies of Cannabis Use in Adolescence: Evidence from 90 studies and 9,441 participants

Sarah Lichenstein[1], Nick Manco[1], Lora Cope[2], Leslie Egbo[3], Kathleen Garrison[1], Jillian Hardee[2], Ansel Hillmer[1], Kristen Reeder[4], Elisa Stern[1], Patrick Worhunsky[1], Sarah Yip[1]

[1]Yale University, [2]University of Michigan, [3]Wesleyan University, [4]East Carolina University

OBJECTIVE: In light of ongoing cannabis policy changes, increased availability, reduced perceptions of harm, heightened interest in medicinal uses of cannabis, and drastic increases in potency, it is essential to establish an understanding of cannabis effects on the developing adolescent brain. This systematic review aims to: (1) synthesize extant literature on functional and structural neural alterations associated with cannabis use during adolescence; (2) identify gaps in the literature that critically impede our ability to assess the effect of cannabis on adolescent brain function and development; and (3) provide recommendations for future research to bridge these gaps and elucidate the mechanisms underlying cannabis-related harms, with the long term goal of facilitating the development of improved prevention and treatment approaches targeting adolescent cannabis use. METHODS: A systematic search of Medline and PsycInfo was conducted with the following search terms: adolescen* (OR young, youth, pubertal, puberty, minors, emerging adult, development) and cannabis (OR cannabidiol, cannabinoid, cbd, marijuana, thc) and mri (OR diffusion imaging, dti, fmri, fractional anisotropy, functional connectivity, magnetic resonance, microstructure, neuroimaging, resting state, white matter). RESULTS: We identified 90 studies including 9,441 adolescents, which provide preliminary evidence for functional and structural alterations in frontoparietal, frontolimbic, frontostriatal, and cerebellar regions among adolescent cannabis users. However, findings were largely inconsistent across domains and inclusion criteria and analysis steps varied widely. CONCLUSIONS: Larger, more rigorous studies are essential to reconcile divergent results, assess potential moderators of cannabis effects, disentangle risk factors for use from consequences of exposure, and to elucidate the extent to which cannabis effects are reversible with abstinence.

3-I-232 Predicting ABCD Symptomatology from Network Correlations Using Elastic Net Regularized Nonparametric Regression

Kelly Duffy[1], Nathaniel Helwig[1]

[1]University of Minnesota

The primary objective of the proposed study is to predict ADHD symptomatology, as measured by the Child Behavior Checklist (CBCL), using correlations of pre-defined networks in resting state baseline data from the Adolescent Brain Cognitive Development (ABCD) study (N = 11,879 prior to exclusions for missing data and excessive motion). The salient predictors will be selected via an elastic net regularized smoothing spline regression, and the ADHD symptomatology scores will be modeled using a compound Poisson-gamma Tweedie distribution, appropriate for the large number of zero values and non-Gaussian distribution seen often in symptomatology data. The first model will aim to predict raw CBCL scores using the correlations between all pairs of the Gordon parcellation networks, including within-network correlations, of the resting state data. The second model will aim to predict CBCL scores with the same set of network correlations along with demographic covariates and variables measuring prenatal exposure to and parental history of alcohol and substance use. Both models will be evaluated by their R^2 values. Although we refrain from hypothesizing on specific network pair correlations that may be identified as salient predictors, as the primary aim of the regularized regression is to select these without a priori hypotheses, we expect that the second model will explain a greater amount of variance than the first model. We expect to achieve a higher R^2 than previous approaches due to our more flexible framework. We believe that this study will contribute to the existing usage of elastic net models in literature by highlighting the advantages of a nonparametric implementation, such as the ability to model the nonlinear relationship between predictors, and use of an appropriate distribution for the outcome variable. Further, it will highlight between- and within-network resting state connectivity that is most predictive of ADHD symptomatology for targets of future study.

3-I-233 Motor learning-induced reconfiguration of functional brain networks in children

Mackenzie Woodburn[1], Margaret Sheridan[1], Cheyenne Bricken[1], Weili Lin[1], Jessica Cohen[1]

[1]University of North Carolina, Chapel Hill

Brain organization when learning a motor skill shifts from a more to a less integrated organization. This reconfiguration is thought to support more autonomous and segregated function of the networks necessary for motor execution (e.g., motor and visual networks). In children, analyses probing activity of individual regions indicate that reduced activation of top-down control regions and increased activation of motor-related regions occurs with learning, however reconfiguration on the brain network-level has not been examined. Thus, the proposed study will examine how functional brain network reconfiguration underlies motor learning in children across blocks of the serial reaction time (SRT) task. The SRT task probes motor learning such that subjects become faster on blocks of sequenced trials (repeating 12-item pattern) as compared to blocks with randomized trials. In a sample of children (8-10 years, n=28), we will measure the response time (RT) difference between consecutive sequence and random blocks across eight block pairs as an index of motor learning. Brain data will be processed with fMRIPrep. Timeseries will be extracted from 300 regions of a functional brain atlas. We will assess brain organization similarity using mutual information (MI) during the same sequenced and random blocks as an index of network reconfiguration. Multivariate multilevel modeling will separately model motor learning and network reconfiguration across the SRT task. Model covariates will include sex, age, and block order. We expect an increase for RT difference (more learning) and a decrease for MI (greater reconfiguration). Further, we hypothesize that the slopes of the learning and the reconfiguration models will be negatively correlated, suggesting that the extent to which children learn a motor sequence is dependent upon greater brain reconfiguration. This work will provide evidence that the brain's ability to dynamically reconfigure contributes to children's skill acquisition.

3-I-234 Interrogating brain-wide patterns of functional connectivity related to age in newborns

Ashley Nielsen[1], Sydney Kaplan[2], Muriah Wheelock[2], Dominique Meyer[2], Jeanette Kenley[2], Dimitrios Alexopoulos[2], Tara Smyser[2], Lauren Wakschlag[1], Elizabeth Norton[1], Barbara Warner[2], Deanna Barch[2], Joan Luby[2], Chad Sylvester[2], Cynthia Rogers[2], Christopher Smyser[2]

[1]Northwestern University, [2]Washington University, St. Louis

Functional connectivity (FC), the correlation in spontaneous fMRI activity between distinct brain regions, reflects a history of co-activation throughout development. Brain-wide patterns of FC carry information about maturation and/or experience that has been used to accurately predict an individual's age from school-age into adulthood. Building upon our prior work testing if FC carries similar information in the newborn brain, we interrogated the networks important for age prediction with brain-wide FC. Structural and functional MRI were acquired during natural sleep in the first 4 weeks of life from n=262 healthy, term-born neonates. Whole-brain FC was generated using 333 surface parcels and organized by networks defined in adults (Gordon et al. 2016). Multivariate support vector regression identified brain-wide patterns of FC related to postmenstrual age at scan (37-44 weeks), and through 10-fold cross-validation these patterns were able to accurately predict an individual infant's age (R2=0.51). FC strongly weighted by this multivariate model included connections among sensorimotor processing networks (visual, auditory, somatomotor). Feature selection (using restricted number of specific connections for age prediction) revealed that FC from a single network was not sufficient to capture the amount of variance related to age present in brain-wide FC, similar to results in later development. However, disrupting the developmental patterns of FC (scrambling subject order of specific connections) in networks, network pairs, and regions involved in sensory and motor processing negatively impacted age prediction more than expected by chance, suggesting that these connections are important for the brain-wide patterns of FC that can predict age. These findings suggest that during the neonatal time period FC carries information about maturation and/or experience after birth and this information is most prevalent in sensory and motor systems.

3-I-235 Peripheral cytokines, network connectivity, and adolescent depression

Saché Coury[1], Vanessa López[1], Jaclyn S. Kirshenbaum[1], Giana Teresi[2], Anthony Gifuni[3], Ian Gotlib[1], Tiffany Ho[4]

[1]Stanford University, [2]University of Pittsburgh, [3]McGill University, [4]University of California, San Francisco

Prior studies with clinical samples of depressed adults and non-clinical samples of adolescents have found that higher levels of peripheral inflammation are associated with reduced connectivity in regions comprising the central executive (CEN), default mode (DMN), and salience networks (SN). No study, however, have examined associations between inflammation and network connectivity in depressed adolescents. Because depression commonly emerges during adolescence, we sought to test the hypothesis that adolescents with depression show significantly stronger associations between peripheral inflammation and network connectivity than non-depressed adolescents. In this pre-registered analysis (https://osf.io/bj6), we will analyze data from 63 adolescents with Major Depressive Disorder (MDD) and 54 healthy controls (CTL), ages 13-18 years (70 females), recruited from two independent studies. All participants in our analysis underwent resting-state fMRI and provided blood samples, which have been assayed using a multiplex instrument. Based on prior studies, we will construct a composite metric of inflammation from the following cytokines: IL-6, TNF-α, and IL-1β. We will apply an independent components analysis followed by dual regression on the resting-state fMRI data to identify within-network connectivity of the CEN, DMN, and SN. To test our primary hypothesis, we will: (1) replicate previous literature and correlate inflammation values with network connectivity across the entire sample, covarying for age, gender, BMI, average motion, and study sample; and (2) test whether diagnostic group moderates the association between inflammation and network connectivity. By examining whether inflammation contributes to depression-related neurophenotypes in an adolescent cohort, our study will offer insight into the etiology of MDD and will lay the foundation for future longitudinal work testing whether network connectivity mediates associations between inflammation and depression.

3-J-236 Mapping early brain-body interactions: associations between fetal heart rate trajectories during the second and third trimesters with newborn functional brain networks

Angeliki Pollatou[1], Arline Pierre-Louis[1], Bradley Peterson[2], Catherine Monk[1], Dustin Scheinost[3], Marisa Spann[1]

[1]Columbia University, [2]University of Southern California, [3]Yale University

BACKGROUND: The autonomic nervous system matures during the fetal period, is essential for newborn cardiovascular and respiratory homeostasis, and forms the basis of brain-body interactions. As brain development progresses from 2nd to 3rd trimester, fetal parasympathetic activity and heart rate variability (HRV) increases, while fetal heart rate (FHR) decreases. In this way, FHR and HRV provide an index of the development of the fetal autonomic nervous system. Although FHR and HRV have been associated with follow-up behavior measures in infancy and toddlerhood, their connections to autonomic brain systems during infancy (e.g., the hypothalamus which receive autonomic regulatory inputs from the limbic system) have not been investigated. HYPOTHESIS: We hypothesize that greater decrease in FHR and greater increase in HRV from the 2nd to 3rd trimester will be associated with stronger functional connectivity between the hypothalamus and the limbic system. SAMPLE: Our study consists of 45 pregnant adolescents, ages 14-19, that were part of a larger study with fetal heart rate measures acquired from 23-37 weeks of gestation. Additionally, their infants underwent a fMRI scan during their first weeks of postmenstrual life (PMA at scan 40-47 weeks) during natural sleep without sedation. ANALYTIC PLAN: After standard preprocessing, functional connectivity matrices--or, connectomes--will be generated using an infant specific functional parcellation. Each edge in the connectome will then be correlated with either change in FHR or change in HRV, while controlling for PMA at scan and sex. The network-based statistic will be corrected for multiple comparisons.

3-K-237 Curvish: An R package for asking questions about development

John Flournoy[1], Graham Baum[1], Patrick Mair[1], Leah Somerville[1]

[1]Harvard University

Understanding systematic variation of neuroimaging data over time is a central project in developmental cognitive neuroscience, e.g., when describing normative development (Tamnes et al, 2017), or functional dynamics underlying risky behavior during adolescence (Casey, et al., 2016). This research requires that we accurately model developmental trends and derive meaningful quantities from them with appropriate uncertainty. For example, to ask at what age there is a peak in functional BOLD response, we have to find the maximum value of our trend function as well its uncertainty. One approach that has been taken is to bootstrap simple polynomials, but this risks oversimplifying the functional form and biasing estimates. More complex questions strain this approach. Modeling trends using Bayesian splines provides flexible descriptions of development, and posterior probability distributions which can be manipulated to ask complex questions with ease. The curvish package extends brms (Bürkner, 2017) to help users estimate and manipulate Bayesian spline models in cross-sectional and longitudinal data. It provides functions to compute derivatives; the X value where the trend or its derivative is maximized, minimized, or equal to some value; and regions of the trend that are different from another point on the trend or some value. Finally, it replaces false-positive error correction for multiple comparisons with control of the total Type-S (sign) error probability.

3-K-238 Multiple complexity analyses of preterm neonatal combined EEG-fNIRS measurement

Lorenzo Semeia[1], Mina Nourhashemi[2], Mahdi Mahmoudzadeh[2], Fabrice Wallois[2], Hubert Preißl[1]

[1]University of Tübingen, [2]University of Picardie Jules Verne

Each year, millions of infants are born preterm, before 37 weeks of gestation. Prematurity exposes these babies at high risk of developing neurological disorders. Monitoring brain functions in these newborns with non-invasive neurophysiological techniques, such as electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS), is therefore of great relevance. A novel solution for the analysis of neurophysiological data is represented by the study of signal complexity. The current research aims to examine complexity in combined EEG-fNIRS recordings of preterm newborns at rest. In particular, multiscale entropy, multiscale permutation entropy, and Lemper-Ziv-Welch compression will be considered. The analysis will be performed on an existing dataset recorded at the University Hospital in Amiens (FR). The brain electrophysiological activity of 32 preterm infants (12 females), who were recorded between 27 and 35 weeks of gestation, was recorded simultaneously with EEG (8 channels, sampling rate of 1024Hz) and fNIRS (1 channel, sampling rate of 5Hz). We hypothesize that: 1) Infants' age between 27 and 35 weeks of gestation is linearly related to EEG and fNIRS complexity metrics, such as with increasing age, the different metrices increase as well. 2) Complexity metrics from EEG are correlated to metrics in fNIRS. For example, multiscale complexity in the EEG signal is correlated to multiscale complexity in fNIRS signal. In order to test our hypotheses, Pearson correlation coefficients will be calculated, and linear models will be built. The definition of age-related changes in complexity in a multimodal approach could significantly increase our understanding of the neurovascular coupling in infancy, providing an additional tool for analysing combined EEG-fNIRS data. Moreover, examining the evolution of different complexity indexes across ages could add further insight into the emergence of cognitive processing in human beings.

3-K-239 The Human Connectome Project in Development: Examining sampling, attrition, and COVID-19 impacts at the study's conclusion

Melanie Grad-Freilich[1], HCP-D Consortium, Leah Somerville[1]

[1]Harvard University

The Human Connectome Project in Development (HCP-D) aims to enable major advances in our understanding of the normative development of human brain connectivity. This project, aiming to acquire data from over 1,300 5-21 year olds, provides a unique, publicly available resource including multimodal data on several biological and cognitive constructs that are of critical importance to health and well-being across this age range. These data will allow a wide range of investigators in the community to gain new insights about brain development and connectivity. HCP-D data collection began in 2016 at four sites across the USA (UCLA, University of Minnesota, Harvard University, and Washington University in St. Louis). The project is nearly complete, as data collection will conclude in August of 2021. As with all research, the COVID-19 pandemic forced a temporary disruption in the capacity for in-person testing. Each site eventually re-established in-person testing in 2020, but not without impacts to the pace of testing, the testing procedures, and the timing of longitudinal follow-ups. Here, we will present data on the final resulting sample of HCP-D with respect to sample size, sample composition, COVID-19 adaptations, and the pacing and completeness of the longitudinal subcomponent of the study. In addition, we will provide an update regarding what HCP-D data have been publicly released into the National Data Archive to date.

3-K-240 Effective connectivity during an avoidance-based Pavlovian-to-instrumental transfer task

Daniel Petrie[1], Sy-Miin Chow[1], Charles Geier[1]

[1]The Pennsylvania State University

Pavlovian-to-instrumental transfer (PIT) refers to a phenomenon whereby a classically conditioned stimulus impacts the motivational salience of instrumental behavior. We examined behavioral response patterns and fMRI-based effective connectivity during an avoidance-based PIT task. Participants (n = 11; 8 females; Mage = 28.2, SD = 2.8, range = 25-32 years) completed an aversive-based PIT task while undergoing fMRI. Repeated measures ANOVA was used to compare instrumental button-press responses, across five types of stimuli and a pre-stimulus fixation period. Effective connectivity between a priori brain regions engaged during the task was determined using HRF-GIMME, a novel approach that enables identification of

individual- and group-level effective connectivity maps. Behaviorally, participants exhibited specific PIT, defined as when a conditioned stimulus (CS) previously associated with a reinforcing outcome increases instrumental responding (R) directed at the same outcome. We did not find evidence in our sample for general PIT effects in that a CS did not increase instrumental responding towards a different but related reinforcing outcome. Using HRF-GIMME, we recovered effective connectivity maps among corticostriatal circuits engaged during the task. Group-level paths were identified revealing directional effects from left putamen to right insula and from right putamen to right cingulate. Our model also revealed a direct effect of specific PIT stimuli on BOLD activity in the left putamen, underscoring the importance of this region as a junction between conditioned cues and instrumental action. Results provide initial evidence of directed network connectivity in key brain nodes in an aversive-based PIT task network. This study adds to a growing literature studying PIT effects in humans as well as employing GIMME models as a means to better understand how psychological phenomena are supported in the brain and inter-individual heterogeneity in neural networks.

3-L-241 Peer victimization as a potential moderator of the temperament-anxiety association

Anita Harrewijn[1], Eveline Crone[1], Ingmar Franken[1], Pauline Jansen[1]

[1]Erasmus University Rotterdam

One strong predictor for pediatric anxiety disorders is an inhibited temperament in early life. However, not all children with an inhibited temperament develop an anxiety disorder. Identifying risk factors for anxiety in children with an inhibited temperament could improve early detection and prevention of anxiety disorders. Here we focus on peer victimization as a potential moderator of the temperament-anxiety association. Based on Degnan et al. (2010), we hypothesize that particularly the combination of an inhibited temperament and peer victimization predisposes to anxiety symptoms in adolescence. We pre-register the analysis of existing data from the Generation R Study, a prospective cohort study following 1232 families since birth with in-depth temperament assessments. Temperament was assessed at 3 years with the Laboratory Temperament Assessment Battery. Fear was observed in response to physical contact with an unknown, hidden object (jumping spider toy) and shyness was observed in a social interaction with an unfamiliar adult wearing a hat and sunglasses. Ratings across these conditions will be z-scored and averaged. Victimization was assessed at 7 years with a computerized peer-nomination instrument. Anxiety was assessed at 13 years with the DSM-oriented anxiety scale from the Child Behavior Checklist and Youth Self-Report. Analyses will be done separately for self- and parent-reported anxiety. Linear regression models in R will be used to test if peer victimization moderates the temperament-anxiety association, including anxiety symptoms as dependent variable, and temperament, peer victimization, sex, and their interactions as independent variables. Child's national origin (parents' birth country), maternal age and education, household income, and marital status will be included as covariates. Alpha will be set at 0.05 and missing independent variables will be imputed using the mice package in R.

3-L-242 Cerebral blood flow and cognitive outcome after pediatric stroke in the middle cerebral artery

Regula Everts[1], Leonie Steiner[1], Andrea Federspiel[1], Nedelina Slavova[1], Roland Wiest[1], Sebastian Grunt[1], Maja Steinlin[1]

[1]University of Bern

Adaptive recovery of cerebral perfusion after pediatric arterial ischemic stroke (AIS) is sought to be crucial for sustainable rehabilitation of cognitive functions. We therefore examined cerebral blood flow in the chronic stage after stroke and its association with cognitive outcome in patients after pediatric arterial ischemic stroke (AIS). This cross-sectional study investigated cerebral blood flow and cognitive functions in 14 patients (age 13.5 ± 4.4 years) after pediatric AIS in the middle cerebral artery (time since AIS was at least 2 years prior to assessment) when compared with 36 healthy controls (aged 13.8 ± 4.3 years). Cognitive functions were assessed using neuropsychological tests and cerebral blood flow was measured with arterial spin labeled imaging in the area of the anterior, middle, and posterior cerebral artery (ACA, MCA, PCA). Patients had significantly lower IQ scores and poorer cognitive functions compared to healthy controls. Arterial spin labeled imaging revealed significantly lower cerebral blood flow in the ipsilesional MCA and PCA in patients compared to healthy controls. Further, we found significantly higher interhemispheric perfusion imbalance in the MCA in patients compared to controls. Higher interhemispheric perfusion imbalance in the MCA was significantly associated with lower working memory performance. Our findings revealed that even years after pediatric stroke in the MCA, reduced ipsilesional cerebral blood flow occurs in the MCA and PCA and interhemispheric imbalance is associated with cognitive performance. Thus, our data suggest that cerebral hypoperfusion might underlie some of the variability observed in long-term outcome after pediatric stroke.

3-L-243 Cerebellar resting-state connectivity and sensory symptoms in youth with autism

Melis Cakar[1], Nana Okada[1], Kaitlin Cummings[1], Jiwon Jung[1], Genevieve Patterson[2], Susan Bookheimer[1], Mirella Dapretto[1], Shulamite Green[1]

[1]University of California, Los Angeles, [2]University of Denver

OBJECTIVE: The cerebellum (Cb), a key brain region for sensorimotor coordination, shows structural and functional abnormalities in autism spectrum disorder (ASD). Cb atypicalities have also been linked to ASD symptom severity, including broad sensory symptoms. Sensory over-responsivity (SOR) in particular is highly prevalent and impairing in ASD youth, but its association with atypical Cb function has yet to be examined. Since ASD is a developmental disorder, it is crucial to characterize how Cb connectivity changes across typical development and how this differs in ASD to fully understand the Cb role in ASD symptomatology. We propose to examine associations between SOR and Cb resting functional connectivity (rsFC) in ASD and assess how connectivity in these regions relates to age in typically developing (TD) compared to ASD youth. METHODS: Participants include 55 ASD (16F, 39M) and 46 TD youth (12F, 34M), aged 8-18 years. SOR was measured by parent reports on the SenSOR Inventory (Miller, 2004). Through a seed-based whole-brain connectivity approach, we will use sensorimotor Cb subregions (lobules I-VI, VIIIA and VIIIB based on previous associations with sensorimotor processing; Leggio

and Olivito, 2018; Khan et al. 2015) as seeds in our analyses. SOR scores will be entered as a bottom-up regressor (thresholded at $z>2.3$; $p<0.05$). We will extract connectivity strength values in regions associated with SOR and examine their correlations with age in ASD vs. TD. H1: SOR in ASD will be correlated with increased rsFC between sensorimotor Cb and sensory cortices. H2: TD children will show a greater decrease in rsFC between sensorimotor Cb and sensory cortices with age compared to ASD children. Implications: Findings will provide insight into whether differences in development of Cb connectivity may play a role in ASD symptomatology, specifically SOR. Results will be discussed in terms of implications for therapeutic interventions for children with ASD with SOR.

3-L-244 Associations between Cognitive and Neural Factors with Psychopathology Symptom Changes Over Time: Specificity Versus Shared Associations

Nicole Karcher[1], Jaisal Merchant[1], Brent Rappaport[1], Deanna Barch[1]

[1]Washington University, St. Louis

OBJECTIVE: The current study examined whether impairments in cognitive and neural factors at baseline predict overall levels or changes in psychotic-like experiences [PLEs] and whether they generalize to other psychopathology symptoms (i.e., caregiver-rated internalizing and externalizing symptoms). METHODS: Using three Adolescent Brain Cognitive Development Study time points from ages 9-13 (N=5883 with complete symptom data across data waves), the current study used univariate latent growth models to examine associations between cognitive and neural metrics at baseline with symptom measures. For symptom measures, we examined overall mean associations (i.e., intercepts) and symptom changes (i.e., slopes). Predictors included neuropsychological test performance, global structural MRI, and several a priori within-network resting-state functional connectivity metrics. RESULTS: The results showed an overall pattern whereby cognitive and brain metric impairments at baseline showed the strongest associations with steeper PLEs slopes. Additionally, lower fluid cognition, including lower inhibitory control showed associations with steeper PLEs as well as overall levels of externalizing and internalizing symptoms. Lower working memory scores and brain volume were associated with both steeper PLEs and externalizing symptom slopes. Further, there were several metrics uniquely associated with steeper PLEs slopes, perhaps most specifically lower cingulo-opercular and ventral attention within-network resting-state functional connectivity. CONCLUSION: Neural and cognitive impairments in middle childhood were broadly associated with greater PLEs slopes, and showed stronger associations with changes in PLEs than other indices of psychopathology. However, deficits in fluid cognitive scores, including inhibitory control, may represent trans-symptom risk factors. These results inform our understanding of psychopathology and potentially aid in early identification efforts.

3-L-245 Perceived social interaction quality as a mediator between social anxiety and ventral striatum activation to social reward in children with autism spectrum disorder

Elizabeth Giacobbe[1], Kathryn McNaughton[1], Heather Yarger[2], Elizabeth Redcay[2]

[1]University of Maryland, College Park, [2]University of Maryland

Social anxiety (SA) occurs in approximately 15-20% of children with Autism Spectrum Disorder (ASD) (van Steensel, Bogels & Perrin, 2011), and SA may make children with ASD view social experiences more negatively (Schneider et al., 1992). In preliminary analysis of data from our lab, we found that variability in SA symptoms in children with ASD relates to ventral striatum (VS) response to peer engagement during a social interaction, suggesting SA may alter sensitivity to social reward. The current study aims to determine if the perceived quality of a peer social interaction is a mediator between SA symptoms and VS response to social reward. The quality of the interaction will be defined by enjoyment of/satisfaction with the interaction. First, we aim to replicate the preliminary relation between SA symptoms in children with ASD and VS activation to a social reward during a social interaction. Second, we will investigate if the perceived quality of the interaction mediates this relation. 43 child participants, all with an ASD diagnosis, participated in an interactive fMRI task in which they sent messages about themselves to a perceived peer and received engaged ("Me too!") or unengaged ("I'm away") responses. Participants also sent messages to and received messages from a computer ("Matched!"/"Disconnected"). SA symptoms were measured using the social phobia subscale of the Screen for Child Anxiety Related Emotional Disorders, parent-report form (Birmaher et al., 1996). Select post-task questions about the peer interaction will make up an overall interaction quality score. A linear regression will be used to identify a relation between SA symptoms and VS response to social reward. Then, a mediation model will assess if interaction quality is a mediator between SA symptoms and VS activation. We hypothesize a negative association between SA symptoms and VS activation to social reward, and that the perceived quality of the interaction will mediate this relation.

3-L-246 Predictors of Suicidal Thoughts and Behavior in Children: Results from Penalized Logistic Regression Analyses in the ABCD study

Laura van Velzen[1], Yara Toenders[1], Aina Avila-Parcet[2], Richard Dinga[3], Jill Rabinowitz[4], Adrián Campos[5], Neda Jahanshad[6], Miguel Renteria[5], Lianne Schmaal[1]

[1]University of Melbourne, [2]Hospital de la Santa Creu i Sant Pau, [3]Radboud University, [4]Johns Hopkins University, [5]QIMR Berghofer Medical Research Institute, [6]University of Southern California

Despite numerous efforts to predict suicide risk in children, the ability to reliably identify youth that will engage in suicide thoughts or behaviors (STB) has remained remarkably unsuccessful. To further knowledge in this area, we apply a novel machine learning approach and examine whether children with STB could be differentiated from children without STB based on a combination of sociodemographic, physical health, social environmental, clinical psychiatric, cognitive, biological and genetic characteristics. The study sample included 5,885 unrelated children (50% female, 67% white) between 9 and 11 years old from the Adolescent Brain Cognitive Development (ABCD) study. We divided children into three subgroups: 1. children with current or past STB, 2. children with psychiatric disorder but no STB (clinical controls) and 3. healthy control children. We performed

binomial penalized logistic regression analysis to distinguish between groups. The analyses were performed separately for child-reported STB and parent-reported STB. We were able to distinguish the STB group from healthy controls and clinical controls (area under the receiver operating characteristics curve (AUROC) range: 0.79-0.81 and 0.70-0.78 respectively). However, we could not distinguish children with suicidal ideation from those who attempted suicide (AUROC range 0.49-0.59). Factors that differentiated the STB group from the clinical control group included family conflict, prodromal psychosis symptoms, impulsivity, depression severity and a history of mental health treatment. This work underscores the need for clinicians to monitor children who present multiple risk factors and may inform future socio-environmental suicide prevention interventions in at-risk children.

3-L-247 Resting-state functional connectivity networks in adolescent self-harm

Ines Mürner-Lavanchy[1], Julian Koenig[1], Corinna Reichl[1], Romuald Brunner[2], Michael Kaess[1]

[1]University of Bern, [2]University of Regensburg

Non-suicidal self-injury (NSSI) is a highly prevalent transdiagnostic symptom and risk marker for mental health problems among adolescents. Research on the neurobiological mechanisms underlying NSSI is needed to clarify the neural correlates associated with the behavior. We examined resting-state-functional-connectivity (RSFC) in n = 33 female adolescents aged 12-17 years engaging in NSSI, and n = 29 age-matched healthy controls using graph theory. Mixed linear models were evaluated with the Bayes Factor (BF) to determine group differences on global and regional network measures and associations between network measures and clinical characteristics in patients. Adolescents engaging in NSSI demonstrated longer average characteristic path lengths and a smaller number of weighted hubs globally. Regional measures indicated lower efficiency and worse integration in (orbito)frontal regions and higher weighted coreness in the pericalcarine gyrus. In patients, higher orbitofrontal weighted local efficiency was associated with NSSI during the past month while lower pericalcarine nodal efficiency was associated with suicidal thoughts in the past year. Higher right but lower left pericalcarine weighted hubness was associated with more suicide attempts during the past year. Patients engaging in NSSI showed less integrated frontal RSFC networks but a highly connected occipital sub-network. The pattern of results was less clear for the clinical associations in patients, with higher and lower network efficiency relating to worse clinical outcome depending on the brain region and hemisphere. Using a graph-based technique to identify functional connectivity networks, this study adds to the growing understanding of the neurobiology of NSSI.

3-N-249 Assessing how EEG gamma power and SES explain variability in language skills among late and typical talking toddlers

Julia Nikolaeva[1], Brittany Manning[1], Soujin (Jinnie) Choi[1], Emily Harriott[1], Kaitlyn Fredian[1], Lauren Wakschlag[1], Elizabeth Norton[1]

[1]Northwestern University

An estimated 10% of toddlers are late talkers (2-year-olds with a vocabulary <50 words or not combining words, but without another condition such as autism spectrum disorder or deafness to explain the deficit). Examining brain oscillatory power using EEG may help explain the role of brain mechanisms that support variability in language skills. Further, SES is known to be an important factor in both language and brain development. Reduced frontal EEG power in gamma-band (30-50Hz) brain activity has been previously linked to lower language in children at-risk for developmental disorders and SES-related disparities in language development. The goal of this study is to test the role of frontal EEG gamma-band power in explaining variance in language ability among SES-diverse late and typical talking toddlers. We hypothesize that neural mechanisms underlying gamma-band power support language ability, after controlling for key demographics including child sex, age, and SES (indicated by mother's education). Here, we will analyze data collected from 176 2-year-old children over-sampled for late talking status (~50% late talkers) who completed EEG during passive movie-watching, in addition to standardized assessments of language ability. In proposed analysis, we will perform a logistic regression setting 2-year late talker status as the dependent variable, with child sex, age, and SES in the first step of the regression, and concurrent frontal EEG gamma power in the second step. Second, we plan to examine regression beta weights to assess the unique contributions of gamma and SES toward late talking status. As the first study to examine EEG power among late talkers, this work will support the closing of a gap in research with late talking children using tools from neuroscience to objectively explain language development across a spectrum of ability.

3-N-250 Reciprocal relations between reading skill and the neural basis of phonological awareness in 7- to 9-year-old children

Jin Wang[1], Julia Pines[1], Marc Joanisse[2], James Booth[1]

[1]Vanderbilt University, [2]The University of Western Ontario

By using a longitudinal design and fMRI, our previous study (Wang et al., 2020) found a scaffolding effect of early phonological processing in STG in 6-year-old children on later behavioral reading skill in 7.5-year-old children. Other than this previous study, nothing is known about longitudinal change in the bidirectional relation between reading skill and phonological processing in the brain. To fill this gap, in the current study, we used the same experimental paradigm as in Wang et al. (2020) to measure children's reading skill and brain activity during an auditory phonological awareness task, but with children who were 7.5 years old at Time 1 (T1) and about 1.5 years later when they were 9 years old at Time 2 (T2). The phonological awareness task included both small grain (i.e., onset) and large grain (i.e., rhyme) conditions. In a univariate analysis, we found that better reading skill at T1 predicted lower brain activation in IFG at T2 for onset processing after controlling for brain activation and non-verbal IQ at T1. This suggests that early reading ability reduces the effort of phonemic access, thus supporting the refinement hypothesis. When using general psychophysiological interaction (gPPI), we found that higher functional connectivity from IFG to STG for rhyme processing at T1 predicted better reading skill at T2 after controlling for reading skill and non-verbal IQ at T1. This suggests that the early effectiveness of accessing rhyme representations scaffolds reading acquisition. Both findings are consistent with prior studies demonstrating that phonological access in the frontal lobe becomes important in older elementary school readers. Moreover, the refinement effect for onsets is consistent with the hypothesis that learning to read allows for better access of

small grain phonology, and the scaffolding effect for rhymes supports the idea that reading progresses to larger grain orthography-to-phonology mapping in older skilled readers.

3-N-251 Home literacy environment mediates the relationship between socioeconomic status and white matter structure in infants

Ted Turesky[1], Joseph Sanfilippo[2], Jennifer Zuk[3], Jolijn Vanderauwera[4], Xi Yu[5], Ally Lee[1], Kathryn Garrisi[1], Jade Dunstan[6], Clarisa Carruthers[6], Nadine Gaab[1]

[1]Harvard University, [2]Queens University, [3]Boston University, [4]Université Catholique de Louvain, [5]Beijing Normal University, [6]Boston Children's Hospital

The home literacy environment (HLE) in infancy has been associated with subsequent pre-literacy skill development, while HLE at pre-school age is associated with white matter tracts known to subserve pre-reading and reading skills. Furthermore, children's socioeconomic status (SES) has been linked with both HLE and white matter organization. However, the association among HLE, SES, and brain anatomy has not been investigated in infants. Here, we hypothesized (1) an association between HLE and white matter organization in pre-reading and reading-related tracts in infants, and (2) that this association mediates a link between SES and white matter organization. To test these hypotheses, two cohorts of infants (mean age: 7.8 months) underwent diffusion tensor imaging MRI. Fractional anisotropy (FA) was estimated from the left superior longitudinal fasciculus (SLF) and left arcuate fasciculus using the automated fiber-tract quantification method. In Cohort 1, HLE was measured with the Reading subscale of the StimQ (n = 18) and in Cohort 2, specific components of HLE were measured using a questionnaire developed in-house (n = 15). SES was measured with years of maternal education. HLE measures were positively related to FA in left SLF in both infant cohorts and the overall Reading subscale of the StimQ mediated the association between maternal education and FA in the left SLF in Cohort 1. Taken together, these findings underscore the importance of considering HLE from the start of life and may inform interventions targeted at low-SES families to support developing infants during a period of heightened brain plasticity.

3-O-252 Separable neurocognitive changes underlie the development of communicative ability in adolescence

Cong Wang[1], Menghan Cong[1], Qingtian Mi[1], Guihua Yu[1], Yanjie Su[1], Lusha Zhu[1]

[1]Peking University

Humans possess a remarkable ability to understand the intended meaning of a communicative signal, even when the meaning is not coded in the signal directly. Recent evidence suggests that the decoding of communicative signals requires inhibiting literal interpretations and inferring the signal sender's most probable intention, possibly through reasoning the sender's goal-directed choices during signal generation. It remains largely unknown, however, when humans acquire this ability, and whether and how basic cognitive functions such as executive control and social reasoning are developed and interacted with one another in support of the maturation of communicative ability. Here, we investigated these questions by leveraging the recent progress in understanding the neurocomputational mechanism of communicative signal interpretation in adults, and examining the neurodevelopmental trajectory during the transition in and out of adolescence using both cross-sectional and longitudinal fMRI data. A total of 316 subjects (ages 8-24, fMRI=141, behavior=175) participated in the experiment, among which 53 subjects were scanned twice, spanning 1.7-year. We assessed their ability to interpret communicative signals using a well-established referential communication game, where subjects needed to recover intended referents from references in contexts. According to cross-sectional data, the age-related improvement observed in reference resolution is related to two dissociable developmental trajectories: (i) social reasoning, subserved by activity in the vmPFC, and (ii) egocentric processing of communicative context, subserved by activity in the sensory cortex. Longitudinal data further show that the behavioral changes in these two cognitive functions are linked to the changes in functional activity in the frontoparietal network. These results suggest separate, yet intertwining neurocognitive changes that underlie the development of communicative ability across adolescence.

3-O-253 Temporal Dynamics of Resting State EEG: Age and Sex Effects in Young Children

Armen Bagdasarov[1], Kenneth Roberts[1], Michael Gaffrey[1]

[1]Duke University

BACKGROUND: Resting state EEG microstates are brief periods of stable scalp potential topographies believed to reflect moment-to-moment changes in cognition and cognitive processing. Four prototypic microstates (A, B, C, and D) explain the majority of variance in resting state EEG topography and transition between each other every ~100ms, believed to reflect changes in the activation of underlying functional neural networks. Previous studies have suggested that the temporal dynamics of microstates are age and sex dependent. However, no data is available to inform these relationships during early childhood, a period of rapid cognitive development. METHOD: Participants were 71 typically developing children (58% Female) aged 4 to 8 years (M = 6.40, SD = 0.99). 140 seconds of artifact-free EEG during eyes-closed resting state was available for each participant. Atomize and agglomerate hierarchical clustering identified microstates A, B, C, and D in each participant and the average duration of each was calculated. RESULTS: Linear regressions revealed that as age increased, the duration of each microstate decreased. Age explained a significant proportion of variance in microstate A duration, $R2=.11$, $F(1,68)=8.24$, $p<.05$; B duration, $R2=.06$, $F(1,68)=4.19$, $p<.05$; C duration, $R2=.06$, $F(1,67)=4.31$, $p<.05$; D duration, $R2=.14$, $F(1,66)=11.09$, $p<.05$. Independent samples t-tests revealed that males had a significantly lower microstate C duration than females, $t(69)=-2.10$, $p<.05$, but a significantly higher microstate D duration than females, $t(69)=2.93$, $p<.05$. CONCLUSION: The temporal dynamics of resting state EEG microstates differ based on age and sex even in young children. This may reflect neurodevelopmental processes associated with age- and sex-specific changes in cognitive development during this time. Future longitudinal research is needed to further elaborate the potential developmental implications of these findings for understanding early cognitive development.

3-O-254 Comparing Detection of Autism Spectrum Disorder within Males and Females Using Machine Learning

Joseph Wolff[1], Jeffrey Eilbott[1]

[1]University of Virginia

Autism Spectrum Disorders (ASD) are a spectrum of social disorders characterized by deficits in social communication, verbal ability, and interaction that can vary in severity. In recent years, researchers have used magnetic resonance imaging (MRI) to help detect how neural patterns in individuals with ASD differ from those of neurotypical (NT) controls for classification purposes. In this study, we analyzed the classification of ASD within males and females using functional MRI data. Functional connectivity (FC) correlations among brain regions were used as feature inputs for machine learning algorithms. Analysis was performed on 558 cases from the Autism Brain Imaging Data Exchange (ABIDE) I dataset. When trained specifically on females, our algorithm underperformed in classifying the ASD subset of our testing population. Although the subject size was relatively smaller in the female group, the manual matching of both male and female training groups helps explain the algorithm's bias, indicating the altered sex abnormalities in functional brain networks compared to typically developing peers. These results highlight the importance of taking sex into account when considering how generalizations of findings on males with ASD apply to females.

3-P-255 Studying training-induced neuroplasticity after cognitive and physical training in pediatric cancer survivors: a prospective monocenter trial from Bern/Switzerland

Kirstin Schuerch[1], Valentin Benzing[1], Valerie Siegwart[1], Nedelina Slavova[2], Andrea Federspiel[2], Claus Kiefer[2], Maja Steinlin[1], Jochen Roessler[1], Regula Everts[1]

[1]University of Bern, [2]Support Center for Advanced Neuroimaging (SCAN)

Pediatric cancer survivors (PCS) frequently experience cognitive sequelae, often in the domain of executive functions (EF). Consequently, improving EF is crucial in PCS. The literature in children suggests cognitive and physical training may lead to structural and functional changes in the brain and improve EF. The aim of this study is to examine training-induced neuroplasticity in PCS in relation to EF after cognitive (working memory) or physical (Exergaming) training when compared to a control group over three time points (prior to, immediately after 8-weeks of training and at a three-months follow up). Children after non-central nervous system cancer (¡Ý one year since cancer treatment) are included. We expect altered cerebral blood flow (CBF, measured by Arterial Spin Labeling), after both training conditions, and expect no changes in the control group. Besides determining global CBF, region of interest analyses will be conducted using cortical regions of the working memory network and the cerebral vascular territories. Further, we expect altered structural connectivity (SC, measured by Diffusion Tensor Imaging), after both training conditions, and expect no changes in the control group. SC will be estimated using the q-space diffeomorphic reconstruction algorithm. Changes in CBF and SC across the three time points and across the three groups will be compared. Additionally, the relationship between changes of the CBF, the SC, and changes in EF will be analyzed. The findings of this study will extend our knowledge on training-induced neuroplasticity in relation to cognition in PCS. Learning more about the underlying mechanisms of the effects of cognitive and physical training on structural and functional markers in the brain is essential to advance the quality of aftercare.