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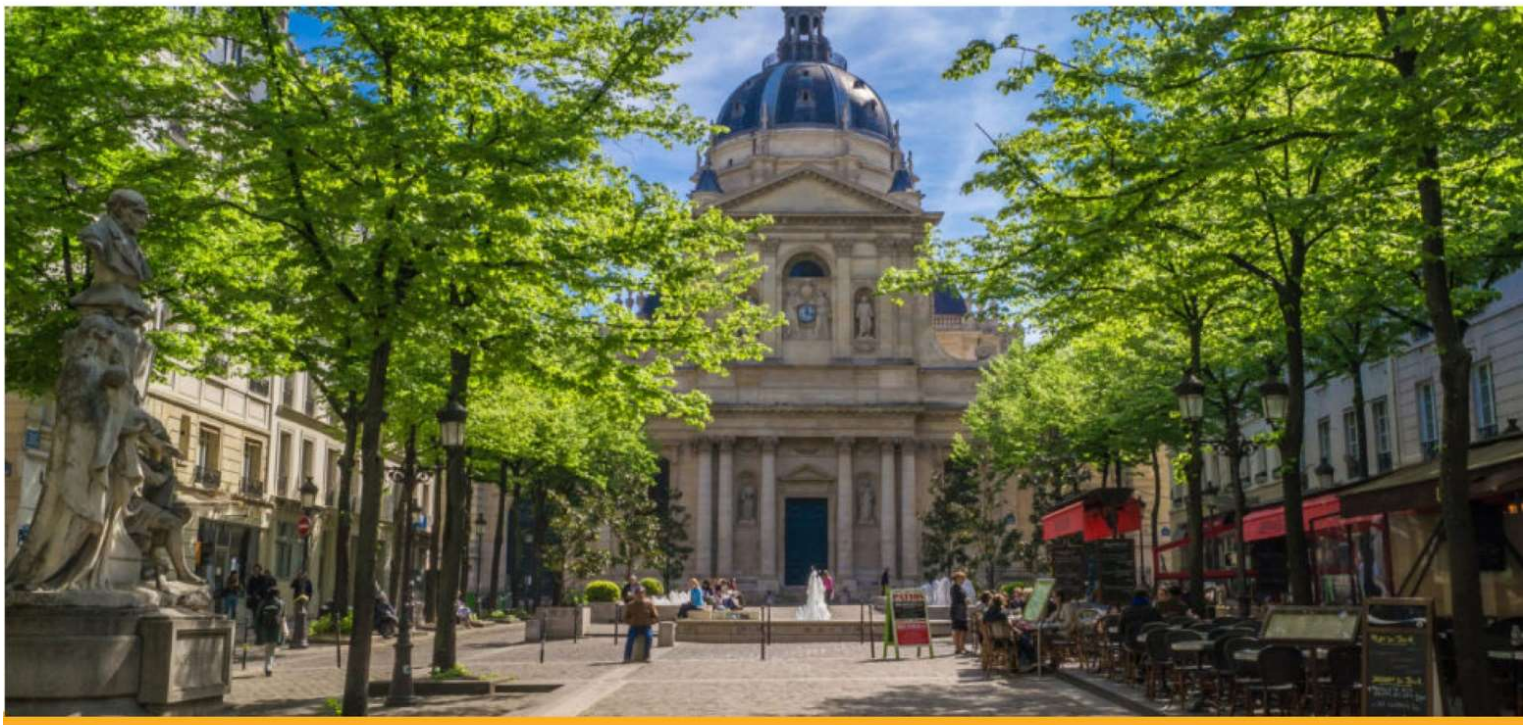

Abstract Book

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1-A-10 Probing striatal tissue iron as a sensitive index of brain maturation and function in infancy.

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During the prenatal period there is unique and significant brain maturation, setting up a template that will later be refined by experience, influencing trajectories. Striatal regions, involved in cognitive and motor function, are vulnerable to prenatal stressors and remain a critical but understudied portion of early development. A window into pediatric striatal development is through striatal physiology, measuring tissue iron that accrues primarily in the basal ganglia. Iron plays an important role in development, including in myelination, energy metabolism, and as a critical step for dopamine synthesis, where PET [11C]dihydrotetrabenazine, a marker of presynaptic dopamine, is related to striatal brain iron in adolescence. Limited work has characterized striatal brain iron in infancy, only finding age-related change after 3 months. However, previous work had small samples and failed to separate gestational and postnatal age. Here, we leverage T2* from MRI resting state scans, which provide a measure of brain tissue iron, in data from the Developing Human Connectome Project (N=516, Modal PMA 40 weeks). Results showed that when including gestational and postnatal age as independent terms in linear models, strong postnatal increases were found for the ventral striatum, putamen, and pallidum but not the caudate. Interestingly, gestational age was only related to deposition in the ventral striatum. To identify changes that aren't specific to regional definitions from atlases and find patterns that are robust to shifts in regional organization, we use a voxel-wise approach, where support-vector regression predicts which voxels are changing with age. For the first time in neonates, we demonstrate significant gestational and postnatal change in striatal iron. A multivariate approach provides specificity, better mapping future trajectories critical for understanding normative development.

1-A-11 Do neuroplasticity and genetic factors contribute to cognitive training? An imaging-genetics study in healthy children.

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Executive functions, including inhibitory control (IC), updating, and switching, are important for academic achievement, physical and mental health. Several cognitive training programs have tested the possibility of improving EFs. Different factors, at different levels, contribute to cognitive training, including the basal cognitive level, the brain activity and anatomy, and genetic factors. In this context, the aim of this study was to decipher the genetic, cerebral, and cognitive factors contributing to IC training gain in 75 healthy children (9-10 years old) before and after a 5-weeks computerized IC or active control training. To investigate the multilevel associations between genetic factor (polygenic risk score; PRS), brain volumes (grey matter volume for 8 regions of interest of the IC network) and IC (Stroop interference or Stop Signal Reaction Time: SSRT) and their change following training, a structural equation model (SEM) was constructed and estimated with these different IC and ROI measures, stratified by age and training groups. The best multilevel model, according to training-related change significance and specificity along with model fit, corresponded to SSRT as IC measure and left anterior

cingulate cortex (ACC) as ROI measure. In the IC training group, IC change was found to be explained by the PRS, the baseline levels of left ACC volume and SSRT efficiency as well as volume change in left ACC. In contrast, in the control group, change in IC was only explained by the baseline level of SSRT efficiency. This imaging genetics study provides the first evidence that cognitive changes following an IC training in children are affected by a combination of factors at different levels: cognition (SSRT baseline level), brain macrostructure (ACC baseline volume and plasticity), and genetics (PRS). In addition, this study highlights the interest of SEM modeling to investigate multilevel gene-brain-cognition associations.

1-A-20 Lateralization of inhibition network from children to adolescent: cognitive training in children as a developmental speed-up?

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Neural asymmetries play a crucial role in the physiology of neural circuits, cognition and behavior. In particular, during development, hemispheric dominance occurs in different sensory motor and cognitive functions. Inhibitory control (IC) is the ability to resist automatisms or distractions and to adapt to conflicting situations. IC plays an essential role in the development of complex cognitive abilities such as arithmetic and develops from childhood until early adulthood in close relation with the protracted anatomo-functional maturation of IC brain regions. In addition to hemisphere-specific neural changes, the left-right asymmetry (laterality pattern) of regional brain activity and structure changes with cognitive development and age, but also with cognitive training. In this study, we analyzed the developmental lateralization (DL) of main brain regions of the IC network (i.e., the inferior frontal cortex (IFG), anterior part of the insula (ant-insula), the anterior cingulate cortex (ACC), the caudate nucleus and the putamen) from childhood (60 children from 9 to 10 years old) to adolescence (51 adolescents from 16 to 17 years old). We also investigated in children the lateralization changes following a 5-weeks computerized IC training in the regions that showed a significant DL in order to determine whether training accelerated the development of cerebral lateralization. We computed lateralization indices for each region of interest from VBM maps (structural MRI) and Reho maps (resting state fMRI). We found a DL towards the right within the ACC brain region and towards the left within the ant-insula, the putamen and the caudate nucleus brain regions. After IC training, we found in children a left lateralization in the putamen in VBM, reflecting a developmental speed-up. So, we showed that brain laterality of regions involved in IC changes throughout the development and an IC training of medium duration in children might speed up the typical development.

1-A-21 Child Inhibitory Control in Toddlerhood: Associations with Child Interaction Quality and Preliminary Neural Structural Correlates

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Objective: Inhibitory control (IC) is a predictor of academic achievement and social-emotional development. IC develops rapidly in early childhood and is considered moderately stable from

preschool-age onwards. Even though the significance of IC for later development has been widely reported, its role in early childhood interaction skills and its neural correlates in toddlerhood have not yet been studied. We explored the associations between child IC at 24 and 30 months and child interaction quality (responsiveness and involvement) with the mother at 30 months. We conducted a preliminary exploration of structural neural correlates of IC and child interaction quality in a subsample of children. Methods: We measured IC using the Snack Delay task and child interaction quality with the mother using the Emotional Availability Scales (EAS) at 30 months in a sample of N=350 toddlers from the FinnBrain Birth Cohort Study. In a subsample, IC was measured also at 24 months (N=27) and structural MRI scans were acquired at 18-24 months (N=9). VBM analysis at the threshold of $p < .05$ and FDR-corrected at alpha <.05 was performed to detect grey matter clusters associated with IC. Results: Better IC was positively related to better child interaction quality both cross-sectionally at 30 months (B=.12, p=.010) and longitudinally between 24 and 30 months (B=.14, p=.044). For IC at 24 months, the analysis revealed a cluster with less grey matter in the right calcarine sulcus (p<.001) and for IC at 30 months, clusters with more grey matter in the left cerebellum (p=.007), right middle frontal gyrus (p=.018) and right superior occipital gyrus (p=.037) were identified. Implications: These results suggest that better IC in toddlerhood is associated with better child interaction quality with the parent. They also give preliminary support for associations between IC and more grey matter in areas involved in frontoparietal network and visual processing. Replication studies are needed

1-A-22 Testing the dual-systems model of adolescent development through behavioral measures and white matter microstructure

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The dual-systems model posits distinct developmental trajectories in reward (quadratic) and executive (linear or inverse) systems through adolescence into adulthood, resulting in elevated reward sensitivity relative to executive control. However, few studies have assessed correlations between relevant psychological functioning and structural neural substrates in the same sample. Here, we tested this model using a combination of behavioral measures and indices of frontostriatal white matter (WM) microstructure. A sample of participants (n=97, ages 11.3-24.9 years) completed measures of reward sensitivity (Behavioral Activation System; BAS), executive functioning (EF; a composite index of Digit Span, CANTAB SWM, Tower of London, and spatial delayed response performance), and diffusion-weighted imaging as part of a longitudinal study. Atlas-based region-of-interest analyses were performed on fractional anisotropy (FA) and radial diffusivity (RA) in medial orbitofrontal (mOFC) and dorsolateral prefrontal (dlPFC) cortices and mean diffusivity (MD) in the nucleus accumbens (NAc) and dorsal caudate (dCa). Linear, quadratic, and inverse models for age effects were tested for each measure. In the reward system, mOFC RA showed a linear age effect while NAc MD showed a quadratic effect. In the control system, dlPFC FA and RA, and dCa MD showed linear age effects. Among BAS subscales, Reward Responsivity showed a significant quadratic age effect while the EF composite showed an inverse effect. Regression analyses demonstrated that the EF composite was predicted by age, dlPFC FA, BAS drive, and NAc MD. These findings provide cross-sectional support for the dual-systems model by demonstrating quadratic maturational effects within the reward system in contrast to

linear and inverse effects in the control system. Sex differences will be discussed. Longitudinal analyses are underway using tractography to refine and extend the assessment of structural connectivity within each system.

1-A-24 The behavioral relevance of functional network connectivity during working memory in children

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Working memory (WM) is an important predictor of educational and mental health outcomes. Recent work in adults has found that functional connectivity (FC) during working memory (wmFC) is a better predictor of WM ability, IQ, and reading skills than resting-state FC (rsFC; Greene et al., 2018; Jiang et al., 2020). Given that functional brain networks mature through adolescence, it is not yet known if rsFC and wmFC exhibit similar relationships to behavioral measures of WM in childhood as in adulthood. This study leveraged the ABCD Study dataset to assess whether FC during the Emotional N-back (EN-back) task probing WM elicited stronger relationships with WM performance than rsFC in children. We constructed separate FC matrices from rest and the 2-back blocks of the EN-back task in discovery (n=498) and replication (n=513) samples. For each subject and each state, we calculated a measure of network integration (node dissociation index; NDI) for brain networks implicated in cognitive control, attention, and task performance. First, we characterized differences in NDI between rest and the EN-back task. Then, we tested whether EN-back NDI would exhibit stronger relationships with 2-back accuracy than rest NDI. We found that all brain networks were more integrated during the EN-back task than rest. Additionally, EN-back NDI of the cingulo-opercular and dorsal attention networks related to 2-back accuracy significantly more so than rest. Notably, higher 2-back accuracy was related to higher EN-back integration (NDI) of the cingulo-opercular network, but lower dorsal attention network integration. These results align with adult work and show increased relationships with behavior during wmFC compared to rsFC in children. This work is a first step toward understanding how brain network organization during cognitive tasks relates to behavior during development, information which is critical to understanding brain function underlying educational and mental health outcomes.

1-A-25 Network Fidelity Improves with Brain Network Maturation and Executive Function

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Executive function coordinates attention, memory, and inhibitory control for goal-directed actions. Its evolution with neurodevelopment suggests a growing capacity to coordinate goal-relevant details. To investigate how changing brain networks in adolescent development support a shift from processing inputs that represent a compressed gist to inputs that retain high-fidelity details, we analyzed behavioral and MRI data acquired from 1,042 youths aged 8-23 years who underwent diffusion weighted imaging (DWI). Using structural connectivity derived from DWI, we applied a network metric adapting information theory to structural connectivity. Based on the premise that heteromodal brain regions release a set of messages flowing in parallel across the structural network and the intuition that longer

pathways distort a message's content, we surmised that fidelity of information transfer depends on networks that allow information flow to access shortest paths and operationalized fidelity as the probability that one of those sent messages takes the shortest path. The chance to access the shortest path can also be increased by sending more messages and, when fewer messages achieve the same fidelity, we operationalized this as compression. We modeled linear and non-linear effects of network compression, including covariates for age, sex, network degree, and motion. We tested if our network metric relates to executive function using a factor score summarizing performance speed and accuracy in 4 tasks. We found that with increasing age, structural networks prioritize compression initially and fidelity later ($F = 27.54$, $p < 0.001$). Individuals that prioritize fidelity performed better on executive function tasks ($t = 3.60$, $p < 0.001$), beyond standard network metrics of the strengths of pathways between regions ($t = 2.99$, $p < 0.01$). Our results support a model of network communication and compression where individually differing levels of fidelity related to executive function.

1-A-26 Variation in Striatal Dopamine-Related Neurophysiology Supports Age-Related Changes in Glutamate through Human Adolescence

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Recent research from our lab has identified changes in prefrontal cortex (PFC) glutamate (Glu), gamma-aminobutyric acid (GABA), and GABA/Glu balance in adolescence (Perica et al.,Flux 2021/22), potentially reflecting critical period plasticity that supports developmental specialization of PFC-dependent cognitive function. The mechanisms mediating the engagement of this process remain unknown. Emerging evidence implicates dopamine (DA) in regulating changes in E/I through adolescence (Reynolds & Flores, 2021); here, we assess the role of DA in supporting changes in PFC Glu and GABA from adolescence to adulthood. Indices of Glu and GABA were obtained in 143 10-30 year olds (73F) using 7T Magnetic Resonance Spectroscopic imaging (MRSI). An oblique MRSI slice of 24x24 voxels (1.0x0.9x0.9mm) using a J-refocused spectroscopic imaging sequence (TE/TR=35/1500ms) facilitated data collection across multiple cortical regions. MR-based indices of striatal tissue-iron (time-averaged and normalized T2*; nT2*) provided an indirect measure of DA-related striatal neurophysiology. Increased striatal nT2* was associated with higher Glu in anterior cingulate cortex ($\beta=-.17$, $p=.04$), medial PFC ($\beta=-.21$, $p=.02$), and anterior insula (Ins; $\beta=-.23$, $p=.005$). In dorsolateral PFC (DLPFC) and Ins, we observed nT2* by age interactions on Glu (DLPFC: $\beta=-.29$, $p=.007$, Ins: $\beta=-.22$, $p=.02$), and follow-up tests revealed that age-related decreases in Glu were driven by individuals with high levels of nT2* (DLPFC: $\beta=.36$, $p=.004$, Ins: $\beta=.32$, $p=.005$) relative to low (DLPFC: $\beta=-.13$, $p=.33$, Ins: $\beta=.22$, $p=.07$). This study provides in vivo evidence linking DA processes to age-related changes in PFC GABA/Glu. Models applied at future timepoints will identify longitudinal associations between DA and shifts in GABA/Glu. Understanding developmental mechanisms underlying regulation of E/I transmission can inform the emergence of psychopathologies, such as schizophrenia, that involve changes in DA, Glu, and GABA.

1-A-27 Executive functioning and emotion regulation among young children with Attention-Deficit/Hyperactivity Disorder (ADHD): The role of cardiac autonomic balance

Melissa Hernandez[1], Madeline Curzon[1], Jamie Spiegel[1], Carlos Sanchez[2], Anthony Dick[1], Paulo Graziano[1]
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Children with Attention-Deficit/Hyperactivity Disorder (ADHD) have deficits across self-regulation (SR) skills, including executive function (EF) and emotion regulation (ER). Within the autonomic nervous system (ANS), there is support for altered parasympathetic (PNS) and sympathetic (SNS) functioning among children with ADHD. However, few studies integrated both parasympathetic regulation (RSA withdrawal) and sympathetic reactivity (cardiac pre-ejection period [PEP]) indices when examining children?s SR. Following Berntson et al., 2008's recommendations, we focused on cardiac autonomic balance (CAB), with higher values reflecting greater parasympathetic relative to sympathetic activation, and cardiac autonomic regulation (CAR), with higher values reflecting greater co-activation of PNS and SNS activity. Within a sample of 245 preschoolers (Mage = 5.44, SD = .80; 82% Hispanic; 49.7% with ADHD), we examined the autonomic reactivity in PNS and SNS during ER and EF tasks. RSA and PEP were collected via electrocardiogram (ECG) and impedance cardiograph (ICG) while children wore an ambulatory MindWare Mobile during a 5 min rest period and during the ER/EF tasks. As expected, children with ADHD had significantly poorer ER and EF compared to typically developing (TD) children across the performance measures and rating scales (Cohen's d: .24 to 2.47). In terms of the physiological measures, children with ADHD had comparable baseline levels of RSA, PEP, CAB, and CAR relative to TD. On the other hand, on 4 out of the 4 ER/EF observed/performance tasks, children with ADHD had significantly lower CAB scores relative to TD (Cohen's d = -.26 to -.41). No significant differences emerged on CAR scores. The current study clarifies the underlying physiological dysregulation among children with ADHD by showing that young children with ADHD's autonomic dysregulation, relative to TD, appears to be primarily a function of an overactive SNS and hypoactive PNS (i.e., lower CAB scores).

1-A-28 The predictive role of neural markers of impulse control on nonsuicidal self-injury in youth

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Nonsuicidal self-injury (NSSI) is the deliberate destruction of one's own body tissue (e.g., cutting, biting) without conscious suicidal intent. NSSI has theoretically been tied to emotion dysregulation. Although impulse control has been linked to both NSSI and emotion dysregulation, only a few studies have explicitly examined the role of impulse control on NSSI in youth. Previous work has found that youth with NSSI vs. controls have higher self-reports of impulsive behavior, poorer inhibitory control, and greater impulsive decision-making. It is currently unknown whether neural markers of impulse control predict NSSI in youth. Data were used from the Adolescent Brain Cognitive Development (ABCD) Study, a multisite longitudinal study. Independent variables included baseline (age 9-10 years) Stop Signal Task ROI activity from the lateral prefrontal cortex (LPFC), anterior cingulate cortex (ACC), and striatum during the correct stop vs. incorrect stop contrast. This contrast was of interest as it captured the neural difference between successful impulse control vs. unsuccessful impulse control. The dependent variable was parent-report of youth's current "self-injurious behavior without suicidal intent" from the Schedule for Affective Disorders and Schizophrenia (K-SADS) at year 2 (age 12-13 years). Logistic regressions were used to test whether impulse control predicted NSSI. Analyses were bootstrapped 1000 times at a 95%

confidence interval. Diminished LPFC significantly predicted NSSI, B=-1.40, 95% CI [-2.39, -.33], p=.01, χ2(1, N=5081)=6.32. Diminished ACC significantly predicted NSSI, B=-1.01, 95% CI [-1.94, -.02], p=.04, χ2(1, N=5064)=4.15. Striatum did not predict NSSI. Neural markers of impulse control may be linked to NSSI. Diminished neural activity of this contrast indicates greater activation during incorrect stops vs. correct stops. These results add to our understanding of mechanisms which contribute to risk of NSSI in youth.

1-A-29 Using profiles of emotion regulation and executive functioning to predict growth in academics across time in children with and without ADHD

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Emotion regulation (ER) and executive function (EF) demonstrate substantial associations with academics (Spiegel et al., 2021). Diagnoses of ADHD and learning disorders (LD) are associated with poorer ER/EF (Swanson et al.,2009; Pennington & Ozonoff,1996). Although the exact mechanism by which ER/EF affect academics is unknown, evidence suggests a neurological explanation. Data were collected for 197 children (71% male; 82% Hispanic; 52% ADHD; intake Mage=5.48, SD=.81) across 3 time points (intake, 6mo and 1 yr follow-ups). Diagnostic status (ADHD, ADHD+LD, control), ER, and EF were assessed at intake. A multimodal approach (parent & teacher report, performance, observation, and fMRI) to the examination of ER/EF was utilized. fMRI data utilized neurite density index (NDI; neurite volume fraction) and orientation dispersion index (ODI; variability of neurite orientation) parameters. At each timepoint, children were administered the WJ Achievement. Aim 1: Establish profiles of ER/EF amongst children with and without ADHD. Two latent profile analyses (with and without fMRI data) will be conducted. We hypothesize that there will be sufficient variability in ER/EF to allow for several distinct profiles, with at least: one profile primarily good, one primarily poor, and one with variable EF/ER. Aim 2: Determine whether profiles are predictive of diagnostic status and changes in academics across development. Resultant profiles (Aim 1), without fMRI data included, will be used as predictors in a logistic regression predicting diagnostic status and in a series of growth curve models predicting change in reading and math. Aim 3: Determine whether the inclusion of fMRI data within latent profiles provides added predictive value beyond that of traditional measures of ER/EF. Aim 2 analyses will be repeated utilizing profiles including fMRI data. Model fit and results of these analyses will be compared to Aim 2. We hypothesize incremental benefits from inclusion of fMRI data.

1-A-30 No evidence for risk for Parkinson's Disease in young children with attention deficit hyperactivity disorder (ADHD): An examination using Neurite Orientation Dispersion and Density Imaging (NODDI)

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Attention-Deficit/Hyperactivity Disorder (ADHD) is the most common reason for early childhood mental health referral affecting between 10 to 25% of preschoolers. Neurobiologically, ADHD is proposed to be associated with dysfunction of dopaminergic (DA) circuits in the cortex and basal ganglia. The substantia nigra (SN) is a prominent component of this circuit, and neuronal cell death in SN causes of Parkinson's disease. In animals, stimulant medication, a common treatment for ADHD, is neurotoxic to SN DA neurons. This raises concern that stimulants might put people with ADHD at higher risk of later Parkinson's Disease. However, it is possible that early DA circuit dysfunction involving the SN is already a Parkinson's risk factor. This would be indicated if there are neuronal differences in SN between medication naïve ADHD and typically developing (TD) children before they are exposed to stimulants. To establish whether there are existing differences, we employed a novel MRI method sensitive to in vivo neurite density. Method: The final participating sample consisted of 111 4-7-year-old medication naïve children diagnosed with ADHD (dual clinician diagnosed) and 117 typical controls (M age = 5.66, SD = 0.87, and 69% male; 48.5% TD). All children were scanned in an MRI (3T Siemens Prisma) with a 102-direction multi-shell diffusion-weighted imaging acquisition. Neurite orientation dispersion and density imaging (NODDI) reconstruction was applied. The SN was manually identified, and neurite density imaging (NDI) SN differences were examined across groups. Results: No group differences in NDI, indexing neurite density, were revealed across the groups (M: ADHD Left SN = .402; Right SN = .401; TD Left SN = .407; Right SN = .404; p = .13 and .37 for left and right SN, respectively). Conclusions: There is no detectable difference in SN neurite density across ADHD and TD children. This is incompatible with the idea that ADHD is itself a risk factor for Parkinson's disease.

1-A-31 Relations between executive functioning and internalizing symptoms vary as a function of frontoparietal-amygdala resting state connectivity

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Frontoparietal-amygdala connectivity is implicated in emotion regulation and risk for internalizing problems. Executive functions (EF), another marker of top-down regulation generally regarded as adaptive, are also associated with risk for anxiety, although inconsistent in directionality. High attention shifting (AS), one behavior under the EF umbrella, is associated with lower levels of anxiety. However, high inhibitory control (IC), another EF behavior, may be a risk factor for anxiety, in that high IC may facilitate behavioral rigidity. Multilevel modeling was used to test the interaction between resting state frontoparietal-amygdala activity and each EF behavior on count of internalizing behaviors over time as reported with the Child Behavior Checklist, within the ABCD data set from baseline, wave 1, and wave 2. Age corrected scores for the Flanker task (IC) and the Dimensional Change Card Sort Task (AS) from the NIH toolbox were Z-scored for analyses. Sex at birth and puberty were entered as covariates. Repeated measures were nested by participant, family, and scanner. For IC, we found a significant interaction between frontoparietal-left amygdala connectivity and inhibitory control on count of internalizing symptoms, b = -0.74, p = .046. Johnson-Neyman analysis showed that children with moderately positive connectivity, $0.02 < x < 0.60$, had a negative relation between IC and internalizing symptoms. In the AS model, there was a significant main effect of AS, b = -0.14, p = .03 where increasing AS is persistently associated with fewer internalizing symptoms. Thus, IC may be a protective factor for internalizing

problems, but only for children with moderate regulation as indexed by frontoparietal-amygdala connectivity. The buffering effect of IC is not found at the extremes. Meanwhile, high AS may be a broad protective mechanism against internalizing problems. Understanding differential relations may help inform whom may benefit from specific interventions.

1-A-32 Inhibitory control and the neural correlates of science and maths counterintuitive reasoning in primary school children

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Recent evidence suggests that inhibitory control plays a role in counterintuitive reasoning by suppressing misconceptions. Neuroimaging studies have shown that adult physics experts demonstrate greater activation in the prefrontal cortex and anterior cingulate cortex compared to novices, when correctly judging physics misconceptions. This pattern of activation has been interpreted as reflecting inhibitory control recruitment. However, the degree to which inhibitory control supports science and maths reasoning during development remains under-investigated, and previous studies have focused on single misconceptions (e.g. fractions, electrical circuits), rather than the broad range of misconceptions associated with the science and maths school curriculum. The present study aimed to assess the neural correlates of science and maths counterintuitive reasoning in primary school children and whether the suppression of intuitive concepts involved the activation of inhibitory control circuits. Fifty-six participants in Year 3 (7-8 year-olds) and Year 5 (9-10 year-olds) were recruited as part of the UnLocke project (www.unlocke.org) and completed counterintuitive science and maths problems and an interference control task (Animal Stroop), while undergoing functional magnetic resonance imaging scanning. Data were analysed in 38 children. Large fronto-parietal activation was observed when children resolved counterintuitive science and maths problems, with very similar activation in Year 3 and Year 5 children. Overlapping activation was observed between counterintuitive and interference control tasks in frontal and parietal clusters. Correlational and multivariate analyses further explored the extent to which this overlap may reflect inhibitory control specific processes and neural populations vs. broader cognitive control systems. A better understanding of the role of inhibitory control in science and maths reasoning may guide the development of classroom interventions.

1-A-33 How do new fathers regulate in the presence of aversive infant stimuli?

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Objective: New parents undergo significant neurobiological changes while adjusting to infant care. Self-regulation abilities may facilitate caregiving by helping parents respond effectively to infant cues (i.e., infant cries). Difficulty with inhibitory control, a form of self-regulation, is associated with poor caregiving in mothers, and in turn, predicts negative child developmental outcomes. Fathers also engage in infant caregiving that predicts child outcomes; however, it is unclear how fathers regulate in the presence of a distressed infant. Therefore, we propose to examine new fathers' neural correlates of

emotional interference (EI), a form of inhibitory control, while listening to aversive infant stimuli. EI is defined as the suppression of irrelevant or emotionally distracting stimuli and has been found to activate the left anterior insula and the ventral inhibitory system. Methods: Data was collected from 38 new fathers who completed the well-validated Go/No-Go fMRI task during the early postpartum period. We adapted the task to contrast two auditory conditions: infant cry and white noise. Hypothesis: We anticipate new fathers to exert greater activation in brain regions involved in EI (ventral inhibitory system and left-anterior insula) while completing the infant cry condition as compared to the white noise condition. Analysis: The current study proposed to conduct a general linear model analysis in FSL. We will contrast correct No-Go and Go trials (e.g., No-Go > Go) for each auditory condition, and contrast Infant Cry to a White Noise baseline control condition (e.g., Infant Cry > White Noise). Implications: This work may provide an extension to the current cognitive neuroscience and parenting literature.

1-A-34 Infant Excitation/Inhibition Balance Interacts with Executive Attention to Predict Autistic Traits in Childhood

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Autism has been explained as an atypical balance of cortical excitation and inhibition (E/I). However, to detect mechanistic causal pathways we must show that alterations in E/I balance precede symptom emergence, and consider how early risk features such as alterations in E/I balance interact with later developing resilience factors (such as executive functioning) to predict autism outcomes. To validate an non-invasive infant electroencephaolography (EEG) index of E/I balance, we show that 10-month-old infants with Neurofibromatosis type 1 (NF1) are characterised by alterations in the slope of the log of the power spectral density ('1/f'). This is indicative of enhanced inhibition, consistent with evidence of preferential expression of the NF1 gene in inhibitory neurons and increased cortical inhibition in NF1 populations. Next, using our validated EEG metric, we tested for E/I alterations in a larger heterogeneous cohort of infants with and without a family history of neurodevelopmental conditions. Longitudinal analyses showed that alterations in infant E/I balance predicted autistic traits in childhood, but only in infants who also had weaker executive functioning ability. Finding suggest alterations in E/I balance are on the developmental pathway to autism outcomes, and that higher executive functioning abilities may buffer the impact of early cortical atypicalities, consistent with proposals that stronger executive functioning abilities confer resilience to a wide range of risk factors.

1-A-35 Oscillatory brain activity predicts the development of inhibitory control from infancy to toddlerhood

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Changing responses in accordance with variations in the context is key to self-regulate behaviour. Adjusting to infrequent contingencies requires inhibition of the most frequent, dominant responses. In

the last trimester of the first year of life, infants start to show basic inhibition and switching skills. The ECITT task has been recently designed to measure inhibitory control (IC) in infancy, which requires touching a button that appears on one side of a tablet device in 75% of trials (prepotent location) and only 25% on the opposite side (inhibitory location). Infants of 10 months of life are able to flexibly change responses, but there is a substantial development of this capacity during the second year of life. On the other hand, patterns of intrinsic brain electrophysiological (EEG) signals change considerably during infancy and toddlerhood and the relative power of different frequencies has been associated with observed individual differences in attention. Data from resting-state EEG indicate that power of theta (3-5Hz) and gamma (20-45Hz) frequency bands decrease with age while it increases in the alpha (6-9Hz) frequency band. In this study, we aimed at studying the possible association between patterns of oscillatory activity at rest and the early development of IC. For that purpose, we used the ECITT with a cohort (N=100) of 9 month-old infants who were longitudinally followed at 17 months of age. We found that the accuracy in the ECITT task increased between sessions due to an improvement in the performance of inhibitory trials. Although the EEG was concurrently uncorrelated, higher power in alpha predicted a smaller switching cost at 17 months of age, while the association was negative with the relative power of gamma frequency. Our study showed a maturation of IC in infants and shows a predictive association between the intrinsic brain oscillations and IC.

1-A-36 Validating A Virtual Reality Inhibitory Control Paradigm For Capturing Naturalistic Neurocognitive Developmental Differences In Children And Adults Using fNIRS

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Background: Goal-directed behaviour is dependent on inhibitory control and disregarding irrelevant stimuli is essential for action planning in everyday life. Despite the complexities of information in real life, inhibitory control paradigms are usually assessed in laboratories using computerised tasks and lack ecological validity. Therefore, it remains unclear if performance on these tasks replicates in naturalistic settings or how it relates to neural functioning. To address these limitations, the current study will use a naturalistic Go/No-Go paradigm implemented in a Cave Automatic Virtual Environment (CAVE) and wearable functional near-infrared spectroscopy (fNIRS) in adults and toddlers. Objectives: The first objective is to compare performance and brain activity on a computerised Go/No-Go task with those on a naturalistic Go/No-Go task in a CAVE in adults, where executive functions are developed and well-characterised. Once the naturalistic Go/No-Go task is validated, the second objective is to use the tasks in toddlers and establish if they are suitable for capturing developmental differences in inhibitory control. Methods: Participants will be 20 adults (18-60 years) and 20 toddlers (3-5 years). Two block-designed tasks will be evaluated: (1) a computerised Go/No-Go task; (2) an adapted CAVE Go/No-Go task. A wearable fNIRS system will be used as participants complete the two tasks. Data analysis: Firstly, a GLM-based analysis will be used to localise the functional brain activity related to inhibitory control in Go and No-Go blocks in the two tasks. Secondly, the cortical activation patterns from the conventional and naturalistic Go/No-Go will be compared. Implications: This work will contribute to understanding how cognitive and neural correlates are implicated in inhibition in naturalistic settings across

development. It will consider feasibility and acceptability, including VR induced symptoms and effects, and make recommendations for future studies.

1-A-37 Training-induced plasticity of frontoparietal activation and connectivity during task switching in children

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With age, children become better at flexibly switching between tasks and adapting their behavior to changing environments. Children's difficulties with task switching diminish with training, but the neural correlates of these improvements are largely unknown. We examined whether task-switching training in children led to more efficient rule processing in frontoparietal regions and to changes in connectivity between these regions, as previously shown in adults, or if children adapted to increased task-switching demands during training via different neural mechanisms. Children aged 8 to 11 years underwent nine weeks of intensive single-task (SI, N=40/30 with/without MRI) or task-switching (SW, N=40/26) practice on tablets at home, or were part of a passive control group (MC, N=39, all with MRI). They performed task switching in the MRI scanner or MRI simulator on four timepoints before, after 3 weeks, 6 weeks and at the end of training. Children in the SW group showed greater increases in drift rates during task-switching compared to the SI and MC groups, suggesting faster evidence accumulation for the correct response with intensive task-switching practice. With training, frontoparietal activation in the SI and SW groups became increasingly dissimilar to the activation pattern in a group of adults who performed the same task, suggesting that children showed less activation with greater control demands or recruited additional regions not activated by adults. Ongoing analyses of training-induced changes in task-related connectivity aim to explore if children strengthened connections within the frontoparietal network engaged by the task vs. to additional control regions, and how these changes were related to changes in activation and behavior. These preliminary results suggest that the neural mechanisms of task switching in children do not simply become more adult-like with training but rather that improved performance is supported by different neural mechanisms.

1-A-38 Neurobiological differences in executive function in preschool-aged typically-developing children and children with ADHD assessed by a continuous performance task

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Attention-Deficit/Hyperactivity Disorder (ADHD) and associated symptoms are a common reason for early childhood mental health referral, affecting between 10 to 25% of preschoolers. One persistent feature of ADHD is poor executive function. However, little is known about how neural circuits supporting executive function in this age range differ between typically developing (TD) children and children with ADHD. To examine this, we compared TD and ADHD children during task-based functional MRI as they completed a modification of the Kiddie Continuous Performance Task (KCPT). In the KCPT, children press a button when a picture is shown, but withhold responding if the picture is a soccerball.

Withholding the response requires executive function. Method: The final participating sample consisted of 58 4-7-year-old children diagnosed with ADHD (dual clinician diagnosed) and 88 typical controls (M age = 5.66, SD = 0.87, and 69% male). All children were scanned in an MRI (3T Siemens Prisma; whole-brain EPI T2* BOLD scan, TR/TE = 1000/30 ms; FOV = 216 x 216; FA = 52; 2.4 x 2.4 x 2.4 mm; 60 slices no gap). Standard image post-processing corrected for movement (FD = .9 mm) and a voxelwise GLM analysis was applied. Whole brain analysis of Group (ADHD vs TD) showed significant differences in regions of the executive function network, including the right inferior frontal gyrus, right caudate, and right pre-supplementary motor area/supplementary motor area (pre-SMA/SMA; $p < .005$, corrected). TD children activated these regions more than ADHD children. The results show that a) a validated measure of executive function can be applied with preschool children in the MRI environment; b) the task is sensitive to group differences between TD and ADHD-diagnosed children in canonical executive function regions that are also identified in adults.

1-A-39 Neural processes supporting the development of inhibitory control in early childhood: A fMRI study

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Neural processes supporting the development of inhibitory control in early childhood remain poorly understood. Preliminary studies suggest that early childhood is associated with greater recruitment of the dorsal anterior cingulate cortex (dACC) during cognitive control (Sheridan et al., 2015). This may be due to constraints on cognitive strategies used in early development and an increased reliance on context monitoring (Chatham et al., 2012; Chevalier et al., 2014). Cross-sectional studies have demonstrated that, in contrast with adolescence and adulthood when previous reward disrupts inhibitory processes, in early childhood, previous reward increases attentional capture to a stimulus to facilitate behavioral inhibition (Winter & Sheridan, 2014; Davidow et al., 2019). To date, there have been no studies examining neural activation underlying this distinct behavioral pattern in early childhood. The present study used the Conditioned Appetitive Response Inhibition Task (Winter & Sheridan, 2014), a rewarded go/no-go paradigm, to examine neural recruitment supporting inhibitory control generally, and to previously rewarded (PR) versus neutral (PN) cues in 77 children aged 4 - 8 years. We observed expected activation in the cognitive control network for all no-go relative to go trials, including the bilateral IFG, dACC, insula, and inferior parietal cortex as well as the right middle frontal gyrus. Consistent with previous findings, there was a significant negative effect of age on activation during no-go relative to go trials, such that younger children showed greater activation in the dACC. In contrast to our expectations, we did not observe a significant difference in neural activation for all PR relative to all PN no-go trials. Future analyses will compare activation for correct PR and PN trials. Our findings underscore the role of the dACC in supporting inhibition in early childhood, potentially reflecting a greater reliance on context monitoring.

1-A-40 Development of Hippocampal-vmPFC functional connectivity at 7T is associated with increased use of model-based learning strategies

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Through adolescence, executive functions show protracted refinement and performance stabilization. We have proposed that this may be in part mediated by developmental increases in hippocampal-prefrontal cortex interactions (Murty et al, 2016), which facilitate the extraction of relevant information by flexibly drawing upon prior experience. To test this, we conducted a longitudinal neuroimaging study (n=196 sessions from n=142 participants, 72 F; 1-3 visits; ages 10.1-32.6, mean=19.8 /- 5.7) in which participants performed a two-stage decision making task (Decker et al, 2016). Model-based learning was estimated with multi-level modeling of trial level responses (Brown et al, 2018) reflecting the extent to which participants drew upon cognitive models during decision making. We also acquired structural (T1 MP2RAGE) and resting-state functional (3D EPI, effective TR 2.18sec, 2.0x2.0x2.0mm voxels) MRI at 7T. Freesurfer 7.0 was used to segment the hippocampus into anterior (aHPC) and posterior (pHPC) regions, as well as anatomical subfields. BOLD timecourses from these regions were used as seeds for functional connectivity analyses. Group analyses were performed to relate age, task performance, and HPC connectivity using generalized additive models (GAMs). We found, as others, strong age-related increases in the use of model-based learning strategies through adolescence ($p<0.0001$), and replicated our previous findings (Calabro et al, 2020) showing age-related increases in aHPC-vmPFC connectivity strength ($p=0.02$). Notably, the subiculum was identified as a key driver of these age effects, and subiculum-vmPFC connectivity specifically predicted the predominance of model-based learning strategies in the two-stage task ($p=0.005$ controlling for age). These data support a model by which hippocampal-prefrontal interactions, including the subiculum, facilitate the emergence of model-based decision making as a cognitive strategy through adolescence.

1-A-41 Parent-Child Relationship is Associated with Unique Neural Synchrony While Listening to Stories: An fMRI Study

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Introduction: Inter-brain correlation was recently suggested as a method reflecting an interaction between individuals. Whether intra and inter-brain correlation during story listening task capture the ongoing synchronization between parents and their biological children and how it is affected by parental attachment patterns is the research question of the current study. Methods: Thirty-nine children aged 8-to-12 (mean age = 9.75±1.28 years) and seventeen parents (mean age = 39.78 ±10.46 years) typically developing Hebrew speakers, were scanned while listening to five 30-seconds-long Hebrew-spoken stories arranged in a block-design and read by a neutral storyteller. Inter and Intra brain-couplings were measured toward detecting the neural fingerprint of the relationship between parents and their biological children and were also linked to parental attachment patterns. Results: Parents and children hold idiosyncratic inter-brain coupling while listening to stories. This coupling is evident in a higher-level brain network related to mental skills, visualization, memory, and default-mode and in lower-level brain regions, including the auditory and somatosensory networks. While inter-brain connectivity between

parents' visual network and children's cingulo-opercular network introduces a reliable prediction of parental anxiety and security levels, intra-brain similarities within executive function-related networks are also correlated with parental attachment patterns. Finally, parents and children share a unique neural fingerprint representing their relationship. Conclusion: The results demonstrate the existence of a neural marker for parent-child relationships and the role of attachment in determining synchrony between networks associated with attention, visualization, and executive functions. Defining the "typical" parent-child brain synchrony will allow a prediction or even prevention of impaired connection due to parental depression or child-related disorders.

1-A-42 Exploring associations between socioeconomic status and executive functioning in UK adolescents: A cross-sectional and longitudinal analysis of data from the Study of Cognition, Adolescents and Mobile Phones (SCAMP)

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Adolescents from socioeconomically disadvantaged families are more likely to experience poor mental and physical health and struggle academically than their peers. These inequalities may be partly explained by the impacts of socioeconomic status (SES) on cognitive development. In childhood, mechanisms of impact include educational resources in the home and attending preschool, but few studies have explored associations between different SES indicators and cognitive skills in adolescence. Using data from 2,045 SCAMP participants, we investigated associations between parental occupation, whether the parents attended university, school type (state/private), and postcode-based deprivation level and performance on a series of executive function tasks (Trail Making Test, Backwards Digit Span, Spatial Working Memory, Continuous Performance Test) and a test of fluid intelligence (Culture Fair Test). Pupils were assessed in year 7 (M = 11.99 years, SD = 0.39) and in year 9/10 (M = 14.25 years, SD = 0.47). School type was the best predictor across time and outcomes, with better cognitive performance observed in private school pupils, possibly because private schools often select on academic grounds. Variance explained by other SES measures was not consistent across cognitive outcomes, but other SES indices predicted variation within each school type. For example, parent occupation significantly positively predicted state school pupils' Culture Fair Test performance and the father having attended university negatively predicted Continuous Performance Test omission errors in private school pupils, suggesting possible interaction between school and family/area level factors in influencing cognitive skills during this developmental stage. Our results highlight important distal predictors of cognitive skills in adolescence. Future research should explore the mechanisms through which these impact on cognitive development, as these likely differ from those described in childhood.

1-B-16 The changing role of testosterone and prefrontal emotion control: From adolescence to young adulthood

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Background: A paradox of testosterone effects is seen in adolescents vs. adults with respect to social emotional approach-avoidance behavior. During early adolescence, high testosterone levels are associated with increased anterior prefrontal (aPFC) involvement in emotion control, whereas during adulthood this neuro-endocrine relation is reversed. Rodent work has shown that, during puberty, testosterone transitions from a neuro-developmental to a social-sexual activating hormone. In this study, we explored whether this functional transition is also present in human adolescents and young adults in the context of emotion control. Methods: Using a prospective longitudinal design, we investigated the role of testosterone on the neural control of social emotional behavior during the transitions from middle to late adolescence and into young adulthood. Seventy-one individuals (tested at ages 14, 17, and 20 years) performed an fMRI-adapted approach-avoidance (AA) task involving automatic and controlled actions in response to social emotional stimuli. Results: In line with predictions from animal models, the effect of testosterone on aPFC engagement decreased between middle and late adolescence, and shifted into an activational role by young adulthood - impeding neural control of emotions. This change in testosterone function was accompanied by increased testosterone-modulated amygdala reactivity. Conclusions: These findings qualify the testosterone-dependent maturation of the prefrontal-amygdala circuit supporting emotion control during the transition from middle adolescence into young adulthood.

1-B-43 Neurobiological reactivity to a self-referential, social-evaluative stressor in adolescent girls and LGBTIQA+ youth: The SOS task in the Transitions in Adolescent Girls (TAG) and Diverse Genders and Sexualities (DGS) Studies

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Puberty is an important life phase where neurobiological development related to social processing is critical for healthy development. Peer social-evaluative stress, especially stress that is self-referential, is salient during this time of social reorientation. There are observable hormonal and immune responses to social stress, but it is unclear if this reactivity is associated with other risk factors for depression. This study will investigate individual factors that affect neurobiological reactivity to our novel self/social-evaluative stressor, the SOS task, and address its replicability across two separate samples: adolescent girls and LGBTIQA youth. Hypotheses: 1.Participants will have higher heart rate and levels of hormones and immune markers during the SOS task compared to baseline (i.e., more biological stress reactivity) Additionally, participants with more biological stress reactivity will have: 2.higher levels of concurrent depression, anxiety, and perceived stress 3.experienced more discrimination, harassment and heterosexism related to their gender/sexuality (LGBTIQA sample) 4.greater BOLD response in mPFC during the self/social-evaluative stressor (adolescent girls sample). In Study 1 (data collection complete), the SOS task was administered in the MRI scanner with 65 adolescent girls aged 12-15 with one fMRI run

of a block-design passive viewing self-video task. In Study 2 (data collection complete by May 2022), the task is administered outside the scanner with 60 LGBTIQA youth aged 16-24. In both studies, heart rate is sampled frequently and levels of the stress hormone DHEA and immune marker CRP are measured in saliva. The baseline of all biological markers will be compared to during (heart rate) or after (DHEA and CRP) the SOS task. These studies will show if adolescents who differ in how neurobiological systems respond to self/social-evaluative stress may be more at risk for developing depression, providing insight into intervention targets.

1-B-44 Impact of maternal emotional state during pregnancy on fetal heart-rate variability

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Introduction and objective. The fetal autonomic nervous system (ANS) quickly adapts to environmental changes during gestation. For example, reduced fetal heart rate variability (fHRV) is linked to fetal distress and to impaired development of the ANS. Recent studies also showed adverse effects of maternal emotional states, like prenatal stress or depression, on fetal development. In this work, we investigated the impact of maternal emotional state on fHRV recorded using fetal magnetocardiography (fMCG). Metabolic factors such as maternal pre-pregnancy body mass index (BMI), and maternal weight gain and blood cortisol during gestation were also considered. Methods. We calculated fHRV in spontaneous fMCG recordings from 32 healthy fetuses measured between 32 and 38 weeks of gestational age. Maternal emotional state was assessed using different standardized questionnaires about anxiety, depression and stress. An overall indicator of maternal wellbeing was calculated by z-scoring each individual questionnaire and summation. We divided the group by a median split into high and low z-scores (HZS and LZS, respectively). Standard fHRV measures were determined in the time and frequency domain. T-test analyses were performed between LZS and HZS with the fHRV and the anthropometric/metabolic measures as the dependent variables. Results. After correction for multiple comparisons, we found a reduced low frequency (LF) power in the HZS compared to the LZS group. No differences between LZS and HZS were found for the other fHRV and for anthropometric/ metabolic factors. Conclusions. LF components of the HRV reflect the activity of the parasympathetic nervous system. In adults, a reduction in this parameter is associated with stress, negative emotional processing and cardiovascular complications. Our results support the idea of an impact of maternal emotional state on the offspring's ANS development.

1-B-45 Infant gut microbiota composition associates with negative reactivity and fear in sex-specific manner

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Gut-brain axis has been studied mostly in rodents but during the past year increasingly also in humans. Studies indicate that gut microbiota is related to neurodevelopmental and behavioral outcomes. Accordingly, early gut microbiota composition (GMC) has been linked to child temperament, but

research is still scarce. The aim of this study was to examine how early GMC at 2.5 months of age is associated with child negative reactivity and fear reactivity at 8 and 12 months of age, since they are potentially important intermediate phenotypes of later child psychiatric disorders. Our study population was 330 infants belonging to the longitudinal FinnBrain Birth Cohort Study. GMC was analysed using stool sample 16S rRNA sequencing and negative reactivity and fear reactivity were assessed using the Laboratory Temperament Assessment Battery (Lab-TAB) at the child's age of 8 months and the maternal reports of Infant Behavior Questionnaire-Revised Short Form (IBQ-R) at the child's age of 12 months. We found sex-specific associations between alpha diversity and reported fear reactivity as well as observed negative reactivity. The overall composition, i.e. beta diversity, was associated with reported and observed negative reactivity for boys. However, we did not observe any associations between temperament traits and the major short chain fatty acids (SCFAs). Finally, several genera were associated with temperament measurements with most prominent negative associations between genus [Ruminococcus] gnavus group and reported negative reactivity (LogFC=-2.1, p<.01) and fear (LogFC=-1.2, p<.05) and positive associations between genus Clostridium sensu stricto 1 and observed fear reactivity (LogFC=1.6, p<.01). This study adds to the growing literature on infant GMC and temperament and highlights the possible sex-specificity in these associations and adds to the emerging knowledge on the human gut-brain axis development.

1-B-46 The Intestinal Microbiome, the Japanese Diet, and Physical and Psychological Resilience in Postpartum Women in Japan

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OBJECTIVE: Maternal depression and stress increase prolonged risks to the neurodevelopmental outcome of the offspring. However, the population of postpartum women suffering from mental illness in developed countries is increasing steadily, particularly under the conditions of the COVID-19 pandemic. There is an urgent need to identify factors that contribute to the resilience of postpartum women's risks of physical and psychological dysfunction. We conducted two studies to examine the microbiome-physical-psychological association in nonclinical Japanese women (Study 1: N = 347, parenting 0-4 year-olds, Study 2: N = 27, primiparous women 3-6 months postpartum). METHODS: Psychological state (depression, parenting stress, and psychological resilience), physical conditions, and dietary habits were assessed by questionnaires, and fecal samples were collected for gut microbiome analysis in both Study1 and 2. Also in Study 2, physical function (e.g., muscle mass, handgrip), salivary oxytocin, resting ECG data to assess the autonomic nervous system were collected at the experimental site. RESULTS: We found that 23.63% of mothers had a high risk of mental illness (i.e., parenting stress and/or depression). The risk was associated with less Lachnospira and alpha diversity of microbiome compared to those of healthy mothers (p and q < .05). Furthermore, physical and psychological resilience was associated with relative abundances of genera Blautia, Clostridium, Eggerthella. The physical conditions (e.g., physical activity and female hormone-related symptoms) and Japanese food-based dietary habits were also resilience factors (p < .05 or medium effect size). CONCLUSIONS: The microbiome important for butyrate production and metabolism of the Japanese diet was associated

with psychological and physical resilience in postpartum Japanese women. This study will contribute to further understanding of the gut-brain axis mechanisms and proposals for interventions to enhance resilience.

1-B-47 Effectiveness of online emotion recognition training in adolescents with Autistic Spectrum Disorder: pilot results

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Aims: Difficulties in emotion recognition and regulation are commonly reported in patients with Autism Spectrum Disorder (ASD). While the available evidence shows positive results of computer-based of isolated emotion recognition training programs in adolescents with ASD, the duration and intensity required for their transfer to other skills is still debated. This study investigates the effectiveness of a brief online computerized emotion recognition training in adolescents with ASD and its impact on social decision-making processes. Methods: Adolescents with ASD (N=10, 4F, age 10-18) recruited at outpatient clinics received 6 online sessions (~1h/each, over 2 weeks) of a computerized emotion recognition training. They performed the Geneva Emotion Recognition Test (GERT) and a Social Decision-Making task (SDM) pre- and post- training. The GERT assesses emotion recognition abilities. The SDM is a bargain paradigm assessing how after decisions made in a social context, participants integrate monetary and emotional feedback for each trial, to apply it in subsequent decisions. Task performance (GERT: Accuracy; SDM: proportion of choices maximising self-benefit) were compared pre- and post-training using repeated measures models (implemented in RStudio). Results: While participants were able to correctly identify a higher proportion of emotions during the GERT (Standardized Beta: 0.22, t(df)=2.06(39), p=0.04), no significant performance changes were observed during the SDM. Conclusions: Six sessions of an online emotion recognition training already effectively improve emotion recognition. However, this increased emotion recognition skill did not translate into behavioral changes during decision-making in social contexts. These preliminary results suggest that for the transfer of improved emotion recognition skills into behavioral changes a) more sessions might be need b) other aspects of the disorder such as behavioural flexibility need to be targeted.

1-B-48 Shared and disorder-specific neural correlates of emotion and cognitive processing deficits in adolescents with conduct disorder and adolescents with autism

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Aims: Difficulties during cognitive control as well as facial emotion processing have been reported both in patients with Autism Spectrum Disorder (ASD) or with Conduct Disorder (CD). However, little is known about how emotion processing deficits may modulate/be modulated by deficits in cognitive control deficits. This project investigates a) the differential and shared neural underpinnings of facial emotion processing within each disorder and b) the interaction between deficits in emotion and cognitive control processes. Hypothesis: During a facial emotion processing task (EPT), we expect disorder-specific

underactivation in the insula in CD youths only and shared underactivation in the amygdala and ventromedial prefrontal cortex (vmPFC). During the emotional Go/No-Go task (eGNG), we expect shared reduced cognitive control associated with underactivation in the inferior frontal cortex, and disorder-specific overactivation in anterior cingulate and dorsolateral prefrontal cortices in the ASD group and in temporo-parietal regions in CD youths. Methods: Adolescents (10-18 years-old) with either a diagnosis of ASD (N=40), CD (N=40) or typically developing (N=40) will perform the blocked-design EPT and the event-related eGNG inside a scanner. First level models: a)EPT: regressors for emotion-based blocks, ROI analysis including the amygdala, insula and vmPFC; b)eGNG: regressors for trial type and emotion, whole-brain analysis. Contrasts of interest (EPT: angry/happy vs calm; eGNG: emotion go trials vs neutral no-go trials, neutral go-trials vs emotion no-go trials) computed at the single-subject level will be followed by between-group ANOVA comparison of coefficients. Implications: Only by investigating both disorders together, specific neural characteristics might inform about the core neural deficits in CD and ASD. This information is crucial to inform the design of efficient treatments to differentially address the associated disorder-specific deficits.

1-B-49 Learning about Safety: Neural Correlates of Conditioned Inhibition in Typical Development

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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 youth (Kessler et al., 2005). Safety signal learning, based on conditioned inhibition of fear in the presence of safety, has been shown to effectively reduce anxiety-related behavior in animal models and attenuate fear responses in healthy adults (Christianson et al., 2012; Odriozola & Gee, 2021). Cross-species evidence suggests that safety signal learning involves connections between the ventral hippocampus and the dorsal anterior cingulate cortex in adulthood (Meyer et al., 2019). Given that this pathway may follow a different developmental trajectory than fronto-amygdala circuitry involved in traditional extinction learning (Pattwell et al., 2016), safety cues may provide an effective approach to reducing fear in youth by targeting an alternative pathway. In the present study, fMRI data were collected during a developmentally-adapted safety signal learning task (n = 102; ages 9-19) to investigate the neural mechanisms involved in safety signal learning. Consistent with prior findings in adults, results provide evidence of hippocampal involvement in safety signal learning in a developmental sample. Hippocampal activation to the safety signal was found to vary with levels of anxiety in an age-related manner such that youth with lower anxiety showed age-related increases in hippocampal activation, whereas youth with higher anxiety showed no relation with age. Furthermore, hippocampal-dACC functional connectivity during safety signal learning changed linearly, such that younger youth showed higher functional connectivity relative to older youth. These findings provide novel insight into the neural mechanisms that support safety signal learning during development and may have implications for neurodevelopmentally-informed approaches to optimize interventions for youth with anxiety disorders.

1-B-50 Anticipation and receipt of rewards and losses for self and friends in adolescents with attention-deficit/hyperactivity disorder

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An ongoing debate is whether rewards and losses are processed differentially in adolescents with attention-deficit/hyperactivity disorder (ADHD). In daily life, outcome processing often takes place in a social environment, and ADHD has been associated with a host of difficulties in social information processing and in friendships. Consistently, adolescents with ADHD have been shown to have fewer friends. However, no research has been done on outcome processing in social contexts in adolescents with ADHD. Therefore, the aim of the current fMRI study is to examine the neural processing of rewards and losses (anticipation and receipt) for own and best friend's outcomes in male adolescents with and without ADHD (ages 13-23, N = 98). To this end, participants performed a Reward Gambling Task in the MRI scanner. Data collection has been completed. Based on prior research, we expect decreased activation in the ventral striatum (VS) during reward compared to loss anticipation, and no differences or increased activation in the VS during reward compared to no reward receipt in adolescents with ADHD relative to typically developing (TD) adolescents. We expect differential activity, i.e. hyper-activation or hypo-activation, in adolescents with ADHD compared to TD adolescents during the receipt of outcomes for a friend compared to for oneself in brain regions associated with social information processing (e.g., temporoparietal junction), and in regions involved in reward processing (e.g., VS) and loss processing (e.g., insula). Whole-brain and ROIs analyses will examine effects of valence (reward/loss), context (self/friend), and group (ADHD/TD) (see preregistration: https://osf.io/mz3d2/). The results will highlight the underlying mechanisms of reward and loss processing in adolescents with ADHD for themselves and for friends, which will provide relevant information for understanding social information processing in ADHD.

1-B-51 Self-reported social enjoyment predicts neural response to social reward for autistic and neurotypical youth

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Background: In middle childhood and early adolescence, peer social interactions generally take on increased importance. Yet neural responsiveness to social reward is heterogeneous across youth, including autistic youth who may differ from neurotypical youth in their experience of social reward. One source of this heterogeneity could be variations in experience of social enjoyment as measured by self-report. Objective: We test the hypothesis that self-reported enjoyment of peer interaction predicts neural response to social reward for autistic and neurotypical youth. Methods: 114 youth (71 neurotypical, 43 autistic, 7-14 years old) completed an fMRI task designed to probe the neural correlates of social reward during an interactive exchange with a peer. Youth sent self-relevant text messages (e.g. I like cookies) to a computer partner and an age- and gender-matched peer partner. In return, they received engaged (Peer: "Me too!"/Computer: "Matched!") or disengaged ("I'm away"/"Disconnected")

replies. To quantify neural response to social reward, response to peer engaged messages (controlling for response to other messages) was extracted from bilateral ventral striatum, a region involved in reward processing. To quantify self-reported social enjoyment, an exploratory factor analysis was performed on youth's responses to a questionnaire about their experience of the fMRI task, revealing a 'peer enjoyment' factor. Results: Self-reported peer enjoyment significantly predicted ventral striatum response across groups ($t(111)=2.00$, $p<0.05$). The effect was similar for both neurotypical ($r=0.17$) and autistic youth ($r=0.21$). Conclusions: These findings demonstrate that variation in self-reported social enjoyment is a common source of heterogeneity in neural response to social reward for both autistic and neurotypical youth. Future work could extend these findings to other populations in which social reward processing is implicated, such as youth with social anxiety.

1-B-52 Testing the association between pediatric anxiety and amygdala-prefrontal functional connectivity during emotion processing

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Upon viewing angry or fearful facial affect, children with anxiety display a reduced ability to downregulate negative emotions (Abend et al., 2021; Carthy et al., 2010) and disrupted functional coupling between the amygdala and regions in the prefrontal cortex (Monk et al., 2008; Swartz et al., 2014). Alterations in top-down control of the amygdala may underlie affect regulatory difficulties in anxiety. However, developmental research on the association between amygdala connectivity and anxiety is mixed, with little work focusing on youth of color, who are often exposed to elevated stress. We will test associations between anxiety symptoms and amygdala-prefrontal functional connectivity in a sample of preadolescent Latina girls. Forty-eight girls (M=10.1 years, SD=1.8) completed an in-scanner implicit emotion recognition task and labeled the gender of happy and fearful faces, morphed with neutral expressions at incrementally varying emotion intensities. Generalized psychophysiological interaction (gPPI) analysis will examine task-dependent amygdala connectivity for each emotion type and intensity. Concurrent parent-reported anxiety will be a predictor in the second-level, group analysis. We hypothesize that elevated anxiety will be associated with less negative functional coupling between the amygdala and prefrontal regions, specifically the vmPFC, dlPFC, and dACC. Adults with anxiety may display stronger functional connectivity between the amygdala and basic emotion processing regions during threat perception (Brühl et al., 2014), though little is known about these mechanisms in children. In an exploratory analysis, we will also examine functional connectivity between the amygdala and face-processing regions (fusiform gyrus, primary visual cortex). We hypothesize that anxiety will be associated with increased amygdala-perceptual connectivity. Understanding the neural correlates of anxiety in Latina girls may inform generalizable diagnosis and treatment.

1-B-53 Anxiety Severity is Associated with Restless Rapid Eye Movement Sleep in Early Adolescence

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Youth with anxiety disorders often report difficulty falling or staying asleep. Notably, subjective reports do not match more objective measures of sleep in anxious youth. This discordance may stem from the focus of previous studies on the role of individual sleep variables in isolation. Recent studies have proposed an integrated approach, for example, investigating the microstructure of interruptions within specific sleep stages, as a method for elucidating novel relations. We adopted a similar approach and examined associations between anxiety and "restless REM sleep" or REM sleep with elevated occurrences of stage transitions and arousals. We hypothesized that anxiety severity would be associated with greater REM disruptions. Youth across a spectrum of anxiety symptoms (N = 58; ages 10-13, 34 Female) and their parents completed a diagnostic interview (Anxiety Disorders Interview Schedule - Parent/Child; ADIS-C/P) and provided ratings for anxiety severity in the past week (Pediatric Anxiety Rating Scale (PARS)). Youth then underwent nocturnal sleep polysomnography. Restless REM sleep was operationalized as the difference between total REM and stage transition/arousal events divided by total REM (values close to 1 indicate minimal REM disruption). Primary analyses investigated the relation between restless REM and anxiety severity via multiple regression. Across the entire evening greater REM disruption was associated with elevated anxiety severity ($F(1,55) = 6.12$, $p = 0.02$), this association was particularly pronounced during the first half of the night ($F(1,55) = 8.74$, $p = 0.005$) but abated during the second half of the night ($F(1,55) = 2.74$, $p = 0.10$). The current analyses found evidence linking anxiety severity to restless REM in anxious youth. Existing models suggest disruptions of REM (e.g., restless REM) impede adaptation of limbic circuit activity overnight. Improper adaptation of limbic activity may mechanistically contribute to anxiety severity.

1-B-54 Social rejection sensitivity predicts social media use

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Introduction: As an age group, adolescents (10-24years) report the highest use of social media. They spend nearly 6 hours of their day online, with almost half dedicated to social media. The current study explored whether this is can be partially accounted for by age-related differences in sensitivity to social rejection. Methods: The COVID-19 Risks Across the Lifespan dataset was used to explore these associations in 1706 individuals (11-89-year-olds) at three timepoints between May/20-April/21. Results: As predicted, age interacted with social rejection sensitivity (SRS) to predict online social interactions, $F(3,1392)=42.71$, $p<.001$, $R2=.08$. Simple slope analyses showed that young people high on social rejection sensitivity spent most time interacting online, $\beta=-.07$, 97.5%CI[-.08; -.04], $p<.000$; individuals with average levels of SRS showed an intermediate effect of age on online social interactions, $\beta=-.04$, 97.5%CI[-.05; -.03], $p<.000$ and there was no non-significant of age in those low on SRS, $\beta=-.01$, 97.5%CI[-.02; .00], $p=.07$. Importantly, time spent interacting online had a negative impact on mental health (depressive symptoms) as a function of SRS across the assessment timepoints (R2Marginal=.29, $\beta=-.02$, SE=.01, $p<.001$). This adverse effect of online social interactions for those high on SRS was consistent across age $p=.25$. Conclusions: Young people are particularly sensitive to social rejection and exclusion. The availability of online social interactions anytime, anywhere means there are no more non-

social spaces. And young people high on SRS seek out these social interactions, arguably so not to be excluded. However, time spent interacting online is associated with poorer mental health in those highest in SRS. There is no evidence that interacting socially online is universally bad. However, the current findings suggest it may adversely affect the mental health in individuals high on social rejection sensitivity.

1-B-55 The role of functional emotion circuits in psychopathology in youth

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Background: Several mental disorders emerge during childhood or adolescence and are often characterized by reduced socioemotional functioning, including deficits in emotion perception. Emotional facial expressions are processed in three functional brain modules whose connectivity patterns are sensitive to emotional valence (Zhang et al., 2019; J Neurosci). Two of these modules overlap with the default and frontoparietal networks, where a reduced functional segregation has been linked to psychopathology (Xia et al., 2018; Nat Commun). Objective: The aim of our study is to examine the relationships between fMRI-based activation and connectivity during emotion processing and dimensions of psychopathology in youth. The study has the potential to yield important information on the neural underpinnings of emotion perception deficits in mental disorders. Hypotheses: We expect a negative relationship between emotion identification performance and severity of general psychopathology. We hypothesize that poorer emotion perception and higher levels of psychopathology are associated with lower functional segregation between the medial prefrontal-posterior cingulate and frontoparietal modules. Method: The open dataset of the Philadelphia Neurodevelopmental Cohort allows us to use fMRI data from an emotion identification task with angry, sad, fearful, happy, and neutral faces in a large (n~1300) heterogeneous sample of 8-21-year-olds. We will examine 1) module activation differences, 2) intra-, and 3) intermodule connectivity patterns in emotion-related circuits comprised of frontoparietal, subcortical-posterior insula, and medial prefrontal-posterior cingulate cortices. We will apply a bifactor model to calculate general and specific psychopathology factors based on data attained from GOASSESS. To link psychopathology factors to emotion circuit activation and connectivity features, we will employ general linear models, controlling for age, sex, ethnicity, and head movement.

1-B-56 The effect of relative pubertal timing on depression and social anxiety in adolescent boys and girls

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Past research has shown adolescents that mature early compared to their peers can experience more internalizing problems such as depression and social anxiety, especially girls. Previously, relative pubertal timing was determined based on population standards or the mean of an entire sample, instead of based on adolescents' direct peer group. In the current study, pubertal status relative to

adolescents' direct peer environment was related to the development of internalizing problems. We hypothesize higher depression and social anxiety scores in relatively early maturing individuals and we expect this effect to be stronger in relatively early maturing girls compared to boys. To assess relative pubertal development, we assessed the level of pubertal development of each individual student in first year high school classes (N = 304, age range 11-14). We calculated standardized z-scores for pubertal development compared to same-sex students in the same class to determine an individuals' relative pubertal timing. We found a positive relationship between relative pubertal timing and depression. This effect was specific to girls. We did not find evidence for a relationship between relative early pubertal maturation and social anxiety. We used a novel approach in which the pubertal status information from direct peers was used to investigate the effects of relative pubertal timing on internalizing problems. Our results suggest that relatively early maturing girls have higher depression scores than their relatively late or average-timed developing peers. The results from our approach can be a solid addition to the current literature, which focuses on the effects of absolute pubertal development on internalizing problems. For boys, we did not find this effect. In this research, we did not confirm earlier found effects of early pubertal development on social anxiety complaints.

1-B-57 Emotion recognition and social anxiety in children with Autism Spectrum Disorders and Specific Learning Disorders: differences in social rejection and performance fears.

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Objectives This study aimed to assess emotion recognition (ER) abilities and how they can predict distinct components of social anxiety (social rejection and performance fears) in children and adolescents with Autism spectrum disorders (ASD) and Specific learning disorders (SLD), as compared to typical development (TD). Methods The study involved 25 children and adolescents with ASD without ID (19 M), 25 with SLD (15 M) and 67 with TD (40 M) aged 8-16 years. Participants were matched for age [$F(2, 114) = 1.01$, $p = .37$], gender [$\chi 2$ ($df=2$) = 2.22, $p = .33$], and IQ [$F(2, 114) = .94$, $p = .39$]. They were presented with a faces ER matching task (144 items), assessing the ability of identifying the six basic emotions (happiness, sadness, surprise, fear, disgust and anger). Participants had to recognize if two faces shown on the screen express the same or different emotions. Moreover, parents filled the Multidimensional Anxiety Scale for Children (MASC 2; March, 2017), which allowed to measure social anxiety (social rejection, and performance fears). Results Univariate ANoVAs and two hierarchal regression models were conducted. The main effects of group (ASD, SLD, TD), ER scores, and their interaction were tested to predict social anxiety's levels. Beyond significant differences in accuracy on the ER task between the clinical groups and TD [$F(2, 114) = 6.64$, $p = .002$; ASD, SLD < TD], significant interaction effects emerged between group and ER on both social rejection and performance fears: post hoc comparisons suggested that the SLD group experienced higher levels of social rejection when worse detecting other's emotions,whereas the ASD group had higher levels of performance fears when better recognizing them. Conclusions Overall, our findings suggest that social impairments might be present in both groups, by highlighting the importance of considering ER abilities when assessing social anxiety in children and adolescents with different conditions.

1-B-59 Neural Correlates of Affective Reactivity and Risk for Depression in the ABCD study

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Identifying a reliable, clinically relevant, and objective biomarker, which demonstrates high predictive power, has the potential to advance identification of youth at-risk for depression, which represents an essential public health priority given increased incidence of depression across adolescence. We propose to employ data from the Adolescent Brain Cognitive Development (ABCD) study to test relations between baseline neural reactivity during the emotional n-back fMRI task and change in depression symptoms and depression onset at two-year follow up. Based on previous literature, we hypothesize that heightened activation in corticolimbic regions for negative compared to neutral faces and blunted activation in mesocorticolimbic regions for positive compared to neutral faces at baseline will predict depression onset (Hypothesis 1) and greater changes in depression symptoms (Hypothesis 2) at two-year follow up. Hypotheses will be tested using baseline data from the emotional n-back fMRI task, structured clinical interview data (baseline, two-year follow up KSADS) and depression symptoms (baseline, two-year follow up CBCL). Mixed effects models with random effects of family nested inside scanner will be run, with activation in ROIs during the N-Back task at baseline as the predictor. The first model will predict new onset of depression between baseline and two-year follow up. The second model will predict CBCL depression symptoms at two-year follow up, controlling for baseline symptoms. We will explore moderation by child sex. Socioeconomic status and relevant imaging variables will be added as covariates. The proposed analyses will elucidate inconsistencies in previous research limited by small samples sizes and cross-sectional designs through the use of a prospective, longitudinal design to examine neural reactivity as a biomarker of adolescent depression risk, which will help inform targets for preventive intervention to alter risk trajectories in youth.

1-B-60 Investigating the role of social- and self-cognitive processes in the relationship between puberty and mental health in British girls

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Adolescence is marked by the onset of puberty, which is associated with an increase in mental health difficulties, particularly in girls. Social- and self-cognitive processes also develop during this period: adolescents become more aware of others' perspective of themselves and in turn, are more likely to judge themselves less favorably. In the current longitudinal study, data from 124 girls (from London, UK) ages 9 to 16 was collected at two time points (between 2019 and 2021) to investigate the relationship between pubertal development and mental health difficulties during adolescence, as well as the role of social- and self-cognitive processes that occur during this period. Linear mixed effects models showed that pubertal stage predicted increases in mental health difficulties including depression, difficulties in emotion regulation, rumination and anxiety, independently of age. In addition, pubertal stage also predicted increased perspective taking and negative self-judgements. Negative self-judgements, but not increased perspective taking, further mediated the relationship between puberty and all mental health measures included in the study. The results suggest that pubertal development might have an impact on

negative self-judgements in female early adolescents, and in turn, these might increase mental health problems during this period. Future research could aim to reduce the risk of developing mental health problems in young people by designing interventions that alter the way young adolescents make judgements about themselves.

1-B-61 Unfolding the negative expectancy bias in social anxiety: A neurocomputational assessment of social feedback-based learning from adolescence into young adulthood

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Adolescence is a critical time for developing well-adjusted social behavior. Hereto, learning from social feedback to suitably adapt one's expectations about future appraisals from others is key. Biases in such social learning-processes may play a role in the development and maintenance of social anxiety symptoms, which often emerge in adolescence. However, the underlying neurocomputational mechanisms of healthy vs. biased social learning remain largely unknown. Given the Attentional Control theory, EEG frontal-midline (FM) theta power may constitute a neurocomputational index of biased social learning. To test this notion, 78 adolescents (12-17 years) and 165 young adults (18-25 years) completed our newly developed Social Evaluative Learning through Feedback (SELF) - Profile task. In this task, participants created their own social media profile consisting of a profile picture and 60 statements characterizing the participant's personality. Participants were told that they could interact with a self-selected group of peers (n=4) at a later stage. These peers had allegedly evaluated the participant's profile and indicated for each of the 60 statements whether they liked/disliked them based on each statement. Participants then predicted on each trial whether one of the four peers had indicated to like/dislike them per statement. Unbeknownst to the participants, the peers differed in their probability of giving positive feedback (i.e., 85%, 70%, 30%, 15%). Simultaneously, we recorded EEG to examine FM-theta responsivity to social evaluative prediction errors. Here, we present results of neurocomputational modeling analyses of the trial-to-trial changes in feedback predictions to examine (biased) social learning in adolescence vs. young adulthood, and its link with social anxiety. Our results can help improve prevention- and treatment strategies of social anxiety symptoms. Given the chronic nature and adverse consequences of social anxiety, this could have high impact.

1-B-62 A Longitudinal Model of Self-Evaluation and Depression in Adolescent Girls

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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, the associations between self-evaluation and depressive symptoms across adolescence has not been robustly delineated. Do increased depressive symptoms predict increased negative self-evaluation? And, does increased negative self-evaluation predict elevated depressive symptoms? Aim: We will assess longitudinal associations between neural and behavioral indices of self-evaluation and depressive symptoms, which will allow us to parse directional associations and test our hypothesis that these processes will display transactional associations. Method: A unique opportunity to advance this

essential research is provided by the Transitions in Adolescent Girls (TAG) study, which has three waves of neural indices of self-evaluation and depressive symptoms (N=174, initial ages 10.0-13.0, 18 months between waves). Depressive symptoms will be assessed via the Center for Epidemiological Studies Depression Scale for Children (CES-DC). Participants complete a self-evaluation fMRI task where they decide whether traits from three domains (prosocial, antisocial, and social status) describe them. The behavioral metric will be the proportions of self-evaluations that are negative (negative adjective endorsed and positive adjectives rejected). Univariate analyses of vmPFC activity during the self-evaluative condition (contrasted against a high-level control) will serve as the neural marker. In order to control for trait-like variability, we will use a random intercept cross-lagged panel model with three-levels (1) behavioral self-evaluation, 2) neural self-evaluation, and 3) depressive symptoms) across three waves of data. To minimize researcher degrees of freedom, interim results are not presented in this abstract but will be presented at the 2022 Flux conference.

1-B-63 Differential susceptibility of associations between parenting and the development of social behavioral control: a longitudinal fMRI design

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The transition from childhood to adolescence is an important period for the development of social skills, such as the ability to adapt to and control behavior in different social contexts, i.e., social behavioral control. Prior work showed developmental differences in social behavioral control on behavior and fMRI activation, such that older children differentiate more between responses to positive and negative feedback and showed increased activation in the dorsolateral prefrontal cortex during inhibition of aggressive responses to positive feedback. An important question, however, is whether changes in the environment, such as in parenting behavior, can influence the (neural) development of social behavioral control. Moreover, not all children might be similarly responsive to those changes. Specifically, temperamental traits might explain differential susceptibility to the association between parental sensitivity and social behavioral control development, such that children with a more reactive temperament will be more strongly affected by changes in parental sensitivity for better and for worse. We will study these questions in a three-wave longitudinal twin sample, where children were followed from 7-13 years of age (T1: 7-9y, N=512; T2: 9-11y, N=456; T3: 11-13y, N=336). Social behavioral control was measured using the experimental Social Network Aggression Task and parental sensitivity was measured using the parent-child interaction task Etch a Sketch. Bivariate growth curve modeling will be used to 1) test whether individual differences in the development of parental sensitivity are related to individual differences in the (neural) development of social behavioral control and 2) test whether temperament moderates the association between parental sensitivity and social behavioral control. Together, these findings will shed light on which children might benefit most from positive environments in order to thrive throughout their development.

1-B-64 Can inter-individual differences in facial-emotion recognition speed and neural facial-emotion processing in late childhood be explained by age, sex and social competence?

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Identification of facial expressions is necessary to navigate social interactions. This ability rapidly develops in the first year of life and refines throughout childhood. It remains unclear to what extent age- or sex-related variation in neural processing of basic facial-emotions continues to exists in late childhood, how emotion recognition speed is related to this neural processing and how emotion recognition speed and neural processing relate to social competence. We will use data from the YOUth study to answer these three questions in 814 children between 8 and 11 years old: 1. To investigate age- and sex-related variation in emotion recognition speed, we will use linear models with age and sex as independent variables and speed of facial emotion recognition (Penn CNB subtask) as outcome. 2. To investigate inter-individual differences in the neural processing of facial-emotions we use fMRI data on the neural processing of emotional faces, collected during a passive-watching task with alternating blocks of images of houses or faces. Next, linear models will be used to study the effect of age, sex and emotion recognition speed on neural activation using three contrasts: 'happy vs. neutral', 'fearful vs. neutral' and 'happy vs. fearful' facial expressions. To study if differences in emotion recognition speed or facial-emotion processing can be explained by social competence, age and sex, we will use linear models. We hypothesize (H1) that older children are faster to correctly label emotions, and that girls are faster than boys; (H2) that variation in neural processing of emotional faces can be partly explained by age, sex and labeling speed; (H3) that faster labeling and stronger activation in response to emotional versus neutral faces is linked to higher social competence. To conclude, the proposed study will answer whether inter-individual differences in the neural foundations of the processing of basic facial-emotions impact performance during late childhood.

1-B-65 Understanding the contribution of sex and pubertal development to frontal-limbic mediated implicit cognitive control of emotion in the transition to adolescence

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Difficulties with implicit cognitive control of emotion (iCCOE) are implicated in several forms of psychopathology, such as mood disorders, which show increased incidence rates as well as the emergence of sex differences in prevalence during adolescence. Pubertal development is theorized to contribute to this pattern, and influences the structural maturation of the frontal-limbic network which facilitates CCOE. Yet, little is known about sex differences in iCCOE or its neural underpinnings in the transition to adolescence, nor about how iCCOE and its neural underpinnings change with pubertal development. To address this knowledge gap, this preregistered project uses baseline data of the ABCD Ⓒ study to characterize behavior and neural activation during an emotional n-back task (a measure of iCCOE) at age 9-10 (N=7,394), to examine how task behavior and frontal-limbic activation relate to sex-assigned-at-birth, parent-reported pubertal development, pubertal hormone levels, and internalizing symptoms. We predicted that greater pubertal development is associated with improved task performance; that limbic, ventromedial and ventrolateral prefrontal regions are activated during iCCOE (i.e., interaction between cognitive load and stimulus type); and that activity in these regions changes as

a function of pubertal development. Accuracy and reaction time analyses showed a faciliatory effect of face compared to place stimuli, but an impairing effect of emotional compared to neutral faces, with similar patterns across the sexes. There was an interaction between pubertal development, cognitive load and stimulus type in relation to accuracy, but none of the pairwise comparisons were significant after multiple comparisons correction, also not when split by sex. This shows that sex and pubertal stage differences in iCCOE are very limited in this early phase of puberty. Associations with internalizing symptoms and neural activation findings will be presented at the conference.

1-B-66 Developmental changes in adolescent girls' medial frontal gyrus social reward responsivity and depressive symptoms are linked with social media addiction 2 years later

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Objective. Social media addiction (SMA) is becoming increasingly prevalent and, particularly among adolescent girls, is associated with multiple averse mental health outcomes, including depression. However, neural mechanisms that develop across adolescence and may be linked to SMA have not been fully delineated. Methods. Adolescents (N=100; 49 girls) completed a social incentive delay task during 1-3 fMRI scans (6th-9th grade), and 2 follow-up assessments (9th-11th grade). At the final timepoint, participants self-reported SMA symptoms and were classified in either a SMA or control group. Depressive symptoms were assessed at all 5 timepoints. We examined SMA-group effects on brain responsivity to social rewards (smiling faces) over time using whole brain linear mixed-effects models, among female and male participants separately. We similarly examined interacting sex and SMA-group effects on depressive symptoms over time. Results. Among adolescent girls, we observed a significant SMA×TIME interaction on responsivity to social rewards in the medial frontal gyrus (mFG) such that the SMA-group displayed significantly higher mFG responsivity that declined over time whereas the control-group displayed relatively lower initial responsivity that increased over time ($p_{voxel}<0.001$, $p_{cluster}<0.05$). We also observed a significant SEX×SMA×TIME interaction on depression symptoms such that, among girls, the SMA-group displayed a significant increase in depressive symptoms across time whereas the control-group did not. Among boys, SMA-groups did not significantly differ in brain responsivity or depressive symptoms over time. Conclusions. Findings indicate that, among girls, decreasing mFG responsivity and increasing depression symptoms across 6th-9th grade are linked to SMA 2 years later. Initially elevated responsivity to social rewards may be a risk-factor for later SMA, while decreases over time may be associated with escalating addictive use.

1-B-67 Behavioral and neural responses to processing facial expressions and their links with peer victimization

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Based on 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 examines links

between peer victimization and facial expression processing. The data-collection finished: 83 children participated (7.9-12.8 years old, Mage=10.6, 50.6% boys), with at least two self-reported measurements of victimization in the last two years. An emotional dot-probe task, assessed outside the scanner, presented participants with neutral, angry, happy and afraid facial expressions. An emotion processing fMRI task presented participants with facial expressions (neutral, happy, angry, afraid, sad, surprised) and scrambled control faces with an arrow. The gender of the face (boy/girl) or the direction of the arrow (left/right) had to be judged. At the behavioral level, we expect that average peer victimization (past two years) relate to a larger attentional bias for negative facial expressions (especially angry), as indicated by faster reaction times in the emotional dot-probe task. Trial-level bias scores are used in a rm ANCOVA to determine if specific emotions capture initial attention. At the neural level, we expect that higher peer victimized children show stronger amygdala responses to social (faces) versus non-social stimuli (scrambled faces) and to emotional versus neutral facial expressions. Furthermore, we explore whether emotional faces differentially activate areas important for social processing (precuneus, medial prefrontal cortex (mPFC), posterior superior temporal sulcus (pSTS) and temporal parietal junction (TPJ)). We present the results at the conference, which inform us whether peer victimization is related to emotional cue processing. The processing of facial expressions is crucial for social information processing and maintaining social relationships.

1-B-68 Neural mechanisms of negative memory bias for social interactions in young adults with childhood maltreatment

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Threat-based childhood maltreatment often results in social and affective impairments that increase risk for mental health problems and intergenerational abuse. To identify treatment targets that prevent propagation of interpersonal abuse, we must isolate mechanisms that underlie how maltreatment impacts social cognition. In particular, disrupted encoding of social feedback and/or remembering social interactions as more negative than they were (negativity bias) may contribute to cycles of abuse by influencing how individuals perceive their social world. We propose to test whether threat-based maltreatment is associated with distinct patterns of neural activation when encoding social feedback, and the extent to which maltreatment is associated with a negativity bias when recalling this feedback. We recently completed data collection from young adults (N=38, 18-24 years) with a range of threat-based childhood maltreatment. They received positive and negative social feedback from purported peers while undergoing fMRI, then following the scan completed a surprise recall task for peer feedback. We hypothesize that threat-based maltreatment in childhood will be associated with reduced reward-related neural activation for positive vs. negative social feedback, and greater negativity bias when recalling social feedback. Exploratory analyses will test for differences in brain and behavior response to monetary feedback and subsequent recall. By elucidating neural mechanisms that contribute to alterations in social cognition among young adults with a history of maltreatment, we will begin to identify targets for much needed psychosocial interventions to prevent propagation of interpersonal abuse.

1-B-69 Adolescence as a period of increased self-conflict?

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Adolescence has been marked as a critical period of self-concept development and identity exploration, driven by social as well as neurobiological changes. Harter's theory on self-concept development points to mid-adolescence as a phase of increased conflict about one's character traits. Several lines of self-concept and identity research indicate a similar pattern, suggesting mid-adolescence to be a temporary time of increased self-doubt and uncertainty about the self. This study aims to directly test the experienced conflict and to assess the underlying neural mechanisms by explicitly invoking self-conflict in an experimental fMRI paradigm. That is, in this task participants were asked to choose which of two character traits fit them best. These traits could either be both positive (f.e. 'smart' and 'nice'), both negative (f.e. 'unmotivated' and 'stubborn'), or there could be one positive and one negative trait (f.e. 'selfish' and 'honest'). Positive-positive and negative-negative conditions are referred to as 'same' or 'conflict' conditions, whereas positive-negative and negative-positive conditions are referred to as 'different' conditions. In total 188 adolescents aged 10-24 years participated in this 3-wave accelerated longitudinal study. At the time of FLUX congress, we present the behavioral and neural indices of conflict in relation to age and related behavioral measures such as self-concept clarity, self-esteem, and identity. A behavioral indicator of conflict is the reaction time in the same vs. different conditions, whereas on the neural level we intend to demonstrate which brain regions are involved in (solving) the invoked conflict by testing for the same > different contrast. Preliminary results show activation in the salience-network for the contrast same > different, and a regression analysis confirms that this activation is stronger for individuals with higher positivity bias (i.e. percentage positive-chosen traits in the different condition).

1-B-70 Neurological and behavioral mechanisms of Black youths racial discrimination-related risk for internalizing problems in the Adolescent Brain Cognitive Development (ABCD) study.

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In the United States, Black youth report the highest rates of racial discrimination, a risk factor for mental health problems that persist beyond adolescence. The neurobiological and behavioral mechanisms involved in such risk and their contributions to the emergence of psychopathology remain poorly understood. This longitudinal study examined whether amygdala activation and emotion dysregulation act as serial mediators of the link between early racial discrimination and later internalizing problems for Black youth. We also tested whether ethnic identity buffered the amygdala activation-emotion dysregulation serial mediation linkage. We used data from the Adolescent Brain and Cognitive Development (ABCD) Study. At Years 1 and 3, youth and a caregiver completed questionnaires. At Year 2, youth underwent a magnetic resonance imaging scan while completing an Emotional N-back task from which amygdala activation to emotional stimuli was derived. Of the 11,878 youth recruited at Baseline, 648 Black youth (51.3% Female, MYear_1_age=10.99 years) were selected who had acceptable Year 2 imaging data and Year 3 data available in ABCD Study® Release 4.0. Bootstrapping procedures revealed a significant conditional indirect effect (index of moderated mediation=-0.152, SE=0.101, 95%

CI [-0.413,-0.007]): Year 1 racial discrimination positively predicted Year 2 amygdala activation, Year 2 amygdala activation positively predicted Year 3 emotion dysregulation, Year 3 emotion dysregulation was positively associated with Year 3 internalizing problems. Year 3 ethnic identity buffered the amygdala activation-emotion dysregulation linkage for youth who endorsed high ethnic identity levels. This study identified mechanisms through which Black youths' experiences of racial discrimination during early adolescence may contribute to the emergence of internalizing problems. A malleable protective factor (ethnic identity) was also identified, which can be a target of intervention.

1-B-71 The causal impact of parental emotion socialization on adolescent emotion regulation neurobiology and internalizing outcomes

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Background: Emotion dysregulation is a transdiagnostic risk factor for internalizing symptoms. Adolescence is a period of heightened risk of emotion dysregulation due to increased socio-emotional challenges and dramatic development in neural circuits underlying emotion regulation (ER). Evidence shows that parental response to emotions ('emotion socialization') is linked to the development of ER skills and internalizing symptoms in adolescents, and existing cross-sectional and longitudinal studies have suggested that this link may be mediated by changes in adolescent ER neurobiology. However, this relationship has not been tested experimentally. In order to address this gap, we are conducting a randomized controlled trial (RCT) to examine the causal effect of parental emotion socialization on adolescent ER neurobiology and internalizing outcomes. Methods: 60 female adolescents and their female caregivers will be recruited for this project. We will use an evidence-based parenting intervention called Tuning in to Teens, which targets parental emotion socialization and has been shown to decrease adolescent internalizing symptoms in previous RCTs. Adolescent brain function during implicit (affect labelling) and explicit (cognitive reappraisal) ER tasks will be assessed at baseline and 4-month post-intervention. Hypotheses: We expect that adolescents in the intervention group will show 1) greater reductions in amygdala reactivity and 2) greater increases in amygdala-prefrontal functional connectivity during ER tasks compared to adolescents in a waitlist control group. We also hypothesize that changes in adolescent ER-related brain function will mediate the intervention effect on adolescent internalizing symptoms at 6-month post-intervention. Implication: Findings will increase our understanding of the causal neurobiological mechanisms through which parenting behaviors contribute to risk and resilience to internalizing outcomes in adolescents.

1-B-72 The role of neural reactivity to affective images in predicting adolescents social network centrality

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Background: Higher emotional reactivity increases adolescents' risk for conflict with friends and problems within intimate relationships (Cook et al., 2013; Nock et al., 2008). However, it is unclear whether emotional reactivity informs how connected (or isolated) adolescents are within their social

network. Activity in salience neural regions (amygdala; insular cortex) are associated with both affective reactivity (Hare et al., 2008; Miller et al., 2018) and sensitivity to social threat in adolescence (Masten et al., 2013; Silk et al., 2014), and may help explain the link between emotional reactivity and social connection. Objective: The proposed study will examine the extent to which activity in these regions predicts adolescents' social network centrality. Methods: 6th and 7th graders from three middle schools participated in a study examining neurobiological susceptibility to peer influence and were asked to identify their "best, closest friends". Based on close friend nominations, we built social networks using the `igraphs` package in R and extracted measures of network centrality. One hundred forty-eight of these participants also completed a picture rating task during an fMRI scan. Analyses will examine activation in the amygdala and insular cortex during Negative > Neutral and Positive > Neutral trials as predictors of normed closeness, eigenvector, and betweenness centrality- controlling for pubertal status, race, and gender. We will implement an ROI analysis approach using amygdala and insula seed regions, as defined by peak voxel coordinates in Lindquist et al (2016). Significance: Although adolescence is a developmental period in which social relationships are salient and increasingly complex, associations among adolescent neural reactivity and social network position are under-studied. Results may yield insight into biological mechanisms linking adolescent emotional development and their social connection to peers.

1-B-73 Neural mechanisms of social rejection elicited aggression in adolescence

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Aggression linked to peer rejection is a prevalent problem that typically increases in adolescence. Aggression may result from a combination of increased activation in brain regions implicated in threat reactivity during the anticipation and receipt of rejection and reduced activation in regions implicated in cognitive control when deciding how to react to rejection. Capacity to map this complex cascade has been hampered by lack of ecologically-valid fMRI-based tasks that delineate anticipatory, rejection, and retaliatory phases of a social interaction. We developed the Virtual School and Aggression (VSA) task to address this. In the VSA task, adolescents (N=50; 11-15 years) anticipate, receive accepting or rejecting feedback from peers, and then aggress by delivering varying levels of a noise blast. Time lapsed network interaction analyses, a novel form of functional connectivity analyses that combines psycho-physiological interaction analyses and single trial modeling, will test the extent to which threat (e.g., amygdala, insula, dorsal anterior cingulate (dACC)) and cognitive control (e.g., ventromedial prefrontal cortex (vmPFC), dorsolateral PFC (dlPFC), ventrolateral PFC (vlPFC)) networks interact across temporal stages as social rejection elicited aggression unfolds. We hypothesize that aggressive behavior will be associated with a cascade of network interactions whereby increased threat network interactions during anticipation and receipt of negative as compared to positive feedback lead to less cognitive control while deciding to aggress. This study will, for the first time, isolate multi-circuit contributions to in-the-moment rejection elicited aggression in adolescence. Results will illuminate which circuitry (e.g., threat reactivity, cognitive control) novel interventions should target, and when during a social interaction strategies should be implemented to prevent social rejection elicited aggression.

1-B-74 Intergenerational similarity of functional brain correlates during mentalizing in mother-child dyads

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Aims:Studies assessing endophenotypes of parent-offspring dyads hold the prospect of disentangling mechanisms of intergenerational transfer. Genetic predispositions as well as experiences, such as caregiver-child interactions, strongly shape socioemotional skill development. First intergenerational neuroimaging studies reveal the potential of neural concordance design to study complex skill transmission. An increased understanding of socioemotional skill development including biological and behavioral testing in parents and children may inform about developmental trajectories and opportunities for intervention. Methods: fMRI data was acquired using CAToon (a Theory of Mind/mentalizing task), in 42 mother-child dyads (36 mothers: 26-52y; 42 children: 7-15y, 17 girls). Additionally, behavioural data on mothers' psychological well-being, parenting behaviors, children's socioemotional skills and well-being have been assessed. Neural similarity (i.e.,resemblance in mentalizing-related processing) will be tested in mother-child dyads. Familial specificity (i.e.,distinctiveness) will be assessed by comparing similarity in mother-child as compared to randomly selected adult-child pairings using permutation approaches. Finally neural maturity is assessed by developmental intersubject correlation in line with Cantlon (2013). Hypothesis: We hypothesize, that there is neural similarity during mentalizing in mother-child dyads, which is specific for related as compared to unrelated dyads. Furthermore, socioemotional skill development and age will be positively related to measures of neural similarity. Implications: The study of early socioemotional skill development as described through biology and behavior adds to our understanding of mechanisms leading to health and disease. Furthermore, intergenerational neuroimaging studies may provide a foundation for the understanding of the biological bases of positive and negative back-cycling effects of experiences on children's lives.

1-B-75 Exploring associations between emotionally valenced parent statements and parent-adolescent dyadic coactivation during an fMRI hyperscanning conversation paradigm

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Objective: This study examined associations between parents' statements and parent-adolescent dyadic coactivation (i.e., between-brain coactivation) during a conflict discussion fMRI hyperscanning task. Interactions between parent statements and adolescent depressive symptoms on dyadic coactivation were also explored. Method: Thirty-five parent-adolescent dyads completed a conflict discussion task while undergoing fMRI hyperscanning. A de-noising process was used to remove speech-related head motion artifacts (Xu et al., 2014). Audio from the task was recorded and coded for positive and negative parent statements. Emotion-related regions-of-interest (ROIs) were chosen a priori and included the dorsolateral prefrontal cortex (dlPFC), ventrolateral prefrontal cortex (vlPFC), dorsal anterior cingulate (dACC), ventromedial prefrontal cortex (vmPFC), anterior insula (AI), and amygdala. At the subject level, event-related responses for each parent statement were extracted using General Linear Model analysis. At the dyad level, the beta series in each ROI for one dyad member were correlated with beta series in

the other member's brain (voxelwise analysis; voxelwise threshold of p<.001, family-wise corrected at p<.05) to obtain coactivation maps for each dyad for each statement type and each ROI. At the group level, Linear Mixed Effects models were used to examine dyadic coactivation in response to parent statements and interactions with adolescent depressive symptoms. Results: Dyadic coactivation between brain regions, such as parents' right dlPFC and adolescents' right dACC, differed based on whether the parent made a positive or negative statement. Results also revealed a significant interaction between parent statement type and adolescent depressive symptoms on dyadic coactivation between the parent left dlPFC and the adolescent right AI. Conclusion: Parent-adolescent dyadic coactivation differs based on emotional context and may influence adolescent psychopathology.

1-B-76 Empathy Development and Associated Neural Processing in Adolescence

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Empathy has been shown to be a mechanism that supports prosocial behavior, a positive behavior linked with better physical and mental health. Yet, research is needed to clarify how processes constituting empathy, such as perspective-taking (understanding another's emotional state), empathic concern (feeling another's emotional state), and negative responses such as personal distress, develop and relate to adolescent neurodevelopment. The proposed analyses will 1) examine age related differences in empathic processes and responses (empathic concern, perspective-taking, personal distress) during adolescence, and 2) investigate age differences in brain regions linked with pain processing, social cognition, and cognitive control that are associated with empathic processes and responses. This will be accomplished by analyzing previously collected data from a large sample (N = 134) and age range (11-17 years old) of human adolescents who completed a validated empathy task while undergoing a functional magnetic resonance imaging brain scan. Multilevel modeling will address research questions about developmental age trends, and region of interest (ROI) analyses in SPM12 will be used to extract mean BOLD activation from a priori ROIs. It is hypothesized that: 1) empathic concern will be stable, perspective-taking will increase, and personal distress will decrease with age; 2) higher empathic concern will be associated with greater activation in regions implicated in pain processing (dorsal anterior cingulate cortex, anterior insula), and higher perspective-taking and lower personal distress will be linked with greater activation in regions associated with social cognition (medial prefrontal, temporal parietal junction) and cognitive control (i.e. dorsolateral prefrontal cortex, ventrolateral prefrontal cortex, orbitofrontal cortex) among older adolescents. Findings will explicate the developmental and neural mechanisms of empathic behavior development in adolescence.

1-B-77 Relation of experience and EEG connectivity during action observation in infancy

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Recent findings suggest that observing familiar actions elicits enhanced functional connectivity between visual and motor processes in infants, as measured by inter-channel phase coherence (ICPC). This connectivity scales with infants' motor development, suggesting that as infants gain proficiency in a new

motor skill, visual and motor processes become functionally organized during observation of actions. In the current study, we asked whether similar connectivity patterns are evident during infants' perception of a newly emerging communicative action, pointing, and whether such patterns vary as a function of infants' experience. We preregistered a re-analysis of previously collected EEG data (https://osf.io/6sxv7/), containing 10-12 month old infants' neural activity during observation of grasping and pointing before and after a 1-month pointing intervention, as well as information on infants' status of pointing. Consistent with prior research, we found higher motor-visual ICPC as compared to ICPC at neighbor networks during observation of grasping actions. Interestingly, this pattern was not observed for pointing, and infants' pointing experience did not modulate ICPC. However, we found preliminary evidence that the pointing intervention enhanced global ICPC across the whole-brain compared to those who did not receive intervention. This suggests that functional connectivity based on brief experience may be broadly distributed across the whole brain and that the infant brain may need prolonged experience to reliably build on specific network activations, supporting efficient processing of the upcoming stimuli. Future research would benefit from addressing the process and trajectory of how networks change to be more structured and efficient through experience. Our study paves the way for developmental cognitive neuroscience research to investigate changes in functional neural networks that occur with experience and its implications on social cognitive development.

1-B-78 Aggression in toddlers is related to inter-individual variation in prefrontal-limbic circuitry prior to birth

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Background. Aggression is a major public health concern that emerges early in development and lacks optimized treatment, highlighting need for improved mechanistic understanding of aggression etiology. The present study leverages fetal resting-state functional MRI (rsfMRI) to identify candidate neurocircuitry for the onset of aggressive behaviors, prior to symptom emergence. Analyses focus on frontolimbic circuitry given its important role in emotion and behavioral regulation as well as its feasibility for examination in utero. Methods. Pregnant mothers were recruited during the third trimester of pregnancy to complete a 12-to-24-minute fetal rsfMRI scan. Mothers subsequently completed the Child Behavior Checklist to assess child aggression at 3 years postpartum (N=79). Independent component analysis was used to define frontal and limbic regions of interest. Results. Weaker functional coupling between the subcortical limbic network and medial prefrontal (mPFC) network in fetuses was prospectively associated with greater maternal-rated child aggression at 3 years of age (ß=-0.31, **Δ**R2=0.09, p=0.002, 95%CI b[-12.02, -2.72]). Child aggression was not related to within network connectivity of subcortical limbic regions (ß=-0.004, **Δ**R2<0.01, p=0.97, 95%CI b[-4.66, 4.50]) or within mPFC network connectivity in fetuses (ß=-0.15, **Δ**R2=0.02, p=0.19, 95%CI b[-13.96, 2.89]). All analyses controlled for number of rsfMRI frames, motion parameters, GA at scan, fetal sex, birth weight, GA at birth, maternal education, maternal age, partner status, and maternal anxiety/depression symptoms at the 3-year follow up. Conclusion. Neural correlates of aggressive behavior are detectable

in utero, well before the onset of aggression symptomatology. In particular, the functional connectivity undergirding emotion regulation circuitry prior to birth may play an important role in the onset of aggressive behavior early in life, likely via transactional processes with postnatal environments.

1-B-80 Characterizing fronto-amygdala circuitry development during adolescence: implications for internalizing symptoms

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Adolescence, a time of increased risk for the emergence of mood disorders, is characterized by the specialization of top-down functional connections in parallel to decreases in excitatory (i.e., glutamatergic) signaling believed to contribute to improvements in cognitive and affective control processes. The amygdala matures relatively early in development but its functional coupling with frontal regions, in particular the anterior cingulate cortex (ACC), a critical node of the affective system, continues to specialize through adolescence in conjunction with maturation of emotional regulation. Notably, emerging evidence suggests heterogeneous developmental trajectories across amygdala sub-nuclei; however, such spatially granular investigations in humans have been limited. Here, we leveraged multimodal longitudinal data at 7T collected in 140 healthy participants (ages 10-30) to test subject-specific amygdala parcellations to test age effects on resting-state functional connectivity (rsFC) with the ACC as they relate to affective (i.e., internalizing) symptoms. We hypothesize that ACC connectivity to central, medial, and basolateral amygdala nuclei, which support affect, will decrease through adolescence into adulthood while connections to the accessory basal nucleus, connected to the entorhinal cortex, will not show this pattern of development. Further, we hypothesize that reduced strength of these fronto-amygdala rsFC will be associated with greater internalizing symptoms in earlier adolescence, consistent with an early maturation model of emotional dysregulation, but with an opposite relationship in adulthood. Finally, we hypothesize that ACC glutamate, assessed via magnetic resonance spectroscopy imaging (MRSI) will mediate age-related changes in fronto-amygdala rsFC associated with internalizing symptoms. Taken together, we expect that leveraging high-resolution, multimodal neuroimaging data will inform a circuit-specific developmental model of adolescent affect.

1-B-81 Does how you self-reflect on your well-being predict your actual well-being?

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College is a major transition bridging adolescence and adulthood. It's a significant period for self-development, but also marked by heightened risk for mental health issues. How we perceive ourselves has implications for mental health and there's a robust literature on the neural correlates of trait self-evaluation. However, research has yet to examine the neural underpinnings of evaluating one's own well-being or how it is related to well-being itself. This longitudinal study (N waves=4) explores how self-reflecting on well-being is related to concurrent and prospective changes in well-being during the transition to college. The summer before freshman year, participants (N=105) completed a self-evaluation task, reflecting on well-being statements and responding whether they were true for them (self condition) or malleable (control condition). We operationalized self-reflection with two types of

brain indices: 1) univariate activity in self-related brain regions (pgACC, vmPFC, and VS), and 2) multivariate pattern expression of a whole-brain "signature" that accurately predicts when a person engages in self-reflection. We used piecewise linear mixed effects modeling to fit separate slopes for the initial transition (baseline summer to end of fall quarter) and adjustment (end of fall to end of spring quarter) to college, and examined how individual differences in the brain indices moderated these trajectories. Expression of the multivariate signature was positively related to baseline well-being but predicted steeper declines in the transition and adjustment to college. Univariate activity in VS didn't differentiate individuals at baseline, but predicted steeper declines during the initial transition; pgACC and vmPFC weren't related to well-being. These results highlight self-reflection as a potentially important moderator of well-being during emerging adulthood and suggest that deeper self-reflection--while positive at the time--may make this transition harder.

1-C-82 How adolescents use conceptual knowledge to learn and infer value

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Successful learning requires an individual to integrate new information with existing knowledge structures. In the real world, the cues we encounter are imbued with semantic meaning, like concepts and categories. Yet, little is known about how conceptual knowledge is used to guide value-based decision making, and how this process develops with age. Retrieving and updating conceptual knowledge relies on cortical systems that continue to mature through adolescence. Thus, we hypothesized that the tendency to use conceptual knowledge to infer value would emerge with age from childhood to adulthood. Participants (N=102, ages 10-25) completed a decision-making task and were asked to make choices between different objects. Participants encountered 33 distinct categories of objects, and they could learn over time that some categories were worth more money than others (e.g., balloons earn 80 cents but masks earn 20 cents). Thus, individuals could generalize category knowledge to optimize value-based decision making. We found that successful generalization of category value emerged linearly with age. Specifically, 10-12 year-olds did not use category value when making choices. However, the effect of category value on choice strengthened with age, and older adolescents were more likely to generalize category value during decision making. Surprisingly, even though the youngest adolescents did not apply category values to guide decision making, they still reported explicit knowledge of the category values at the end of the task. This reveals that adolescents can learn category value, but they do not apply this knowledge to guide inference during decision making. Together, these findings suggest that the integration of conceptual knowledge and value-based decision making emerges in late adolescence.

1-C-83 You do not have to become fearless, in order to fear less The FearLess study: Unravelling the neural correlates of social extinction learning in adolescents

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Learning which objects or situations you should fear is critical for survival. However, it is equally important to learn which objects or situations you should not fear or not fear anymore, in light of new information, i.e., fear extinction. Remarkably, adolescents show deficits in extinction learning compared to children and adults. However, our understanding of these developmental variations in extinction learning is limited. The main aim of this project is to understand neurodevelopmental differences in extinction learning. We will compare the effectivity of social (learning by observing peers) vs. non-social (learning from own experience) extinction learning in the transition into and out of adolescence. This fMRI study has a within-subject design: the effectivity of social vs. non-social extinction learning will be compared within subjects. We will include 200 participants aged 9-25. We will test two competing hypotheses: a) social extinction learning, compared to non-social extinction learning, is based on an extended vmPFC-amygdala network, also recruiting other nodes implicated in social processing such as the striatum or the temporo-parietal cortex, or b) the effects of social extinction learning are modulatory, meaning that social and non-social extinction learning are based on a common vmPFC-amygdala network, which receives different input depending on the learning modality (social vs. non-social). This will be investigated with the use of Psychophysiological Interactions and Dynamic Causal Modelling analyses. Numerous studies have shown that adolescents benefit a lot from social learning from peers, which was shown in other social contexts such as prosocial learning and risk-taking. This study might shed light on the benefit of social learning in basic processes such as extinction and it will give insight in the underlying (neural) mechanisms why some adolescents may benefit more than others from social vs. non-social extinction learning.

1-C-84 The effects of social isolation on fear learning in adolescents

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Loneliness and isolation are increasing in societies all around the world (e.g., Victor 2005, 2012). However, the effects of isolation on cognition and the human brain are not clear. Adolescents may be particularly sensitive to the effects of isolation (Hammond 2016, 2019; Twenge 2019). Social isolation has been found to increase anxiety behaviours in animal models, with the most detrimental effects occurring in adolescence (Burke et al., 2017). In rodents, social isolation in adolescence has been associated with a significant deficit in the extinction of conditioned fear (Skelly et al., 2015). This suggests that social isolation might contribute to anxiety by disrupting fear learning mechanisms. Using experimentally induced, short-term isolation we assessed: i) the effects of isolation on adolescent (age 16-19) fear learning; ii) behavioural and brain markers that predict individual sensitivity to isolation. We collected structural and functional magnetic resonance imaging (7T-MRI), physiological (electrodermal activity [EDA]), and behavioural data from 42 participants. We hypothesized that isolation would heighten fear learning and attenuate fear extinction and fear extinction retention as measured by skin conductance responses (SCR; EDA) and self-report ratings during a fear conditioning task. To compare differences in these responses to our experimental manipulation, we will use mixed effects models to test for differences between sessions by estimating the fixed effects of condition (threat and safety), phase (acquisition, extinction and extinction retention) and session (baseline and isolation) with subject included as a random effect. Using high resolution neuroimaging, we will also analyse structural brain

markers (including amygdala subfields) to determine how brain structure relates to fear learning, and whether individual differences in brain morphology might predict responses to social isolation.

1-C-85 Investigating the effect of online social evaluative threat on well-being in young people

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Objective: Adolescence is characterised by increased sensitivity to peer evaluation and rejection (Somerville, 2013). Increased social rejection sensitivity (SRS) and decreased social support (SS) during this period have been associated with mood disorders and cognitive deficits (Marston et al., 2010; Matthews et al., 2015). However, although young people frequently interact online, these findings are largely based on offline work. The present study therefore explored the impact of SRS and SS in the context of online social evaluative threat on young people's affect and cognition. Methods: 255 participants (11-30 years) completed a perceptual learning task under two conditions (counterbalanced across participants), once under online social evaluative stress (threat) and once without a stressor (control). In the threat condition, participants completed a voice recording introducing themselves and were informed this may be rated by other participants on attractiveness, intelligence, and friendliness. During the subsequent learning task, they saw a display tracking the number of views and ratings of recordings. In the control condition, participants simply completed the learning task. Results: Participants reported a greater increase in negative affect in the threat compared to the control condition, $t(448) = 6.19$, $p < .001$. Additionally, individuals with increased SRS ($t(221) = 5.40$, $p < .001$) and decreased SS ($t(223) = 4.91$, $p < .001$) reported greater negative affect after controlling for learning task condition. However, there was no evidence that learning was impacted in the present study ($p = .344$). Conclusion: The results provide preliminary evidence that social evaluative threat, SRS, and decreased SS are associated with increased negative affect. Importantly, the findings indicate that this association may extend to online social environments, providing valuable insights into how interactions in these environments might impact young people's mood states.

1-C-86 Neural effects of stakes and cognitive load on learning across adolescent development

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The ability to capitalize on (high vs. low) stakes to enhance cognitive control develops with age. This ability has been shown to relate to an increase in cortico-striatal functional connectivity (Insel et al., 2017). In the current study, we aim to extend these findings to reinforcement learning, and explore whether this is dependent on cognitive load. In a 2x2 within-subjects fMRI study, we investigated how (high vs. low) stakes and (high vs. low) cognitive load affect subsequent learning, and how this is mediated by cortico-striatal functional connectivity across adolescence (ages 13 - 25 years). Behavioral results indicate that stakes enhanced learning performance under high but not low cognitive loads. Furthermore, stakes enhanced learning performance in early but not late adolescence, whereas in earlier research on cognitive control the opposite age-related effect was found (Insel et al., 2017). For the neural data we hypothesize that the behavioral effect from stakes on learning performance is

mediated by age-dependent cortico-striatal functional connectivity, but only under high cognitive load. These findings can help improve our understanding of individual differences in adolescent development of motivation to learn, and could help inform educational practice, e.g. by differentiating motivational approaches across different developmental stages through in- or decreasing stakes for academic tests.

1-C-87 Social rewards and social media engagement of teenagers: a computational account

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Adolescence is a time of great social re-orientation and social sensitivity. Standing out and fitting in the peer group are one of the most important developmental goals during this period. Social media platforms provide adolescents with additional opportunities to meet their need to connect and belong. However, social media has also changed the way adolescents interact and communicate; encouraging immediate feedback (e.g., likes and comments). It is often argued that this continuous exposure to social feedback is specifically dangerous for the maturing adolescent brain that is hypersensitive to social rewards, however, empirical evidence is lacking. In the current study, we will examine social reward sensitivity and social media engagement of adolescents and adults using a computational reinforcement learning model and real-world social media data from Instagram (around 1.600.000 posts from over 7000 adolescents and over 8000 adults). The model allows us to test the hypothesis of whether adolescents show an increased reward sensitivity to social media feedback and relate this to differences in social media engagement in adolescents and adults.

1-C-88 How do adolescents use choice to learn about themselves?

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Across adolescence, individuals gain autonomy and construct their sense of self. Previous work in adults has shown that while values influence choices, the act of choice also results in participants updating and refining their values - such that they upgrade the values of options they have chosen and downgrade the values of rejected options (termed the 'spreading-of-alternatives' effect). However, the impact on adolescent development is unknown. This is potentially of interest as adolescents may be uncertain about their values and therefore the act of choice could itself impart useful information. Here, we investigated the spreading-of-alternatives effect in a sample of 11-18 year olds (N = 201). Participants were asked to rate subjective values of 40 activities, choose between pairs of activities (10 preference choices in the experimental condition plus 10 control choices that queried which image was least colourful), rate the values for the 40 activities again and finally make preference choices between the items previously presented for colour choices. We measured how much participants updated their value ratings for items that they made preference choices about versus items they made colour choices about. We showed that the difference in spreading-of-alternatives between items in the preference versus colour choice condition increased across age ($\beta = 1.81$, $p = .017$). Younger participants updated their ratings on all items, updating their ratings for chosen and rejected options similarly across the preference and colour choice conditions. However, older participants showed a specific benefit of preference choices, updating their ratings more so when they had made preference versus colour

choices. These results suggest that the way that we use choice to update our values develops across adolescence. Further investigation may help us better understand how adolescents gain clarity over their own preferences as they emerge into adulthood.

1-C-89 Williams syndrome: social rewards promote optimal decision making

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Background: Williams syndrome (WS) is a rare genetic disorder (prevalence 1:7 500) characterized by a hyper-social personality and intellectual disability (ID) and caused by a microdeletion of genes implicated in social brain development. It is not known whether enhanced social reward motivation in WS translates to learning and decision making. Social reward learning is an important form of information transmission which has not been studied in WS. Aim: To characterize social reward learning in WS. Participants were individuals with WS (n= 24, age 7-53 years), other syndromal ID (n = 17, age 7-50), and typically developed adults (TD, n = 53, age 20-59). WS and ID groups were matched for age and cognitive ability. Methods: Participants completed two rounds of a two-armed probabilistic reward learning task with either social (an animation of a smiling face) or non-social feedback (an animation of gold coins) in counterbalanced order. Reward probability of the two stimuli were 70:30. Behavioral indices were compared between groups. Computational modeling was used to characterize decision-making. Results: The WS group made more correct choices after social feedback ($p<.01$), the opposite pattern was seen in ID ($p<.01$) and no effect of condition in TD (group x condition interaction, ($p <.003$). The WS group repeated successful choices more often after social than non-social feedback ($p<.05$), indicating enhanced reward sensitivity. Computational modeling indicated that WS and ID participants followed a Win-Stay-Lose Shift strategy (WSLS) where behavior is only updated according to the most recent outcome. TD participants behavior was captured by the Rescorla-Wagner rule which updates expected values of actions gradually. Conclusions. Social rewards lead to optimal decision-making in WS. However, this effect is most likely to follow directly after rewards and may not lead to long-term learning of action values.

1-C-90 Reading instruction causes changes in category-selective visual cortex

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Education sculpts specialized neural circuits for skills like reading that are critical to success in modern society but were not anticipated by the selective pressures of evolution. Does the emergence of brain regions that selectively process novel visual stimuli like words occur at the expense of cortical representations of other stimulus categories like faces and objects? The "neuronal recycling hypothesis" posits that over the course of learning, the computations required for the novel function find their neuronal niche in a related circuit (high level visual cortex in the case of literacy), and that the learning process involves competition between the novel function (e.g., word recognition) and an evolutionarily older function (e.g., face or object recognition). However, to date, this hypothesis has only been evaluated with correlational methods. Here we report the first randomized controlled trial designed to

measure changes in the topography of high-level visual cortex that are caused by reading instruction. Pre-literate children (five years of age) were randomly assigned to intervention programs that either taught reading skills (Letter Intervention) or oral language comprehension skills (Language Intervention). Magnetoencephalography (MEG) data collected longitudinally (before and after the interventions) revealed that being assigned to the Letter versus Language Intervention induced different changes in category selective responses in high-level visual cortex. The Letter Intervention enhanced the response to text but we did not find strong support for the notion that words compete with other categories for cortical territory as children become attuned to this new class of visual stimuli. How these changes play out over a longer timescale is still unknown but, based on these data, we can surmise that high-level visual cortex undergoes rapid changes as children enter school and begin establishing new skills like literacy.

1-C-91 White matter and reading: Longitudinal changes, not individual differences, predict reading development

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Past studies have linked differences in the white matter (WM) and academic skills such as reading. In this study, we tested two hypotheses surrounding the relationship between WM and reading: a) that brain-behavior relationships reflect static traits of the individual or b) that WM and reading comprise a dynamic system that changes over time in relation to learning. To explore these hypotheses, we leveraged a four-year longitudinal dataset (PLING) and four large-scale datasets (HBN, ABCD, PING, HCP). To examine the dynamic relationship between longitudinal changes in WM and reading, we used the PLING dataset to construct a series of linear-mixed effects models. These models showed that changes in the WM are linked with gains in reading scores. We then generated an mlVAR model to explore the dynamics between the timeseries of reading and WM development. This model showed that gains in reading skills predict changes in the WM, whereas changes in the WM do not predict gains in reading. After establishing a longitudinal link between WM and reading development, we then sought to replicate past findings which have shown that individual differences in the WM predict reading skill. In four large-scale datasets, univariate group comparisons revealed no difference in the WM properties of struggling and typical readers. We then trained gradient-boosted random forest models on both diffusion and demographic data to predict individual reading scores. These models consistently showed that WM did not improve predictions above demographic factors. In summary, we find that static WM properties do not predict reading skill but rather, that WM and reading are dynamically linked and may change in response to an individual's educational context over time. We expect that in future longitudinal studies, such as ABCD, gains in reading scores will predict subsequent changes in WM and that the magnitude of this relationship will be moderated by an individual's educational environment.

1-C-92 Newborns' sleep during auditory stimulation: The role of perinatal memory and stimulus familiarity

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Research addressing prenatal learning has shown that late-term fetuses are capable of learning and remembering speech as early as 34 weeks of gestational age (GA) and that this processing is influenced by the maternal voice. It has also been shown that human speech rhythms entrain the amplitude and phase of oscillations in the auditory cortex, while it is not clear if the same holds true before birth and/or in newborns. We therefore here investigate the role of maternal speech and rhyme familiarity in newborns just 2 and 5 weeks after birth. We recorded 29 pregnant women in our experimental group (EG) and 16 pregnant women in our control group (CG), who were repeatedly presented with a familiar nursery rhyme (FR) spoken in the familiar maternal (FV) or an unfamiliar female voice (UV) to the fetus (at 80dB) twice a day from 34 weeks GA onwards. Two and five weeks after birth the rhymes were replayed to the infants for 3 min each. Postnatal EEG was recorded in four auditory stimulation (3 iterations of 1min each) conditions in all voice and rhyme combinations. Each stimulation phase was preceded by a 3min baseline phase with no auditory stimulation. Brain responses were captured using 128 hdEEG. Accompanying video recordings were used for movement assessment and artefact correction. Our analysis utilizes a speech envelope to EEG amplitude coupling, serving as a direct speech-to-brain entrainment measure. Mutual information was used as the coupling metric on the Hilbert transformed amplitude data. Maternal voice (FV) lead to a stronger coupling between speech and the brain signal at 1Hz (sentence) for both experimental and control group. Results indicated that even sleeping baby brains (days after birth) couple more strongly to the familiar maternal voice. Prenatal rhyme exposure also seems to habituate babies to the "noisy" environmental setting, resulting in more/deeper (QS) sleep and lower heart rates. A comprehensive follow-up study is ongoing.

1-C-93 Statistical Learning in the Child Brain

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Statistical learning allows humans--from neonates to adults--to extract meaning from the regularities surrounding us. But our ability to do this across development belies important differences in how statistical learning changes with neural development. A host of brain regions respond to statistical structure in adults, including the basal ganglia, hippocampi, ventromedial prefrontal cortex, and inferior frontal cortex. However, these regions also change dramatically with development structurally, and thus with implications for function. Moreover, these changes occur on different developmental timescales leading to the possibility the child brain relies on different regions to complete this fundamental learning. To better understand how the neural architecture of statistical learning changes from childhood to adulthood, we had 9-10-year olds and adults complete a statistical learning task during fMRI. First, we compared activation during structured image presentation to activation during random image presentation, and found that both children and adults engaged regions previous associated with statistical learning, like inferior frontal gyri, hippocampi, lateral occipital cortices, and basal ganglia (esp. on the left). We additionally saw engagement across ages in fusiform gyrus and entorhinal cortex, as well as superior parietal cortex. A direct comparison of children and adults revealed subtle differences in activation patterns: adults engaged middle frontal regions more than children, while children showed more activation in the basal ganglia (especially the putamen) and superior temporal cortex than adults. Within the hippocampus, children showed more posterior activation than adults. Alongside ongoing

analyses examining 1) the representational structure of statistical memories and 2) learning rate in different regions and ages, these data provide the first investigation of how visual statistical learning is functionally supported by the child brain.

1-C-94 Surprise, surprise! Will generating predictions enhance surprise and declarative learning in adolescents and adults?

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Surprise is a driving force of learning. It occurs when a mismatch is detected between internally generated predictions and feedback from the outside world. Recent findings suggest that surprise during declarative learning can be enhanced by asking participants to deliberately make a prediction before presenting them with new information. Here, we examine whether making predictions triggers different learning systems relative to basic memorisation. Because predictions and feedback may differently affect learning across development, a comparison will be made between adolescents and adults. We aim to enrol 45 adolescents (11-13 y/o) and 45 adults (20-25 y/o), 33 of whom have been included so far. Participants learn numerical trivia facts in the form of "? out of 10", (e.g., 7 out of 10 animals are insects), while lying in the scanner. In the prediction condition, they make a prediction before seeing the correct answer. In the repetition condition, they see the correct answer immediately and are asked to repeat back the answer after a short delay. After scanning, participants' memory is assessed, and they are asked to state how surprised they are about each fact. FMRI analyses will primarily focus on striatum, medial temporal lobe (MTL), and prefrontal cortex regions. We hypothesise that the repetition condition will draw upon brain circuits classically associated with declarative memory formation (e.g., MTL), whereas learning from predictions will additionally recruit regions associated with feedback-based learning (e.g., striatum, anterior cingulate cortex). We further expect this activation to be modulated by the strength of the expectancy violation (i.e., the absolute difference between the predicted outcome and the correct answer), and to predict memory accuracy. Finally, based on pilot data we hypothesise that adolescents will show a larger benefit of prediction-based learning than adults, which may be reflected in enhanced recruitment of striatum and/or PFC.

1-C-95 Development and variability of fronto-limbic connections: Impact of vulnerability conditions on habit formation.

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In adults, an effective and limited recruitment of the prefrontal cortex (PFC) with a relatively lower reward processing allows behaviors to be transformed into habits. In adolescents, a persistent and variable recruitment of PFC associated with a greater cognitive demand is observed together with an increased short-term excitability of reward system, leading to less desensitization of the reward value necessary for the establishment of habits. In contexts of low socioeconomic status (SES), lower PFC activity, greater sensitivity to reward and less behavioral flexibility are observed in adolescents with a more frequent acquisition of maladaptive habits. Using the Slip Action Task (SOAT) with EEG in a sample

of 192 subjects to cover the range of 10-30 years old, we will provide the first neurodevelopmental characterization of habitual behavior. During different phases of this task the stimulus (or responses) are modified in the rewarding value (devaluated). The adaptive participant responses (reward devaluation sensitivity, DSI) evaluate the tendency towards the formation of habits. Preliminary results show a peak in adolescents consistent with our hypothesis in reduced sensitivity to devaluation, indicating that they remain goal-driven, with habitual responses increasing through age 20 ($p < 0.001$). Thus, adolescents showed a higher DSI compared to adults, reflecting a persistent appraisal of stimulus reward that undermines habit formation. To study the impact of SES, a sample of 60 adolescents that differs in SES will be recruited in Argentina at the peak of the effect observed. We will make comparisons between high and low SES in behavioral performance and EEG measures. We expect a facilitation in the generation of habits (less sensitivity to devaluation) in conditions of vulnerability with loss of flexibility marked by the low response of PFC. Therefore, we also expect greater variability in neurophysiological measures.

1-C-96 Social influence on adolescent exploration in uncertain environments

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Social learning allows humans to adapt to a vast range of environments. However, the impact that social information has on people's decisions changes over the lifespan. In adolescence, sensitivity to what others do peaks: teenagers push each other to engage in risky driving, petty crimes, unprotected sex, and starting to use drugs. While these are often taken as examples of poor decision-making, research began to look at such increased sensitivity as a potentially adaptive strategy that responds to the needs of a specific environment. Adolescence is a period of great uncertainty. Research has shown that when decision-makers experience much uncertainty, social information use is beneficial. In this project, we investigate the adaptive potential of adolescents' social sensitivity in a vast, uncertain environment. We use a combination of agent-based simulations, computational modeling, and a behavioral experiment to determine under which environmental conditions adolescents' social sensitivity might be adaptive. In the experiment, participants are asked to explore multi-armed bandits and try to maximize their earnings. While doing so, they can observe the decision of a group of 4 other players, who previously explored the environment themselves. We ask 1) whether adolescents are more sensitive than adults to social information stemming from fellow players, 2) whether this increased sensitivity makes adolescents more likely to find success in an unpredictable environment. We hypothesize that when the reward structure of an environment is less predictable and presents some "hidden gems", i.e. highly rewarding options which are harder to find, a mix of explorative behavior and sensitivity to social information may be more beneficial than harmful. These results would imply that an increased tendency in willingness to follow others down unknown paths may be necessary to form an accurate representation of the social world and become a successful adult.

1-D-98 Neural reward responsiveness moderates the relationship between internalizing symptoms and problematic media use in early adolescence

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Problematic media use (PMU) is the excessive use that interferes with daily functioning (Domoff et al., 2019, 2020), and affects between 1 and 9% of adolescents (Gentile et al., 2017). Vulnerable youth with underlying mental health concerns are at increased risk for PMU (Magis-Weinberg et al., 2022). Reward responsiveness emerges as a potential mechanism underlying this association considering that disruptions in reward sensitivity have been implicated both in PMU (Deng et al., 2021; Vargas et al., 2022) and in internalizing disorders (Luking et al. 2016). In this pre-registered study, we will investigate whether PMU increased over a year, especially for youth with higher internalizing symptoms at baseline in the ABCD study. In addition, we will explore whether this potential increase is moderated by neural reward responsiveness. We will first describe rates of PMU in a U.S. national sample of youth (10 - 14 years). We will explore cross-sectional associations between PMU, internalizing symptoms and reward responsiveness in Month 24 data. We will conduct longitudinal analyses to test for an increase in parental reported PMU between Month 24 and Month 36, controlling for levels of parental reported internalizing symptoms assessed with the Child Behavior Checklist and neural reward responsiveness in the Monetary Incentive Delay (MID) task at Month 24. Exploratory analyses on one half of the data (N = 5631) will inform our pre-registration and guide confirmatory analyses on a second half (N = 5612). We hypothesize that PMU levels will increase for youth with underlying mental health vulnerabilities (Magis-Weinberg et al., 2022). The relationship between internalizing symptoms and PMU will be moderated by reward responsiveness in reward related regions (ventral striatum, orbitofrontal prefrontal cortex). These effects would demonstrate disordered reward processing as one of the underlying neural mechanisms linking mental health vulnerabilities and maladaptive media use.

1-D-99 Representational Similarity of Decision Making for Self and Peer in Nucleus Accumbens Predicts Adolescents Risk Taking and Susceptibility to Peer Influence

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Background: Adolescence is a period marked by increased risk-taking behaviors; peers play a significant role in this process. One way in which peers might influence risk-tasking is as the objects of vicarious risks. Adolescents begin to engage in vicarious decision-making during which their risky decisions impact others, but little is known about the neural representation of these risks and its corresponding implications. Objectives: This study uses representational similarity analysis to investigate the neural representation of adolescents' decision-making for themselves and their vicarious decision-making for their best friends. We examined whether greater neural similarity for self and peer in the nucleus accumbens (NACC) predicted adolescents' risk taking and peer influence. Methods: 169 adolescent participants completed a risk-taking task during an fMRI scan, in which adolescents made risky decisions for themselves and their best friends. Adolescents completed self-reported surveys after scanning. Results & Discussion: We found substantial individual variation in the way adolescents represented themselves and peers in the NACC while making decisions. Adolescents with greater neural similarity in the NACC for the self and best friend during risk taking were more likely to engage in risk-taking behaviors, associate with peers who engage in negative behaviors, be susceptible to peer influence, and use drugs in the next 12 months. This result further supports the importance of peer influence in adolescent development, especially with regard to the onset of externalizing behaviors and the peer

situations that might predict them. Significance: These findings yield important insight into the brain mechanisms contributing to individual differences in peer influence susceptibility and health-related outcomes among adolescents. Findings may be informative for future prevention and intervention strategies designed to decrease adolescent risk taking.

1-D-100 Do neurodevelopmental trajectories of emotional reactivity across adolescence predict wellbeing during adulthood?

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Adolescence is well known for its rise in emotional reactivity, both in terms of frequency and intensity (Dahl, 2004). Traditionally, emotional reactivity has been linked to maladaptive adolescent behaviors such as substance abuse and risk-taking. Adolescence is also the time when most mental disorders emerge (Paus, Keshavan, & Giedd, 2008). Together, these findings have led to the hypothesis that adolescence may be a sensitive period for negative developmental consequences. Recently researchers have argued that the behavioural and neural changes in emotional reactivity also pose opportunities for positive development, such as increases in helping (Telzer, 2016). Possibly, emotional reactivity results in negative or positive developmental trajectories depending on the environment in which adolescents grow up (Schriber & Guyer, 2015). The present study is part of a 12-year longitudinal study, called 'Braintime'. Participants were recruited from a community sample in the Netherlands and were between 9 and 25 years when they first participated in 2011 (N =299). In 2013 (N =254) and 2015 (N =243) participants came back for two additional lab visits. In 2022 we will conduct an online follow-up survey to collect behavioural data on wellbeing. We will use the Multidimensional Wellbeing Paradigm (MWP), a new tool, which was developed in co-creation with adolescents and young adults. The central aim of the present study is to examine individual differences in whether heightened emotional reactivity across adolescence, in terms of ventral striatal activation in response to rewards to the self, predicts better wellbeing during adulthood. It is expected that those individuals with higher emotional reactivity and who are growing up in a social environment with low exposure to stress and socioeconomic hardship, are more likely to show benefits in their wellbeing later in life. The present study will provide us with new insights on the neural predictors of wellbeing among youth.

1-D-102 Associations of Distinct Dimensions of Childhood Adversity with Neurobehavioral Indices of Reward Processing and Longitudinal Psychopathology

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Objectives: The present study examines whether distinct forms of early adversity--threat and deprivation--exhibit similar or distinct associations with neural and behavioral indices of reward processing. We additionally examine whether these indices of reward processing are associated with increases in symptoms of depression and externalizing psychopathology over a two-year follow-up period and serve as either a moderator or mediator of the link between early-life adversity and changes in youth psychopathology, as prior findings are conflicting with some demonstrating evidence for

reward processing as a moderator and others as a mediator of the adversity-psychopathology association. Methods: Youth aged 10-13 and their caregivers participated in two waves of data collection between 2016 and 2019. At baseline, continuous measures of adversity experiences reflecting threat and deprivation, behavioral approach motivation (total points earned on a monetary incentive delay [MID] task), reward reactivity (difference in RT between high and low reward trials on the MID), resting-state functional connectivity in the fronto-striatal network (between ventromedial pre-frontal cortex and three areas of the striatum: caudate, putamen, and nucleus accumbens), and psychopathology were assessed. At the second wave, psychopathology was assessed. Analysis: We will estimate multivariate models examining threat and deprivation, independently and jointly, as predictors of concurrent and prospective psychopathology (N=227); fronto-striatal resting-state functional connectivity (N=165); and behavioral (N=210) indices of reward processing. We will conduct mediation analyses and estimate interaction models evaluating reward processing as a mediator and moderator of the association of threat and deprivation with concurrent and longitudinal psychopathology. Analyses will control for age and sex and those predicting longitudinal psychopathology will control for baseline psychopathology.

1-D-103 Self-report, physiological and behavioral measures of reward processing and their relation to brain functional connectivity in adults and adolescents

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Adolescence is a period with increased sensation seeking and reward sensitivity. This has been linked to functional brain connectivity between reward-processing regions (e.g. the striatum) and prefrontal control regions. Here, we aim to characterize and relate different measures of reward learning and reward processing behavior in adolescents and adults to resting state brain functional connectivity. The study will include 40 adolescents (13-17 years) and 40 adults (30-40 years) typically developed and without confounding somatic or psychiatric conditions. Data collection is ongoing and will be finished in May 2022. Participants answer the self-report Reward Responsiveness subscale from the BIS/BAS scale, complete a probabilistic reward learning task concomitantly with measures of pupil size, and undergo resting-state functional magnetic resonance imaging (fMRI). Self-reported reward responsiveness, behavioral measures of win-stay and lose-shift strategies, and pupillary responses to wins and losses will be compared between adolescents and adults using appropriate between-group tests. We hypothesize that adolescents will (1) report higher reward responsiveness, (2) be more explorative than adults and thus to a lesser degree use a win-stay strategy, and show different pupil dilation patterns than adults. We further expect self-reported reward responsiveness to be positively related to pupillary responses to wins and losses, assessed using correlation analyses. We have non-directional hypotheses about the relation of these measures to brain functional connectivity, but will in addition to exploratory analyses focus on seed-based (striatum) connectivity to prefrontal cortex. Thus, this study will combine self-report, physiological and behavioral measures of reward processing with brain functional connectivity to further our knowledge of reward-related function in adolescence and its development into adulthood.

1-D-104 Development of Corticostriatal Connectivity During Adolescence Supports A Dorsal-Ventral Gradient of the Human Striatum

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Adolescents undergo pronounced changes in neurodevelopment, including increased development of striatal pathways linked to reward-driven behaviors. Seminal work in animal neuroscience suggests that ventral (VS) and dorsal (DS) subdivisions of the striatum are topographically organized: the VS is connected to brain areas involved with reward processing, while the DS is connected to areas implicated in higher-order cognition. However, the functional development of this topographic organization in the human striatum, and how it changes during adolescence, is poorly understood. As such, the present work examined longitudinal changes in resting-state functional connectivity (FC) of DS and VS to address this gap. 132 participants aged 11-23 completed a resting scan at baseline, with subsequent scans every two years across four assessment waves. A seed-based approach was employed and target ROIs were selected based on anatomical tracing studies of VS and DS in primates. Generalized additive mixture models were used to evaluate age-related changes in FC, correcting for the false discovery rate. Findings revealed that VS FC with ROIs implicated in reward processing (e.g., medial orbitofrontal cortex) steadily increased from childhood to adulthood, whereas VS FC between ROIs associated with higher-order cognition (e.g., dorsolateral prefrontal cortex [dlPFC]) steadily decreased over this same period. In contrast, DS FC with dlPFC increased from childhood to adolescence and stabilized in early adulthood. DS FC with reward ROIs showed no age effects. Results suggest that the development of frontostriatal connectivity follows a ventral-to-dorsal gradient where VS and DS pathways exhibit functional segregation that increases during adolescence. Taken together, these results concur with a ventral-dorsal divide of striatal connectivity, aligning anatomically defined striatal projections in nonhuman primates to functional connectivity derived using human neuroimaging.

1-E-17 The relation between kindergartener's home math environment and neural representations of number

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Prior to formal schooling, caregivers provide the primary source of children's math learning. Extensive research shows that a network of parietal, temporooccipital, and prefrontal brain regions support numerical processing and math abilities across development. Adult neuroimaging work suggests that neural representational structure of non-symbolic numbers (i.e., dot sets) reflects the ratio between quantities, while the structure of symbolic numbers (i.e., Arabic numerals) may reflects the joint frequency with which numerals cooccur. In the present study, we examine the neural representational structure of symbolic and non-symbolic numbers in relation to children's home math environment (HME) at school entry. Children (N = 31; 5-6 years old) viewed symbolic and non-symbolic numbers during fMRI and their caregivers completed a questionnaire about the HME. Using representational similarity analysis, we tested whether neural representations were organized based on Ratio or Frequency models and whether this structure was related to children's HME. For symbolic numbers only, we found evidence for a Ratio-based model in the right middle frontal gyrus and a Frequency-

based model in the right inferior temporal gyrus. We also found evidence that, for symbolic numbers only, a supportive HME was positively associated with a Ratio-based representational structure in the left inferior parietal lobule, but negatively associated with a Frequency-based representational structure in the left parahippocampal gyrus. Our findings show that kindergarteners encode symbolic numbers in multiple representational structures across distinct brain regions, and children's HME may differentially shape these neural representations. These findings are in line with the late emergence of symbolic quantity processing in the left parietal cortex and demonstrate the importance of early home academic support for setting the foundation for typical brain development.

1-E-105 Development of Fake news detection during adolescence

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The spread of online fake news is emerging as a major threat to human society and democracy. Although, previous studies in adults converged to show that the ability to differentiate between fake and real news involved to overcome reasoning biases, no study has investigated media truth discernment during adolescence. Yet, Adolescents due to cognitive and socio-affective specificities might be at greater risk to believe fake news in particular those shared on social media. In the present study, we investigated 1) media truth discernment from adolescence to adulthood, 2) the role of the resistance to cognitive biases in fake news detection and 3) the effect of familiarity of the news on the perceived accuracy. To do so, we recruited 432 adolescents from a middle school (6th graders, 7th graders, 8th graders, 9th graders) and 132 adults. Participants had to rate the perceived accuracy of real news and fake news items. To examine whether prior exposure to fake news increase perceived accuracy of the fake news (i.e. illusory truth effect) at all age, participants were familiarized with half the items during a first stage of the paradigm. Participants had also to solve items of the Cognitive Reflection Test (CRT) and the belief bias task (syllogisms) to measure their ability to overcome reasoning biases. Results confirmed that the illusory truth effect exists at all age given that familiarized headlines were perceived as more accurate than novel news. Critically, our findings revealed that media truth discernment develops linearly with age. In addition, the relation between age and media truth discernment was partially mediated by the ability to override intuitive biased responses. Taken together, these results provide new cues to help the development of media truth discernment in adolescence through specific pedagogical interventions.

1-E-106 Predicting Developmental Consequences: a new methodology for policy-focused research

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One of the primary goals of DCN research in recent decades is to chart out developmental trajectories of brain and behavioral phenomenon. For instance, we have well-developed methods for characterizing individual differences in change over time, with models that allow us to identify, for instance, adolescents who show greater increases in ventral striatum response during the teen years than their peers. However, missing from many of these studies is a natural follow-on question: what these

individual differences ultimately mean for real-world outcomes in youths' lives? Similarly, there has been a lack of methodological developments in addressing the unique challenges of predicting distal outcomes in longitudinal models. Using longitudinal data of risky behavior and college achievement in college students (N = 400, ages = 18 - 22), I demonstrate a new conceptual and statistical approach for modeling the consequences of developmental trajectories using growth curve models with distal outcomes (GCM-DO). Results show that, in contrast with standard growth models, the choice of intercept is fundamentally important for GCM-DOs and impacts both the sign and precision of the distal outcome prediction. For instance, estimating the intercept at the initial wave results in a negative effect (i.e., greater increases in risk behavior predicted reduced college achievement), while estimating the intercept at the final wave results in a positive effect. Despite the key difference between these models being our choice of intercept, the effect of the intercept on the outcome does not change. Using simulations, I explore the causes of these unintuitive effects and propose a principled approach to intercept choice in GCM-DOs and the use of interactions to model joint (rather than unique) effects. The results provide initial advances in the modeling of GCM-DOs and a framework with wide applicability to many fundamental and policy-oriented research questions.

1-F-108 Relationships between apparent cortical thickness and working memory during development and across the lifespan - effects of genetics and socioeconomic status

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Working memory (WM) supports several higher-level cognitive abilities, yet we know less about factors associated with development and decline in WM compared to other cognitive processes. Here, we investigated lifespan changes in WM capacity and their structural brain correlates, using a longitudinal sample including 2358 magnetic resonance imaging (MRI) scans and WM scores from 1656 participants (4.4-86.4 years, mean follow-up interval 4.3 years). 8764 participants (9.0-10.9 years) with MRI, WM scores and genetic information from the Adolescent Brain Cognitive Development (ABCD) study were used for follow-up analyses. Results showed that both the information manipulation component and the storage component of WM improved during childhood and adolescence, but the age-decline could be fully explained by reductions in passive storage capacity alone. Greater WM function in development was related to apparent thinner cortex in both samples, also when general cognitive function was accounted for. The same WM-apparent thickness relationship was found for young adults. The WM-thickness relationships could not be explained by SNP-based co-heritability or by socioeconomic status. A larger sample with genetic information may be necessary to disentangle the true gene-environment effects. In conclusion, WM capacity changes greatly through life and has anatomically extended rather than function-specific structural cortical correlates.

1-F-109 Representational Similarity in the Toddler Hippocampus

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The development of the hippocampus has been linked to the ability to remember the past events with specific details. This ability begins to emerge in infancy, but little is known about the degree of

specificity and distinctiveness of hippocampal representations in infancy and early childhood. Here, we sought to utilize Representation Similarity Analysis (RSA) to investigate the degree to which patterns of hippocampal activation can differentiate between experienced events, similar events, and novel events. Forty-six 2-year-olds toddlers participated in a tablet-based game that required remembering associations between unique characters, the places they visited, and the temporal order of the choices. A novel song was played at the end of each game. Toddlers' functional scan was acquired during natural, nocturnal sleep after participating. The functional scan included 9 20-seconds blocks of song, interleaved by 20-seconds blocks of silence. Three different conditions of songs were presented: one of the songs heard during the laboratory visits (Target), a version of one of the two heard songs (Reverse), and a song novel to the child (Novel). We used RSA to compare the degree of similarity between Target-Reverse, Target-Novel, and Reverse-Novel. Greater similarity was observed for Target-Reverse compared to Target-Novel ($t(45) = 2.87$, $p = .006$), suggesting that some features of an old song are recognizable/processed regardless of whether the characteristic melody (specific to forward played songs) is present. Given that the reversed song could be either the Target song played backward or the reversed version of the other learned song, we suggest that these similarity scores capture elements of the episodic context (rather than merely the sensory elements of the song). In conclusion, our RSA results suggest that hippocampal activations during toddlers' sleep can capture contextual cues of an episodic event.

1-F-110 Reliability of cortical signal processing is driven by glutamate maturation, and supports working memory development

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Postmortem animal & human models indicate changes in excitatory (E, via glutamate; Glu) and inhibitory (I, via Gamma-Aminobutyric Acid; GABA) neurotransmitters through adolescence suggestive of critical period plasticity supporting cognitive development (Larsen & Luna, 2018). E/I balance would enhance cortical signal-to-noise ratio (SNR) as spontaneous, asynchronous firing shifts to evoked synchronous firing. How neurotransmitter indices of age-related changes in E/I balance support enhanced SNR in humans, is not known. We acquired EEG during an auditory steady state task and a memory guided saccade (MGS) task, and 7T magnetic resonance spectroscopic imaging (MRSI) at rest from 148 subjects (ages 10-30, 77 F). Frontal evoked activity was quantified as the mean-squared amplitude from the auditory steady state task in the 50-200ms following onset of the auditory cue, and spontaneous activity was measured as the average standard deviation of activity per trial. We used linear mixed-effects models to compare EEG measures to MRSI-derived measures of PFC GABA & Glu in the same participants (Perica et al, Flux 2021), and to MGS data acquired in the same EEG session. As expected, significant age-related decreases were found in performance variability in the MGS task ($p=4.0e-07$). The difference between evoked and spontaneous frontal EEG increased with age ($p=8.1e-05$), driven by decreases in spontaneous activity ($p<2e-16$), consistent with increased cortical SNR. Increased SNR was associated with the deviation of Glu levels from their age-adjusted mean in both the MPFC ($p=0.003$) and DLPFC ($p=0.23$) in adolescents (10-18yo). Finally, higher SNR was associated with less variable responses on the MGS task ($p=0.02$). These findings provide evidence that SNR is

enhanced in conjunction with increases in E/I balance supporting a model for critical period plasticity through adolescence supporting cognitive maturation.

1-F-111 Can we decode school-aged children's working memory contents? Our proof-of-concept study suggests so.

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Objective: Understanding how children maintain information over brief periods of time is important yet elusive, as behavioral measurements tend to rely on difficult concurrent processing tasks, hard-to-understand maintenance instructions, or verbal reports that require accurate insight into one's maintenance strategies. We thus aimed to develop and verify a means of measuring working memory maintenance that is independent from task demands, and that allows children to process information spontaneously. Methods: We devised a simple computerized working memory game without any instructions on how the information should be maintained. We collected electroencephalography (EEG) data from 13 children (7-12-year-olds) while they played the game. We used Multivariate Pattern Analysis (MVPA) to examine if EEG signals during the maintenance period could distinguish between 3 categories of maintained information (visual, spatial, verbal). Results and conclusions: The average decoding accuracy across the entire maintenance period was well above chance (33%), at about 60%. When considering the decoding across time, the decoding accuracy was significantly above chance within the first 500ms of the maintenance period, according to a Bonferroni-corrected paired t-test with 1000 permutations. This shows that early during working memory maintenance, children's brains differentially maintain information belonging to the three most common object categories used in working memory research. Significance: As the first study of its kind, our proof-of-concept showed that with a simple child-friendly task and MVPA of EEG data, it is possible to peer into the uninstructed representational content of children's working memory. This suggests the utility and sensitivity of MVPA for investigating said representational content, and opens the door to further investigations into its nature and stability, as well as the strategies that children spontaneously use to maintain it in working memory.

1-F-112 Age related differences in the effect of depressive symptoms on working memory for social and non-social relationships

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Introduction: During adolescence many social and cognitive functions continue to develop (Andrews et al., 2021). For example, working memory (WM) capacity continues to mature. However, less is not known about the extent to which WM differs in social vs non-social contexts across adolescence. Developmental differences in the processing of social, especially negative social information, vs. non-social information may further vary as a function of individuals' levels of depressive symptoms, which have been shown to influence WM capacity (LeMoult & Gotlib, 2019). Study Objectives: This current study will therefore examine age-related differences in the degree to which WM capacity varies by context (social vs non-social), depressive symptoms, and valence (positive or negative information).

Methods: To do this, we designed a novel network memory task (NMT). The NMT comprises 3 network conditions: social-self: friendship networks including the participant; social-other: friendship networks not including the participant, and non-social: flight networks. Within each condition, participants will be presented with 12 networks displaying the relationships between 3-4 people (social) or flightpaths between 3-4 cities (non-social). Following the presentation of each network, they will be shown 3 connections and asked whether the connection shown was present in the network. Reaction time and accuracy will be collected. Participants will be aged 11-65 years. Analysis/Hypotheses: Using a mixed model approach we will test our hypotheses that (1) adolescents will more accurately and quickly classify social vs non-social associations than adults; that this effect will be highest in the social-self condition. (2) Individuals with higher depressive symptoms will classify negative vs positive associations more accurately and quickly. This effect will be stronger in adolescents compared to adults and will be greater in the social vs non-social conditions.

1-F-113 Functional Interactions during Consolidation of Memories in Newborns

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Introduction Only a few days after birth human infants can recognize the sound of a previously heard word [1]. However, they fail to recognize a familiar word when interfering information is presented in the retention interval between the encoding and the recognition test [2]. At least two proposals can explain this retroactive interference phenomenon: A. a storage-based hypothesis, which presupposes a failure in recognition due to limitations in the number of items that can be stored, or B. a consolidation-based hypothesis, which assumes that newborns require protracted consolidation periods. The aim of the present study was to evaluate the second hypothesis. Methods Forty healthy full-term newborns (13 males; mean age: 2.8 days, range: 2-5 days) were tested on their ability to recognize the sound of a word after interfering sounds. The experiment consisted of an encoding phase and a test phase separated by a retention interval of 4 minutes (2 min of silence + 2 min of interfering stimulation). During the test phase, brain hemodynamic responses to were assessed with fNIRS over 24 channels grouped in 6 ROIs: frontal, temporal, and parietal areas of both hemispheres. Effective connectivity analysis among the ROIs was performed with SEM. Differences between the models were assessed using the "stacked model" approach [4]. Results and Discussion Permutation tests revealed significantly stronger hemodynamic responses to novel than to familiar sounds ($p = 0.006$, Bonferroni-corrected) in the right-frontal (RF) region [see also 2,3]. Moreover, the RF showed the strongest effective connections with the parietal areas bilaterally which are implicated in the process of consolidation and long-term retrieval of memories in human adults and non-human animals [5-6]. The findings support the hypothesis that short silent resting periods are effective consolidate newborns' fragile memories, turning them resistant to interference.

1-F-114 The Temple Tour: Neural coding of episodic and spatial representations in children and adults

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Navigation and episodic memory are two fundamental cognitive processes that guide mature decision-making. Conceptually, they are linked by reliance on accurate retrieval of spatial and temporal context and accurate integration of different types of information. However, the extent and nature of interdependence at behavioral and neural levels are unclear, with some recent evidence suggesting they are mechanistically distinct. In this study, we investigate how spatial navigation and episodic memory relate to each other behaviorally and how they are represented in the medial temporal lobe in children and adults. We developed a real-world tour task in which children (8-13 years) and young adults took a guided walk through a novel environment and encoded sixteen distinct events. Next, they experienced a second encoding event in a testing room that was episodically rich but devoid of a spatial component. We assessed knowledge of the environment (only tour encoding) and episodic recollection of the events (both tour and room). On the second day, participants received an fMRI scan while viewing images of the tour and room objects, along with brand new objects. In ongoing analyses, we will isolate areas of BOLD activation and contrast neural representations of the tour, room, and new objects, teasing apart nuances in the neural representation of the spatial (tour v room) and episodic components (room v new). We will focus specifically on the hippocampus, a region historically implicated in both episodic memory and spatial coding, isolating the long-axis and subfield segmentations to inform possible variable coding of these closely related systems. Currently, we have 26 adults and 4 children and will present data from a full adult sample (N=40) and a partial child sample (N~20). These data will inform the developmental trajectory of the neural coding underlying spatial and episodic memory systems and tease apart how they relate both overall and componentially.

1-F-115 Developing a child-friendly paradigm to explore neural mechanisms underlying pattern separation

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Pattern separation (PS) is a process by which neuronal activation patterns underlying similar memories are made distinct to counteract interference at retrieval (Norman & O'Reilly, 2003). Although it cannot be measured directly in vivo; it can be inferred from performance on a mnemonic similarity task (MST) in which participants encode pictures and then discriminate from memory those they saw at encoding (Targets); new pictures (Foils); and pictures that are similar but not the same as the encoded pictures (Lures). Adult studies have shown differences in hippocampal activation to Targets and Lures. Child studies have shown that hippocampal structure relates to one's ability to form precise memories via PS. However, we have yet to establish in early childhood whether there are functional hippocampal changes during a MST and whether hippocampal function relates to PS development. To address these gaps, we developed a passive viewing, block design MST where participants encode 60 pictures outside the scanner, passively view 30 in the scanner, and complete an active retrieval after the scan. We investigated: 1) whether anterior and posterior hippocampus show differential activation to Targets, Lures, and Foils during passive viewing and 2) whether neural response magnitude relates to behavioral performance outside of the scanner, measured via a Lure Discrimination Index (LDI), which indicates how well participants distinguish targets and lures. We have recruited 17 adults to test this paradigm. We found significant differential activation for Target>Rest in posterior hippocampus (t=1.83, p =.043),

Lure>Rest in anterior hippocampus (t=1.92, p =.037), and Foil>Rest in posterior (t=2.64, p =.009), anterior (t=3.07, p =.004), and whole hippocampus (t=2.84, p =.006). Multiple regression revealed that neural response magnitude did not predict LDI. We plan to double our sample before the meeting and recruit a child sample.

1-F-116 To remember and reinstate: How neural reinstatement of memory representations differentially evolves over time in children and young adults

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Memory consolidation evolves over time and involves interactions between medial temporal lobe (MTL) and neocortical structures. Thus far, little is known about how extended developmental trajectories of brain maturation may affect memory consolidation processes. In this fMRI study, 6-year-old children (n = 37, 15 females), and young adults (n = 36, 16 females) first learned object-location associations to a high level, which were then retrieved after one night (short delay) or two weeks (long delay). As a pre-registration analysis, we plan to apply representational similarity analyses (RSA) of brain activity pattern to examine differences in reinstatement of unique object-location associations between short and long delay. Our behavioural results showed that: (i) short delay memory retention rates declined only in children but not in adults; (ii) long delay memory retention rates declined in both age groups, but the decrease was steeper in children. For the RSA analyses of correctly retrieved associations, we expect: (i) greater within- and between-subjects reinstatement effects in young adults in comparison to children in hippocampus, precuneus and parahippocampal gyrus; (ii) greater time-related decrease in reinstatement effects within the regions-of-interest in children in comparison to young adults. The planned analyses may potentially extend previous research, demonstrating that learned complex visuo-spatial associations can be reliably reinstated not only within short time delay, but also after extended delay of two weeks, and importantly, how these reinstatement patterns evolve differentially over time in the maturing brain.

1-F-117 Is Hippocampal Connectivity Related to Nap Status?

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In early childhood, memory abilities and hippocampal maturation increase just as children transition out of the afternoon nap. Research shows this transition is related to memory performance across a wake period. Research also shows volumetric differences in hippocampus based on nap status (napper vs non-napper). That said, the hippocampus belongs to a network of regions that shows increases in intrinsic connectivity across early childhood. Yet, no analysis has examined differences in hippocampal connectivity with these regions based on nap status. This study's purpose is to investigate relations between nap status, memory, and hippocampal connectivity. Participants will be a cross sectional sample of 3 to 5 year olds from a completed study. Each subject completed a memory task by encoding image locations on a grid. They were then tested on the image locations before (test 1) and after (test 2) a nap or wake period. To assess nap status, subjects wore an Actiwatch for two weeks prior to an MRI

scan where a T1-weighted scan and a 7 minute rsfMRI scan were collected. Hippocampal seed regions will be obtained via Freesurfer 6.0 and adjusted with ASAT. To address motion, volumes with a framewise displacement >0.05 will be scrubbed. Time-series correlations between hippocampal seeds and 6 cortical ROIs drawn from a previous study (Geng et al., 2019) will be calculated to measure hippocampal connectivity. Nap status will be calculated as: >5 naps/week = Napper, 2-5 naps/week = Semi-napper, <2 naps/week = Non-napper. We will assess whether nap status predicts memory performance and functional connectivity differences using ANOVAs. Consistent with past work, we predict that there will be accuracy differences between test 1 and 2 for nappers, but not non-nappers in the wake condition only. We also predict that non-nappers will display greater hippocampal connectivity with the selected regions compared to nappers. We have no a priori predictions about semi-nappers.

1-G-12 Maternal neglect is associated with delayed development of functional connectivity in late childhood

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Current literature suggests that parenting behavior has important implications for brain development and mental health outcomes in children. While most research to date has been conducted in cross-sectional samples and on specific brain regions/connections, longitudinal studies that use whole-brain approaches are lacking. Investigating the association between parenting and whole-brain connectivity development may provide new insights on the mechanisms linking parenting behaviours and child mental health. 240 children (126 female) underwent magnetic resonance imaging (MRI) that included a resting state sequence at wave1 (mean age=8.9 years) and wave2 (mean age=10.9 years), providing a total of 398 resting state functional MRI datasets. Parenting behaviour was assessed at wave1 using parent-report questionnaires, the Alabama Parenting Questionnaire and the Multidimensional Neglectful Behavior Scale. An exploratory factor analysis was conducted on the questionnaires and the resulting factor scores were used in analyses. Measures of child internalising (anxiety, depressive) symptoms were collected at both waves. Network-based R-statistics (NBR; an implementation of Network Based Statistic (NBS) for mixed effect models in R) was used to identify significant subnetworks where age-related changes were associated with parenting behaviour. Age was associated with widespread decreases in functional connectivity between cortical networks, and between cortical networks and the nucleus accumbens. Higher maternal neglect was associated with lower decreases in connectivity over time, particularly between the ventral attention (salience) network and the default mode network, and the frontoparietal network and the default mode network. This study suggests that functional connectivity between network decreases during childhood, and parental neglect is associated with a delayed development of functional connectivity.

1-G-13 Early childhood household instability, adolescent structural neural network architecture, and young adulthood depression: a 21-year longitudinal study

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Evidence from animal models shows that highly variable environments accelerate offspring growth and mortality, suggesting that such conditions increase the pace of development and exacerbate risk for poor health outcomes. In humans, unstable early environments are associated with greater risk for psychopathology, with recent studies suggesting that childhood instability relates to faster structural (volume; surface area) and functional (activation; connectivity) brain maturation. Less is known, however, about the effects of unstable environments on white matter networks. During development, myelination plays a crucial role in solidifying neural connections and limiting plasticity, and white matter networks become more efficient and less segregated over time. The present study examined the associations among early household instability (number of residential moves, changes in household composition, caregiver transitions in the first 5 years), structural network organization (graph analysis application on tractography connectome at age 15), and externalizing and internalizing behaviors (ages 15, 21) in a population-based sample (N=191; 53% female, 77% Black, median income $36,694). Results show that greater childhood instability relates to increased structural network efficiency in adolescence, and that these associations are distinct from the effects of other types of adversity (e.g., poverty, harsh parenting). Moreover, global efficiency indirectly explains the relationship between instability and depression during young adulthood (age 21). Further exploratory examination of regional specificity showed that structural connections of the left fronto-lateral cortex were particularly central in the associations with instability. Using prospective longitudinal data, these results suggest that instability in early life leads to accelerated development of white matter organization, which in turn, increases risk for depression in early adulthood.

1-G-14 The development of iron status during youth: implications for adolescent neurocognition

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Iron is essential to brain function, and iron deficiency during youth may jeopardize neurodevelopmental processes. Here, we characterize the development of iron status in a community-based sample of 4,899 participants from the Philadelphia Neurodevelopmental Cohort. Iron status was measured using electronic medical records of blood tests for hemoglobin, (n=30,317), ferritin (n=1,358), and transferrin (n=1,340) that spanned from ages 0-22 years. Generalized additive mixed models revealed that all iron status metrics followed nonlinear developmental trajectories, with sex differences emerging during adolescence (all R2partial >.008; all PFDR <.05) that were associated with menarche. Higher socioeconomic status (SES) was associated with greater hemoglobin throughout development (R2partial =.005; PFDR <.001). During adolescence, hemoglobin levels were dimensionally associated with cognitive performance (R2partial =.02; PFDR <.001), with the greatest association observed for executive functioning (R2partial =.02; PFDR<.001). Furthermore, adolescent hemoglobin levels were positively associated with brain white matter microstructure in the uncinate fasciculus (R2partial =.05; PFDR =.028) and superior longitudinal fasciculus (R2partial =.06; PFDR =.028). These results suggest that iron status dynamically evolves during youth, with females and individuals of low SES being at greatest risk for iron deficiency during adolescence. Diminished iron status during adolescence may have important

consequences for brain development and cognition, suggesting that this critical period of brain development may be an important window of intervention.

1-G-15 Spontaneous activity development unfolds along the sensorimotor-association axis through adolescence

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Objective: In the developing rodent brain, spontaneous activity evolves from strong and synchronized to sparse as the cortex transitions from plastic to mature. Here, we leverage that synchronized bursts in intrinsic activity are a functional hallmark of plastic cortices to characterize the unfolding of activity-indexed plasticity in the human brain. We hypothesized that age-related change in spontaneous activity would differ across the sensorimotor-association (S-A) axis. Methods: Resting-state functional MRI from 1,033 youth ages 8-23 years were processed with fMRIPrep and XCP Engine. Fluctuation amplitude, defined as the power of low frequency BOLD fluctuations, was quantified to characterize spontaneous activity levels. Associations between fluctuation amplitude and age were modeled using generalized additive models covaried for sex and scan motion. Results: Fluctuation amplitude progressively declined with age in sensorimotor regions yet increased with age until adolescence in transmodal association regions. Greater decreases in fluctuation amplitude were strongly associated with greater age-dependent increases in intracortical myelination, a key limiter of plasticity (r= -0.67; p.spin< 0.001). Cortical age effects varied according to a region's position in the S-A axis (r= 0.54; p.spin= 0.002), with a temporal sliding window analysis revealing that the correlation between fluctuation amplitude change and S-A axis rank was maximal in mid-adolescence (r= 0.68 at age 15). Lower neighborhood socioeconomic status was associated with lower fluctuation amplitude in association regions but higher amplitude in primary sensorimotor regions, thus environmental effects were stratified by the S-A axis (r= 0.48; p.spin< 0.001). Conclusions: Our findings suggest that spatiotemporal changes in cortical plasticity are governed by the S-A axis through adolescence and influenced by the developmental environment, with implications for the timing and nature of youth interventions.

1-G-118 Childhood Emotional Abuse is Associated with Delayed Brain Age in Depressed Adolescents

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Exposure to early adversity has been found to be associated with atypical brain maturation in adolescents; it is unclear, however, whether specific types of adversity are differentially associated with delayed or accelerated brain maturation. We tested this hypothesis in a sample of adolescents with Major Depressive Disorder (MDD) who experienced significant levels of early adversity. 59 depressed adolescents (16.25±1.29 years; 37 female) completed a high-resolution T1-weighted MR scan at 3T and the Childhood Trauma Questionnaire (CTQ), which examines severity of emotional, physical, and sexual abuse, and emotional and physical neglect. We used FreeSurfer version 6.0 to estimate cortical and

subcortical gray matter morphometry and applied ENIGMA MDD's BrainAge algorithm to estimate brain age. We examined linear associations between each CTQ subscale and the residualized brain age score after accounting for chronological age. Brain ages ranged from 7.73-42.69 years (mean: 23.52 ± 7.38 years). Greater severity of emotional abuse was associated with a younger brain age (β=-0.54, p<0.05. Although sex did not moderate this association, this effect was significant only in girls (β=-0.64, p=0.01), not in boys (β=-0.36, p=0.54). Consistent with recent reports showing that childhood abuse is associated with delayed brain maturation in girls, we found that greater severity of emotional abuse is associated with delayed maturation in depressed adolescents, and further, that this effect was driven primarily by girls. Our results underscore the importance of considering type of childhood adversity in attempting to understand the nature of altered brain maturation in depressed adolescents.

1-G-119 Adversity before birth alters but does not accelerate infant functional networks

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Early life adversity (e.g., poverty, stress, trauma) is linked to poorer outcomes later in life and its impact on functional brain networks can be seen in childhood. One potential mechanism proposes that adversity activates the hypothalamic-pituitary-adrenal stress pathway and prematurely accelerates the maturation of functional networks. We investigated whether an effect of prenatal exposure to adversity on functional networks: 1) could be detected at birth and 2) reflected accelerated maturation during gestation or infancy. As a part of the Early Life Adversity and Biological Embedding study, we oversampled mothers facing adversity during pregnancy and measured whole-brain functional connectivity MRI in their healthy, term-born infants after birth (n=262). Survey, health, and demographic measures were incorporated into two latent factors of prenatal adversity: Social Disadvantage and Psychosocial Stress. Support vector regression (SVR) was applied to detect multivariate patterns of infant functional connectivity related to each factor. Functional networks of offspring at birth differed as a function of the social disadvantage (R2 = 0.29; p<0.001), but not the psychosocial stress (R2 = 0.04; p=0.03), experienced by mothers before birth. Brain maturity estimated from functional connectivity with SVR was not significantly related to disadvantage or stress suggesting that, unlike postnatal adversity, prenatal adversity may not accelerate functional networks near birth. However, the effects of prenatal disadvantage were most pronounced in "late developing" networks like the fronto-parietal, ventral attention, dorsal attention, and default mode networks, potentially setting the stage for altered trajectories later in life. These findings provide insights into when and how functional networks begin to diverge in the context of adversity while prompting further investigation into the persistence and malleability of these effects beyond infancy.

1-G-120 Prenatal maternal cortisol predicts network-level functional connectivity in neonatal offspring

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Intro: A growing literature has reported a role for cortisol in shaping brain development prenatally, implicating maternal cortisol production in early neurodevelopmental outcomes (Sandman et al., 2016). One recent study reported links between prenatal maternal cortisol production and neonatal amygdala functional connectivity in a seed-based analysis (Graham et al., 2019). It is not yet clear whether these effects extend beyond cortisol receptor rich subcortical structures. Method: Maternal cortisol production, measured as diurnal area under the curve one day each trimester and averaged across trimesters, was associated with neonatal functional connectivity strength (M=41 weeks postmenstrual age) in 179 dyads. We used a published enrichment procedure to identify network pairs associated with prenatal maternal cortisol (Wheelock et al., 2019). A thresholded correlation matrix of prenatal maternal cortisol production with the neonatal connectome was used in two network-level tests, a 2-test and a hypergeometric test. Only network pairs showing more associations than expected based on 10,000 permutations in both tests are reported. Maternal socioeconomic status and infant birthweight, sex, age, and motion during the scan were covariates. Results: Maternal prenatal cortisol was associated with temporal default mode, anterior default mode, motor, and subcortical networks of an age-specific network assignment (Kaplan et al., 2022). Maternal cortisol production was positively associated with subcortical-subcortical connectivity (p=.018) and negatively associated with temporal default mode-motor network (p=.046) and temporal default mode-anterior default mode connectivity (p=.043). Discussion: These results extend the previous literature, indicating that prenatal maternal cortisol production is associated with neonatal functional connectivity in subcortical and default mode networks and may provide insight into early neural determinants of risk for psychopathology.

1-G-121 Associations between Functional Brain Network Organization in Youth and Multi-Domain Resilience to Neighborhood Disadvantage

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Resilience is a dynamic process defined as the ability to adapt positively in the face of adversity. Though a few recent studies have identified neural markers of resilience in cognitive and affective networks, limited work has been done in this area, and the broader network organization supporting resilient outcomes in youth remains unknown. Moreover, most previous work defines resilience as the absence of psychopathology, which does not account for behavioral research showing that resilience exists across multiple domains (e.g., social and academic). Thus, we used graph analysis to examine the brain network organization/topology associated with multiple domains of resilience in a sample of 555 adolescent twins (10-17yrs) recruited from neighborhoods with above average poverty levels. We used factor analysis of parent, teacher and adolescent reports to identify a general factor of resilience and three distinct factors: psychological, social, and academic resilience. Next, we conducted graph analysis on functional connectivity data from resting and task-based MRI (with task effects removed). Initial analyses using multilevel models to account for the nested nature of the data (and controlling for age, gender and race/ethnicity) revealed that differences in information flow (i.e., global efficiency; ß = -0.18,

p =.003) and overall organization (i.e., small world propensity; ß = -0.19, p =.004) of the frontoparietal network, a network implicated in executive functioning, were associated with the general factor of resilience. Future analyses will examine the brain network topology associated with specific resilience domains and explore whether these associations are moderated by the level of adversity faced by the youth. This work will provide a novel analytical approach to better understanding the neural architecture supporting resilience in at-risk youth experiencing chronic neighborhood disadvantage.

1-G-122 The developmental effects of neighborhood disadvantage on functional brain network organization in youth

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Early adversity is generally associated with altered neural structure and function supporting cognitive and socioemotional functioning. Few studies have specifically examined how neighborhood disadvantage influences brain development or how it relates to the broader topology of brain networks and functioning. Further, as windows of maturation and plasticity differ across brain systems, disadvantage may exert unique effects on brain organization depending on the timing of exposure. This study leveraged a longitudinal community sample of 557 twins sampled from neighborhoods with above-average poverty levels to evaluate the association between neighborhood disadvantage and adolescent (10-17y) network topology. Using resting-state fMRI and task-based fMRI with task effects removed, we employed graph theory to quantify (a) the degree to which the entire brain segregates into distinct networks (modularity, system segregation) and (b) the influence of four cognitive-affective networks on information flow across the brain (betweenness centrality). Initial multilevel models revealed that greater neighborhood disadvantage in adolescence was associated with lower modularity (β = -0.09, p = .012) and system segregation (β = -0.14, p = .002). These findings remained above and beyond family income, family education, harsh parenting, parental depression, age, sex, race, graph density, and head motion. By contrast, adolescent neighborhood disadvantage was unrelated to the betweenness centrality of the frontoparietal, salience, default mode, and subcortical networks (all p's > .076). These findings suggest that neighborhood poverty in adolescence may influence the topology of the entire brain rather than the centrality of specific cognitive-affective systems. Future analyses for Flux will compare associations between neighborhood poverty in childhood versus adolescence with network organization to explore potential sensitive periods in the topological embedding of disadvantage.

1-G-123 Is pubertal status in the early teens a risk factor for later internalizing symptoms in LatinX populations?

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Puberty is a time of physical and psychological change and there is large individual and ethnic variation in pubertal development. How pubertal status relative to peers affects mental health is a major question. Although studies examining puberty and internalizing symptoms have yielded inconsistent results, there are data that suggest children whose pubertal status is higher than their peers may

experience increased risk for internalizing issues. However, much of the prior research has been conducted among children in urban areas and has not always included diverse samples. Low-income and Latinx youth are particularly understudied. The present study focused on Mexican-American youth living in a predominantly agricultural area of California who participated in a longitudinal study called the Center for Health Assessment of Mothers and Children of Salinas (CHAMACOS). We examined the association between pubertal status, measured using Tanner staging at 10.5 and 12 years in girls and 12 years in boys, and development of anxiety and depression at 16 years measured using BASC-2 child self-reports. Models were conducted separately for boys and girls and adjusted for prepubertal BMI and other key covariates. We hypothesized that children with more advanced pubertal status would have higher anxiety and depression scores at 16 years. Using linear regression analyses, we found that among (N=240) boys in the CHAMACOS sample at 12 years of age, higher Tanner scores of genital development were positively associated with greater anxiety scores at age 16. Among girls, we found no significant association between Tanner stage at 10.5 (N=252) or 12 (N=274) years of age and anxiety or depression at 16 years. These findings contrast with our predictions for girls while supporting a relationship between early puberty and later anxiety in boys. Future research should further examine effects of advanced pubertal status among Mexican-origin boys, a vastly understudied population.

1-G-124 Neighborhood disadvantage moderates the association of systemic inflammation with neural activation during receipt of reward in adolescents

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Introduction: Higher levels of peripheral inflammation have been found to be associated with alterations in reward-related neural circuitry, including the nucleus accumbens (NAcc). Neuroimmune research suggests that exposure to deprivation, including socioeconomic adversity, disrupts the normative communication between the immune system and brain function; however, few studies have examined whether experiences of deprivation impact the link between inflammation and reward-related neural circuitry. Here, we tested this hypothesis in adolescents. Methods: 83 adolescents (50F/33M; 15.6±1.1 years) were recruited from the San Francisco Bay Area. We computed a deprivation composite score from neighborhood-level indicators of adversity, including poverty, unemployment, and housing burden (CalEnviroScreen 3.0). Peripheral inflammation was assessed with C-reactive protein (CRP) derived from capillary blood. Participants completed an fMRI monetary incentive delay task where we estimated bilateral NAcc activation during anticipation of rewards (vs. neutral) and receipt of rewards (vs. neutral). We conducted multiple regression analyses to assess whether CRP was significantly associated with NAcc activation to rewards, and whether deprivation moderated that association (α=0.025). Results: CRP was positively associated with NAcc activation during receipt of rewards (β=0.31; p=0.02). There was a significant interaction between deprivation and CRP levels (β=-0.23; p=0.02): this association was weaker in adolescents who experienced greater deprivation. All NAcc activation-related analyses during anticipation of rewards did not yield significant results. Discussion: Elevated systemic inflammation may sensitize neural activation during the receipt of reward in adolescents. Importantly, experiences of deprivation may weaken this association, providing possible evidence that deprivation may disrupt communication between immune system functioning and reward-related neural circuitry.

1-G-125 Neural correlates of cortisol regulation: Examining associations among markers of stress reactivity in adolescent females

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Research has increasingly focused on neural and physiological indices of stress reactivity as potential markers of psychopathology risk in youth, including altered recruitment of the salience network (i.e., amygdala, putamen, insula), as well as blunted or heightened cortisol production. However, the association between these neural and biological stress response systems remains poorly understood. The present study examined associations between cortisol reactivity to the Trier Social Stressor Test (TSST) and neural activity in response to viewing negative images in a sample of 122 adolescent females (M = 12.74 years, SD = 1.92) at elevated risk for depression. Area under the curve with respect to increase (AUCi) was computed to capture cortisol reactivity, current depression symptoms were assessed via parent- and self-report on the Mood and Feelings Questionnaire, and differences in BOLD response during contrasts of negative > neutral images as a function of AUCi were examined. Whole-brain analyses revealed that AUCi was associated with increased activity in the temporoparietal junction (TPJ)-- part of the human ventral attention system associated with detecting salient external stimuli and mentalizing. Further, increased TPJ activity was linked to elevated depression symptoms in this sample (β = .25, p = .01), and a subsequent mediation analysis demonstrated a significant indirect effect of AUCi on depression symptoms through TPJ activity (B = .02, SE = .01, 95% CI: [.003, .036]). Planned analyses will examine associations between activation in the TPJ and additional regions of interest (e.g., salience network) with risk for multiple forms of psychopathology. Findings contribute to a growing field of research connecting physiological and neural stress response systems, and suggest that these markedly different forms of emotion reactivity may rely on shared mechanisms, particularly in adolescent girls at risk for internalizing psychopathology.

1-G-126 Neural and Neuroendocrine Predictors of Maladaptive Emotion Regulation in Adolescents during the Covid-19 Pandemic

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Objective: The onset of the Covid-19 pandemic introduced and worsened stressors for many, but the impact on mental health may be particularly severe for those with a history of difficulties regulating emotions, such as non-suicidal self-injury (NSSI). The purpose of this study was to evaluate if physiological and neural indices of stress system functioning predicts employment of maladaptive coping strategies during the early months of the pandemic. Methods: Sixty-five female adolescents (mean age 16.19 y) were part of a large longitudinal study enriched for NSSI. Prior to the pandemic, hypothalamic-pituitary-adrenal (HPA) axis activation in response to a social stressor and amygdala activation in response to an emotion matching task were assessed. In July-August 2020, participants were asked to report on NSSI engagement, coping, and difficulties in regulating emotions. Multinomial logistic and linear regressions were conducted to determine if physiological and neural stress markers

predicted continued engagement in NSSI and emotion regulation difficulties during the pandemic. The impact of discordance between cortisol and brain metrics (values split at the median into high and low groups) on pandemic outcomes were explored via chi-squared test and ANOVA. Results: Blunted HPA activity predicted increased difficulties in emotion regulation (b = -0.297, p = 0.029). Increased right amygdala activation predicted cessation of NSSI behaviors (b = -0.748, p = 0.020). Discordance in HPA and brain metrics (high cortisol, low connectivity) was found to occur more frequently in those with a history of NSSI, but did not differentiate between those who ceased or continued engaging. Conclusions: These results give insight into differential coping responses in the context of a time-locked, shared stressor. Additionally, they suggest premorbid markers of the biological stress system functioning that may be key for identifying those who are in the greatest need of intervention.

1-G-127 A data-driven, biopsychosocial approach towards an environmental risk score (ERS) of depression in late childhood and early adolescence

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Objective: Though significant advances have been made in probing the genetic architecture of depression, the resulting polygenic risk scores (PRS) show weaker associations in early adolescence compared to adulthood. Consistent with a "two-hit" hypothesis, early environmental exposures (ERS) convey vulnerabilities that interact with PRS and adult stressors, resulting in increased depression risk. The aims of this research are twofold: 1. Derive an ERS of early adolescent depression risk. 2. Assess ERS and PRS prediction of depression separately and in combination in early adolescence. Methods: We have, so far, conducted a literature review to identify upwards of 60 risk factors for depression. We will use penalised regression for variable selection and leave-one-out cross-validation to derive ERS in the Adolescent Brain and Cognitive Development (ABCD) study. ERS will be trained in N=11,876 participants (9-10 years) from ABCD baseline data collection. This timepoint contains the majority of our pre-identified risk variables, however the complete set will be tested in the 2-year follow-up (N=10,414; 11-12 years) as a sensitivity analysis. Additional factors in the 2-year follow-up include metabolic health, pain and gender identity. ERS will then be used to predict depression at ABCD 3-year follow-up (N=6,251; 12-13 years). Finally, we will test a combined model of ERS and PRS predicting depression cross-sectionally and longitudinally. Hypotheses: Given our data-driven approach, we will not make hypotheses about individual risk factors in the final ERS model. However, we hypothesise that 1. The predictive power of ERS will outperform PRS in this sample. 2. The combined model of ERS and PRS will perform best. 3. ERS of depression will highlight contributors to depression risk that may indicate opportunities for targeted prevention of depression onset.

1-G-128 Impact of Socio-Economic Status on electrophysiological response to acoustic stimulus change in infants

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The socio-economic status (SES) of a child shapes development from an early stage. The aim of this EEG study was to investigate how sensitive functional neural network responses elicited during attentional

processes are related to environmental influences of infant's upbringing. As part of the longitudinal BRISE study (Bremen Initiative to Foster Early Childhood Development), event-related potentials (ERPs) of 158 healthy, awake infants between six and twelve months of age were recorded during a passive auditory oddball paradigm. Infants were presented with 200 standard tones (466.6 Hz) and 48 randomly dispersed deviants (550.5Hz). SES, including maternal education level and possible migration background were assessed via questionnaires. The infant's P3a-like component is associated with unintentional direction of attention to deviant stimuli and was measured 280-330ms after stimulus presentation at fronto-central brain regions. Our results demonstrate that infants elicit a P3a following deviants and that the response increases with age. After controlling for age, lower maternal education and migration background were related to an increased P3a. The age-dependent increase of the P3a may indicate developmental brain changes, establishing P3a-related processes as triggers of attentional control mechanisms during development. An excessive P3a, however, may also indicate increased distraction. Considering the known risks of children with lower SES for their learning biographies, their larger P3a may indicate that these infants are more surprised and distracted by deviants despite their repetition within the simple task utilized. The results, nevertheless, illustrate opportunities for early intervention programs since attention elicited by unexpected irregularities belongs to the fundamental processes triggering learning. Thus, oddball paradigms are a promising tool for longitudinal studies of basal cognitive abilities and the influence of SES on children's development.

1-G-129 Specific cognitive skills are weakly associated with socioeconomic deprivation: Evidence from three large-scale cohorts

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Socioeconomic disparities in cognitive skills have long been studied to elucidate the causes and consequences of early-life adversity on developmental outcomes. Some theories propose that specific cognitive domains, such as language or executive functions, are particularly vulnerable to environmental risk. Alternatively, SES may be primarily associated with general cognitive ability, which reflects broad cognitive skills across different tasks rather than variance in specific skills. However, few studies have tested if socioeconomic deprivation is associated with specific cognitive skills after controlling for general cognitive ability, using latent variable methods (c.f. Tucker-Drob, 2013). Structural equation models were used to estimate specific associations between SES and cognitive skills across three large scale cohorts (RED, ABCD and WJ-IV), totalling 16,360 participants from the UK and USA (ages 6-19). We estimated how strongly SES is directly associated with specific cognitive tasks by controlling for latent general cognitive ability. We found that associations between SES and specific cognitive skills were relatively small (all standardised B ≤ .17). In other words, tasks that are better indicators of general cognitive ability usually have higher correlations with SES. However, socioeconomic advantage was a specific predictor of better vocabulary knowledge across two cohorts, though associations with broader literacy skills were inconsistent. In contrast, in the ABCD cohort, participants from more disadvantaged socioeconomic groups had relatively preserved executive function skills. These results may have implications for the targets and outcome measures used in interventions that aim to reduce socioeconomic disparities.

1-G-130 Poverty, Sleep, and Childhood Brain Function

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Poverty affects a child's cognitive development and mental health and is thought to contribute to differences in brain structure and function (indexed by resting-state functional connectivity [RSFC]). However, physiological contributions that may underlie these effects are not well understood. One physiological pathway through which poverty may influence RSFC and behavior is through sleep health disparities. Our goal was to establish and replicate links between poverty and brain function (RSFC) and explore the mediating role of sleep. Behavioral, demographic, and RSFC data from an independent Discovery (N=2,549) and Replication (N=2,509) ABCD Study dataset were used, including socioeconomic (SES), cognition, mental health, and sleep measures. Linear mixed effects models were used to quantify associations between brain function and socioeconomic factors, controlling for cognition and mental health. We used canonical correlation analysis (CCA) to localize brain regions most influenced by SES. Sleep was tested as a potential mediator of associations between poverty and brain function. Greater poverty was robustly associated with poorer cognitive ability (t =-15, p<10-50) and greater overall psychopathology (t=5.4, p<10-8). The first component of RSFC, which represents the primary mode of variability in brain function across children, was associated with poverty (b=-0.13, p<10-16), but not cognition or mental health (p's > 0.05). CCA revealed SES was most associated with control and attention networks. Additionally, sleep fully mediated the association between poverty and RSFC for the most disadvantaged children and partially mediated the association between poverty and cognition. We provide evidence for reproducible links between brain function and poverty, as well SES more broadly. The mediating effect of sleep on brain function suggests an intervention target for parents, specifically the improving of sleeping conditions for their children.

1-G-131 Socioeconomic Factors and Resting State Functional Connectivity in Children and Adolescents

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Socioeconomic status (SES) has been repeatedly associated with the function of the ventral striatum (VS), a critical node of reward processing circuits (Marshall et al.,2018). Studies of typical development have found age-related decreases in resting-state functional connectivity (rsFC) between the VS and medial PFC regions (van Duijvenvoorde et al., 2019). However, no studies have examined how these developmental changes may vary by SES. The goal of this study was to investigate how age-related changes in VS rsFC vary by SES. Participants were typically developing individuals between the ages of 3 and 21 years (N=568)(Jernigan et al.,2016). Socioeconomic factors were family income and parental education. Whole-brain, seed-based functional connectivity analyses conducted using AFNI were used to investigate age-by-socioeconomic-factor interactions in the prediction of VS rsFC while controlling for age, sex, race/ethnicity, scanner, and socioeconomic factors. Results indicated a significant interaction (p<.005) between age and family income for connectivity between the VS and the subgenual anterior cingulate cortex (sgACC). Follow up simple slope analyses revealed no significant association between

age and VS-sgACC connectivity in the low-income group (β=-.02,p=.58). However, significant age-related decreases in VS-sgACC connectivity were found for both the middle and high-income groups (β=-.10,p<.01;β =-0.09,p< .001). Findings suggest greater age-related decreases in VS connectivity with the sgACC among children from higher income families, consistent with literature indicating that lower SES children have a more active reward circuit than higher SES children (Yaple & Yu,2020). Greater age-related decreases in sgACC-VS connectivity in children from higher SES backgrounds may indicate increased ability to regulate reward reactivity. These findings show how family income may alter neural development in ways that may underlie socioeconomic disparities in mental health.

1-G-133 What's the harm?: Examining the role of police contact and amygdala function among Black adolescents

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Childhood adversity significantly shapes youth outcomes. Existing literature demonstrates that threatening adverse experiences predict heightened amygdala reactivity during socioemotional processing (McLaughlin et al., 2019). However, this growing literature has not considered experiences unique to Black youth despite their exposure to racism-related adversity (Bernard et al., 2020). Police contact is associated with poorer mental and physical health outcomes among adolescents (McFarland et al., 2019) and is disproportionately experienced by Black adolescents. Thus, we will examine the potential biological embedding of one aspect of structural racism by exploring police contact and amygdala function. We test these questions in a subsample of 167 adolescents from the Fragile Families and Child Wellbeing study (FFCWS), a well-sampled longitudinal study of mostly lower-income families since birth. At age 15, adolescents participated in fMRI during an event-related emotional faces task and provided a self-report of police contact. We hypothesize that: (H1) Police contact will be positively associated with amygdala reactivity to threat (angry and fearful faces), (H2) Individuals who witness police contact with others (i.e., vicarious contact) will exhibit amygdala reactivity comparably to those who directly experience contact, and (H3) Direct police contact will relate to less amygdala habituation across the task, marking continued vigilance. We will analyze these data using the GLM of SPM12 with a focus on a contrast of angry fearful faces>baseline, while controlling for gender, family income, and pubertal status. This submission aligns with the Flux environment and brain function themes. This work will also advance knowledge on how social context shapes brain development, while expanding this literature to consider how aspects of structural racism impact brain development in minoritized youth.

1-G-134 The importance of friendships in reducing brain responses to stress in adolescents exposed to childhood adversity: a preregistered systematic review

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Up to 50% of all children and adolescents growing up worldwide are exposed to at least one form of childhood adversity (CA), which is one of the strongest predictors for later life psychopathology. One way through which CA confers such vulnerability in later life is through increased sensitivity to and

likelihood of social stress. A growing body of research demonstrates the positive impact of adolescent friendship support on mental well-being after CA; however, the mechanisms that may underlie this relationship are unknown. Neurobiological models of social buffering suggest that social support can reduce perceptions, reactions, and physiological responses to and after stress. Therefore, this preregistered, systematic literature search examined whether friendships reduce neural stress responses in adolescents with CA. In accordance with the PRISMA guidelines, we searched for empirical studies published in English and involving human subjects by using internet databases (Web of Science Core Collection, PubMed, and PsycINFO) through December 2021. A total of 6260 articles were identified. After removing duplicates, two independent reviewers screened titles, abstracts, and keywords of 4297 articles based on the PI(C)OS concept: population (P; adolescents between the age of 10-24 with CA), intervention (I; friendships), outcome (O; neural stress mechanisms), and study design (S; empirical study). This screening resulted in four eligible studies out of which only two did directly test whether friendships buffer neurobiological stress responses in adolescents with CA. One study found support for friendship stress buffering in a sample of previously institutionalized adolescents (Tang et al., 2021) and the other found no support for friendship buffering in a small sample of well-functioning adolescents with mild to moderate CA (Fritz et al., 2019). Hence, future research is clearly needed to investigate whether friendships reduce stress vulnerability in adolescents with CA.

1-G-135 Exposure to community violence as a mechanism linking socioeconomic disadvantage and neural responses to reward

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Background: Exposure to community violence is associated with a host of negative outcomes across development (e.g., depression, addiction). Although many of these outcomes are associated with disruptions in reward processing, little research has examined the impact of exposure to community violence on reward-related brain regions. Moreover, a host of studies are linking socioeconomic disadvantage to brain structure and function, presenting the need to identify more proximal mechanisms through which disadvantage impacts brain development. Thus, we examined associations between exposure to community violence and reward-related ventral striatum activity in a cohort of adolescents sampled from birth records with enrichment for neighborhood disadvantage. Methods: We utilized fMRI data with a child-friendly reward task from 444 twins (ages 7-19 years, 56.1% male) along with twin report of exposure to community violence and census data on neighborhood disadvantage. Results: In SPM12 models, we found that exposure to community violence was associated with greater reactivity to rewards in the left (k=137, T=4.68, MNI -18 14 -8) and right (k=23, T=4.25, MNI 6 16 -4) ventral striatum (all ps<.001). These associations remained after accounting for harsh parenting and other covariates (family income, gender, age, race/ethnicity, primary caregiver education). Moreover, using path modeling in Mplus, we identified an indirect pathway in which socioeconomic disadvantage predicted greater reward-related left ventral striatum reactivity via greater exposure to community violence (alpha-beta=0.024, CI=[0.001, 0.059]). Conclusions: Our findings highlight the unique impact of

exposure to community violence on reward processing and provide a mechanism through which socioeconomic disadvantage may impact the brain.

1-G-136 Early stressful experiences are associated with reduced neural responses to naturalistic socioemotional content in children

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Introduction How do early experiences shape emotional processing? Early life stress is one major factor that introduces vulnerability in the development of emotion neurocircuitry. Further, although the parent-child relationship is central to children's emotional development, little is known about how variation in normative parenting behavior relates to variation in neural responses to emotion. Here, we examined whether brain activity to naturalistic emotional content is related to parent behaviors specifically, or can be explained by broader experiences of adversity. Methods Because children can struggle with tasks in the scanner, we collected fMRI data while 4-to-11-year-olds watched a short film with positive and negative emotional events, and rich parent-child interactions (n = 70). We collected two measures of stress exposure: socioeconomic status (SES) and stressful life events experienced by the child. For a sub-sample (n = 30), parent behaviors were measured during a brief parent-child interaction, consisting of a wordless picture book, a challenging puzzle, and free play with novel toys. We characterized positive parent behaviors (e.g., warmth, praise) and negative parent behaviors (e.g., harsh tone, physical control). Results During parent-child interaction events in the movie, higher SES was related to greater activity in medial orbitofrontal cortex. We also found that negative parent behaviors were associated with less activation of the ventral tegmental area and cerebellum during positive emotional events in the film. Associations held after controlling for SES, stressful life events, and parental depression. In a region-of-interest analysis, we found that negative parent behaviors were associated with less activation of the amygdala during positive emotional events. Conclusion These exploratory results suggest that early experiences of stress, as well as caregiving experiences, may shape reward-related responses to socioemotional information.

1-G-137 Impact of rs-fMRI motion thresholding on sociodemographic characteristics and functional connectivity in the ABCD Study®

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Objective: Motion negatively impacts resting-state fMRI (rs-fMRI) data and relates to participant characteristics. Our previous work demonstrated ABCD Study participants with low-noise baseline rs-fMRI data were more socioeconomically privileged and had fewer mental and physical health concerns than those with higher-noise data. The present study extends this line of work by examining how different motion thresholds (more to less stringent) influence the sociodemographic characteristics of

samples and functional connectivity values within resting-state networks. Methods: Participants included youth with acceptable rs-fMRI data (N=8,560; 50% female; ages 9.0-10.9 years) at the baseline ABCD Study timepoint (NDA release 3.0). Four binary variables were created to indicate whether participants met various motion thresholds (framewise displacement [FD]<0.15, 0.2, 0.3 and 0.4mm). Linear mixed-effects models were used to test for differences in sociodemographics (age; sex; race/ethnicity; parent education, marital status, and income) or functional connectivity values (within 13 networks from the Gordon parcellation) between those that did and did not meet each threshold. Random intercepts were included for family, and p-values were Bonferroni-corrected. Results: Significant sociodemographic differences were observed at the least stringent motion threshold (FD<0.4mm), such that more females, older participants, non-Hispanic white participants, and participants with married parents met the threshold (ORs=1.24-1.37, ps≤0.004). Across each threshold tested, functional connectivity within seven networks was consistently greater in participants who met the threshold (βs=0.12-0.55, ps<0.001). Conclusions: Functional connectivity data may improve with more stringent motion thresholding but even lenient thresholds may reduce the representativeness of samples. Future research is therefore needed to determine optimal methods for balancing rs-fMRI data quality and generalizability.

1-G-138 Neurobiological and early environmental correlates of locus of control and post-traumatic stress symptom profiles: a latent profile analysis

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Background: Perceptions of controllability in one's environment have been broadly associated with mental health. Locus of control (LOC) refers to an individual's belief system regarding their perceived controllability. While psychopathology following exposure to early-life stress (ELS) has been associated with LOC, findings have been inconsistent as to whether stress-related psychopathology is associated with a more external or more internal LOC. These mixed findings may be due in part to heterogeneity in both the quantity and nature of stress experienced, as well as in neurodevelopmental outcomes following ELS. The goals of the current study are to use latent profile analysis (LPA) to elucidate heterogeneity in the association between post-traumatic stress (PTS) symptoms and LOC, and to explore neurobiological and early environmental correlates of these distinct profiles. Hypotheses: We hypothesize that (1) multiple PTS symptom/LOC profile subgroups can be differentiated; (2) frontolimbic connectivity, perceived controllability during ELS, and cumulative ELS exposure will differ between subgroups. Measures: Young adults (N=138) completed self-reported measures of ELS, LOC, and PTS symptoms, and a resting-state fMRI scan. Planned Analyses: We will use LPA to identify subgroups of individuals differentiated by profiles of PTS and LOC. ANCOVA will then be used to examine between-class differences in resting-state frontolimbic functional connectivity, perceived controllability during ELS, and cumulative ELS exposure. General Implications: Associations between ELS exposure, LOC, and psychopathology are yet to be fully understood. Disentangling these associations may provide greater

clarity as to when and how perceptions of controllability could be addressed in psychotherapeutic interventions.

1-G-139 Identifying Developmental Sensitive Windows Related to Dimensions of Childhood Adversity Exposure and Cortico-Limbic Circuitry

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Dynamic changes in cortico-limbic circuitry and neuroplasticity across development confer sensitive periods when the effects of adversity exposure may be especially salient. Thus, the effects of adversity may vary depending on the timing of exposure. Clarifying how timing and specific dimensions of stressful experiences interact to confer alterations in neural circuitry is a critical step to identify periods of heightened sensitivity when the effects of adversity may be particularly strong. We will use a dimensional approach to evaluate how four key proposed dimensions of adversity (threat, deprivation, predictability, and controllability) relate to cortico-limbic circuitry, and how these effects vary across different developmental periods of exposure. Data have been collected as part of an ongoing project on adversity and development that includes detailed and dimensional assessments of exposures and timing. Participants are a community sample of 167 adults who completed an interview on adverse and traumatic childhood experiences and a resting-state fMRI scan. Hypotheses will be tested using elastic net regression with threat, deprivation, predictability, and controllability as independent variables, binned by developmental period at time of exposure (i.e., early childhood, late childhood, early adolescence, late adolescence). A priori regions of interest (amygdala-ventromedial prefrontal cortex) will index cortico-limbic functional connectivity as the dependent variable. Based on prior work, we hypothesize that events characterized by threat experienced during early adolescence will have the strongest association with cortico-limbic connectivity, relative to other dimensions and developmental periods. The proposed analyses will provide important insight into how distinct dimensions of adversity may shape intrinsic functional architecture and the extent to which these dimensions differentially relate to neurobiological outcomes depending on the timing of exposure.

1-G-140 Resting-state functional connectivity patterns are associated with metal mixture exposure in young adolescents

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Background.Early-life metal mixture exposure may increase the risk for anxiety and depression in adolescence. The neural circuitry subserving internalizing phenotypes begins developing in utero and is vulnerable to early-life exposures. Resting state functional magnetic resonance imaging (rs-fMRI) provides a novel tool to examine underlying mechanisms of metal-associated neurodevelopmental

outcomes. We investigate relationships between early-life metal exposure and functional connectivity in pre-adolescents. Methods.In preliminary analysis of 67 children (8-14years; 34 females) enrolled in the Programming Research in Obesity, Growth, Environment and Social Stressors (PROGRESS) study, we estimated weekly exposure (14th week gestation through one year of age) to 15 metals (Ba, Bi, Cd, Co, Cr, Cu, Li, Mg, Mn, Mo, Ni, Pb, Sn, Sr, Zn) in deciduous teeth using laser ablation-inductively coupled plasma-mass spectrometry. Using graph theory analysis of rs-fMRI data, we computed global and local efficiency (GE, LE) and eigenvector centrality (EC) in 111 brain areas (Harvard Oxford Atlas). We used lagged weighted quantile sum (lWQS) regression to examine time-varying associations between metal mixtures and GE, LE or EC in the whole brain and anterior cingulate cortex (ACC), globus pallidus (GP), and insula, adjusting for sex, age. Results.We observed prenatal and postnatal windows between the metal mixture and LE; -13 to 4 weeks, peak βLE (week -2) = -0.23, 95%CI -0.02, -0.45 and 16 to 43 weeks; peak βLE (week 42) = -0.42, 95%CI -0.13, -0.70 and one prenatal window for GE at -18 to -11 weeks, peak βGE (week -18) = -0.35, 95%CI -0.07, -0.64. The metal mixture was significantly associated with decreased EC in the ACC, GP and insula at different critical windows spanning gestation and infancy. Conclusions.Our results combining lWQS modeling with graph theory analysis of rs-fMRI may inform mechanistic understanding of environmentally-associated neurodevelopmental outcomes.

1-G-141 Associations between Socioeconomic Disadvantage, Trajectories of Default Mode Network Resting State Functional Connectivity, Familial Cohesion, and ADHD

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Background: Socioeconomically disadvantaged (SES-D) youth are two times more likely to have attention deficit hyperactivity disorder (ADHD) than their peers. SES-D and ADHD are associated with altered within-network resting state functional connectivity (rSFC) in the Default Mode Network (DMN), pointing to a potential neural mechanism in the relationship between SES-D and ADHD. Literature suggests childhood adversities, like SES-D, are associated with aberrant DMN maturation but the directionality of these relationships remains equivocal, underscoring contributions of familial and environmental context. Moreover, there is evidence that family factors mediate associations between childhood SES-D and ADHD. Objectives: Consistent with previous work suggesting that positive familial factors may buffer against disturbances in DMN development, this project aims to test these hypotheses: (1) SES-D will be associated with less increase in within DMN (wDMN) rSFC during adolescence, and family cohesion (FC) buffers against the SES-D effect (2) patterns of wDMN rSFC will partially mediate associations between SES-D and ADHD, particularly among youth with low levels of FC. Methods: Data will come from two waves of youth in the Adolescent Brain and Cognitive Development Study. SES-D will be assessed from household income and parent-reported Financial Adversity Questionnaire. rSFC will be average connectivity wDMN. ADHD will be assessed using data from parent-reported Child Behavior Checklist. FC will be assessed using data from the parent-reported Family Environment Scale. Analysis Plan: Hierarchical linear models will examine change in wDMN rSFC considering income and FC. Mediation from SES-D by change in wDMN rsFC to ADHD will be examined using mediation models; moderated mediation models will test the contribution of FC. Implications:

These analyses inform how maturation of rSFC is influenced by SES-D, if FC contributes, and the role of these processes in the onset of ADHD.

1-H-142 Sex-specific, age-varying impacts of puberty on cortical thickness and associations with adolescent suicidal ideation

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Objective: Adolescence is a time of large-scale brain development that is shaped by pubertal processes. Further, pubertal development occurs alongside a dramatic increase in suicidality among youth. However, the dynamics of how puberty, age and sex interact to impact brain development and suicide ideation (SI) are still poorly understood. The current study aimed to 1) delineate the age-varying sex-specific effects of pubertal stage on cortical thickness over a two-year period using a function-on-function regression, while adjusting for multiple comparisons, and 2) use logistic regression to model whether developmental trajectories of cortical thickness over a two-year period are associated with SI, while controlling for demographic and study specific factors. Methods: Data are from the baseline (BL) and Year 2 (Y2) waves of the ongoing ABCD Study (N = 8,248, ages 9 - 10 at BL). Primary study variables included biological sex, BL and Y2 chronological age, pubertal stage (Pubertal Developmental Scale), and cortical thickness of 34 FreeSurfer-defined regions of interest (ROIs), and Y2 SI. Results: Seven ROIs (fusiform gyrus, inferior parietal cortex, inferior temporal cortex, isthmus cingulate, lingual gyrus, paracentral gyrus, precuneus) demonstrated statistically significant sex-specific dynamic effects of puberty on regional cortical thickness. The trajectory of cortical thickness in the fusiform gyrus, lingual gyrus, and precuneus demonstrated a negative association with SI, which was significantly moderated by biological sex. This indicated that slower cortical thinning in these ROIs was associated with a higher likelihood of reporting SI, with this effect being stronger for female youth than for male youth. Conclusions: Pubertal development is associated with sex-specific changes in cortical thickness in specific areas of the brain in adolescence. These results demonstrate how deviations in typical developmental processes might incur risk for SI in adolescence.

1-H-143 Structural brain correlates of non-verbal intelligence in 5-year-old children: findings from the FinnBrain Birth Cohort study

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Non-verbal intelligence remains fairly stable through life and predicts multiple important life outcomes, e.g., school and job performance. In neuroimaging studies, non-verbal intelligence is most often associated with structural and functional features of frontal and parietal regions. Most studies have been performed on adults and adolescents, while children aged 5 years and under have received relatively little attention. We combined structural magnetic resonance imaging and neuropsychological data from 165 5-year-old participants (mean scan age 5.40 years, SD .13, 90 boys) from the FinnBrain

Birth Cohort study to explore the neural structure underlying non-verbal intelligence. Brain images were semiautomatically processed using FreeSurfer. Non-verbal intelligence was measured using the Block Design and Matrix Reasoning subtests from the Wechsler Preschool And Primary Scale Of Intelligence as well as Performance Intelligence Quotient (PIQ) estimated from the subtests. We then performed a vertex-by-vertex general linear model (GLM). Higher PIQ scores were associated with higher volumes in left caudal middle frontal ($p = .021$, cluster size = 951mm^2) and right pericalcarine ($p < .001$, cluster size = 1640mm^2) regions, as well as higher pial surface area in left caudal middle frontal ($p = .009$, cluster size = 871mm^2), left inferior temporal ($p = .042$, cluster size = 692mm^2), and right lingual ($p < .001$, cluster size = 1239mm^2) regions. There were no associations with cortical thickness. Correction for multiple comparisons was done using a Monte Carlo Null-Z Simulation with $p = .05$ threshold. To the best of our knowledge, this is the first study to examine structural neural correlates of non-verbal intelligence in a large sample of typically developing 5-year-olds. In conclusion, the neural structure underlying non-verbal intelligence in 5-year-olds is similar to the structure identified in the Parieto-Frontal Integration Theory based on studies on older subjects.

1-H-144 The developing prenatal brain, family history of psychiatric illness, and postnatal functional outcome

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Objective: The blueprint of the brain is formed in the womb, when the human brain undergoes major developmental changes and growth. This period of complex developmental processes poses the brain vulnerable for (gene-by-)environmental factors which can have a permanent effect leading to developmental disorders later in life. However, whether and if so to which extent, increased familiar risk for developmental disorders, such as psychiatric disorders, impacts the prenatal brain remains largely unknown. Therefore, we investigate--and present preliminary findings on--whether and if so to which extent, having a parent with a psychiatric disorder impacts fetal brain development, and impacts subsequently postnatal functional outcome. Methods: To date, over 2500 participants have been included in the ongoing YOUth cohort, a Dutch population cohort in which child development is assessed from the fetal stage to adolescence. Pregnant women receive an 3D ultrasound (US) at 20 and 30 weeks of gestational age, and both parents fill out a variety of questionnaires, including of their psychiatric background. The functional outcome after birth will be assessed via the Child Behavior Checklist Questionnaire (CBCL) and Ages and Stages Questionnaire: Social-Emotional Second Edition (ASQ-SE) around age 3. To segment the fetal brain from 3D US we developed an automated deep learning tool. Analysis plan: Linear mixed modeling is used for longitudinal data analyses to assess brain development over time and its relationship with postnatal outcome and familial risk for psychiatric illnesses in girls and boys. To correct for multiple testing false discovery rate is applied. Path analysis is used to explore directionally/causality. General implications: Knowing which risk-factors are associated with early brain development, when deviations occur, and how they relate to functional outcome measures later in life is highly important for the design of effective prevention strategies.

1-H-145 Childhood white matter morphology mediates the prospective relationship between motor function and internalizing symptoms among youth with and without ADHD

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Objective: Although white matter organisation and motor function have been linked to internalizing problems in typically developing (TD) youth, there is a scarcity of longitudinal work investigating this association in ADHD. To examine whether white matter structural development and motor function in childhood were associated with internalizing problems in adolescents with ADHD, this study estimated white matter morphology in the superior longitudinal fasciculus (SLF), the inferior longitudinal fasciculus (ILF) and the uncinate fasciculus (UF) in 8-12-year-old children with ADHD (n = 40, 11 females) and TD children (n = 36, 14 females). Methods: Diffusion weighted imaging data (b = 700 s/mm2, 2 x 32 directions) were collected on a 3T MRI scanner. Motor function was assessed in childhood using the Movement Assessment Battery for Children (MABC-2) and internalizing problems were assessed in adolescence (ages 12-17) using the Behavioral Assessment System for Children (BASC-2, parent-report). White matter tracts were reconstructed using TractSeg. For each tract, we estimated fiber bundle cross-section (morphology) using Fixel-Based Analysis. Results: Relative to TD children, the ADHD group showed lower overall MABC-2 performance in childhood and greater BASC-2 depression scores in adolescence. Regression analysis demonstrated a positive association between white matter morphology (ILF and UF) during childhood and depression scores in adolescence. Higher MABC-2 scores during childhood were associated with lower fiber bundle cross-section (ILF and UF) and lower adolescent depression scores. White matter morphology in the UF mediated the prospective association between motor function and depression scores in children with and without ADHD. Conclusions: Results suggest that childhood motor difficulties in ADHD may reflect atypical structural connectivity that may then serve as a marker of ADHD-associated difficulties with emotional regulation manifesting in adolescence.

1-H-146 Early amygdala volume trajectories are associated with elevations in school-age anxiety in a sample enriched for familial likelihood for ASD

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Background: While the amygdala has been implicated in both autism spectrum disorder (ASD) and pediatric anxiety, few studies have examined how trajectories of amygdala growth in infancy relate to later anxiety in middle childhood in typical development or in children at increased likelihood for neurodevelopmental conditions or anxiety. Objective: Examine unique effects of anxiety symptoms, ASD familial likelihood, and ASD diagnosis on amygdala volume growth from 6 to 24 months. Methods: This study prospectively examined infants at high- and low-familial-likelihood (HL, LL) of ASD at 6, 12, and 24

months of age, and at school age (7-11 years). Participants underwent structural MRI scans at 6, 12, and 24 months. Clinical best estimate diagnosis of ASD or no-ASD was made at 24 months and school age, resulting in 48 HL-ASD, 137 HL-noASD, and 95 LL participants. Anxiety was assessed at school-age using the Child Behavior Checklist (CBCL). Latent growth curve models utilizing full information maximum likelihood examined amygdala volume over time as a function of ASD familial likelihood, ASD diagnosis, and school age anxiety, controlling for cerebrum volume. Results: Overall model fit was good, $\chi2(10) =12.7$, p=.24, CFI=.991, RMSEA=.031, SRMR=.038. School age anxiety was associated with faster amygdala volume growth from 6 to 24 months, (z=3.37, β=.37, p=.001). Neither ASD familial likelihood nor ASD diagnosis was associated with significant differences in amygdala volume growth. Discussion: Results demonstrate early neural differences (i.e., faster amygdala volume growth) are associated with higher anxiety symptoms by middle childhood, even after controlling for ASD familial likelihood and ASD diagnosis. Altered amygdala trajectories may serve as a possible early transdiagnostic marker of impaired emotional or social processing and precursor to later anxiety.

1-H-147 Mood fluctuations during development and their relation to sleep and brain development

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Mood variability, fluctuations in mood level, is thought to undergo significant changes during adolescence. The development of mood variability is of particular interest because increased levels of mood variability are associated with negative mental health outcomes. Since adolescence is a time of significant change, both in terms of emotional and biological development, multiple mechanisms could underlie this development of mood variability. Two biological mechanisms of interest are sleep and neural development, since they, like mood variability, undergo changes during adolescence and have also been associated with mental health. The present study aims to study the development of mood variability throughout adolescence and to examine the relation with sleep and structural brain development. Data from the Leiden Self Concept study will be used. This is a longitudinal study in which 160 adolescents aged 11-21 were followed for three consecutive years. Mood variability was measured by monitoring daily mood one week each year using the Profiles of Mood States (POMS) questionnaire. Objective (using actigraphy) as well as subjective measures were used to examine sleep, and brain development was assessed using structural MRI. Generalised additive mixed models (GAMMs) will be used to answer the research questions. It is hypothesised that mood instability develops in an inverted U-shape, with low mood variability in early adolescence, high mood variability during mid-adolescence and a decrease in mood variability towards late adolescence. Additionally, it is hypothesised that sleep shows a negative association with mood instability, with shorter sleep being associated with higher mood instability. Lastly, it is thought that mood variability is associated with brain development. Understanding the mechanisms that underlie increased mood variability could shed light on what mechanisms might be potential future treatment targets to prevent onset of psychopathology.

1-H-148 Assessing the validity of a novel cortical marker of delay discounting in two independent samples of early adolescents: Links with externalizing pathology

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Background: Delay discounting, or the tendency to prefer smaller, immediate rewards over larger, later rewards is a well-established risk factor for a multitude of externalizing behaviors. However, the neurobiological substrates of delay discounting are less understood, particularly during the sensitive period of adolescence, which is marked with key neurodevelopmental changes and increased engagement in impulsive behaviors. Building upon recent work that developed a novel cortical marker of delay discounting (C-DD) in an adult sample, the objective of this study was to: i) test whether C-DD relates to delay discounting in a large nationally-representative sample of adolescents, and ii) whether C-DD relates to youth externalizing symptoms. Methods: The current study used two samples: 9992 early adolescents participating in the ABCD study (Mage = 9.93 years old, 48.7% female), and 56 early adolescents recruited from the community (Mage = 12.27, 55.4% female). Cortical thickness was estimated using FreeSurfer's standard pipeline, and the cortical marker of delay discounting (C-DD) was calculated based on procedures outlined by the initial validation study. Results: As expected, C-DD was positively related to delay discounting in the ABCD sample of young adolescents, even after accounting for age, sex, collection site and data quality indicators. Moreover, results showed that C-DD was discriminately associated with externalizing, but not internalizing, symptoms in both samples of young adolescents. Conclusions: Findings provide preliminary evidence that C-DD may be a useful neuroanatomical marker of delay discounting with translational relevance to understanding externalizing psychopathology in young adolescent samples. To the extent that C-DD represents a reliable and stable marker of impulsive decision-making, it may facilitate future research seeking to identify adolescents at risk for engaging in impulsive and risky behaviors.

1-H-150 Structural brain correlates of resilience among youth exposed to neighborhood disadvantage

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While studies highlight various negative consequences for youth exposed to neighborhood disadvantage, many individuals exhibit resilience; yet the underlying factors supporting resilient outcomes remain underexamined. Few studies have assessed how brain structure is related to positive adaptation across multiple domains. The current study evaluated associations between structural brain measures (volume, thickness, and surface area) and resilience across multiple domains. Methods: 708 twins (354 families; 7-19 years) were recruited from birth records to be representative of families living in neighborhoods with above average levels of neighborhood disadvantage. Factor analysis of parent, teacher, and self-report measures yielded 3 resilience latent factors (psychological resilience, social engagement, academic success) and a general resilience meta-factor. Results: Controlling for age and gender, general resilience was positively related to cortical volume and surface area in multiple prefrontal, temporal, and parietal regions (e.g., superior frontal, orbital frontal, supramarginal, and superior temporal gyri, anterior cingulate, precuneus) and subcortical volume (e.g., amygdala, thalamus, caudate, hippocampus) (all ps <.001). Psychological, social, and academic resilience were positively related to subcortical and cortical volume and cortical surface area in many of the same regions.

Psychological resilience was uniquely positively related to thickness in the superior frontal gyrus and volume in the rostral middle frontal gyrus. Academic resilience was uniquely positively related to volume in the fusiform and precentral gyri, and thickness in the middle temporal and precentral gyri. Conclusion: Our findings elucidate structural correlates of positive adaptation across multiple domains among a representative cohort of youth exposed to neighborhood disadvantage and highlight the need to examine the neural structures supporting positive outcomes in youth.

1-H-151 Neonatal cerebellar brain volume differences in subgroups of very preterm children with elevated autism traits

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Background: 25% of children born very preterm (VPT; <32 weeks' gestation) screen positively for autism spectrum conditions (ASC). However, at present, it is not possible to predict which children will develop ASC traits. Hence the need to find early markers to identify vulnerable children and offer timely supportive interventions. Objectives: Firstly, to compare neonatal brain volumes between VPT toddlers grouped according to their scores on an ASC screening tool, the Modified-Checklist for Autism in Toddlers (M-CHAT); secondly, to evaluate persisting ASC traits in childhood. Methods: VPT individuals from the Evaluation of Preterm Imaging study (EudraCT 2009-011602-42) underwent magnetic resonance imaging at term-equivalent age and ASC screening at 2 years (M-CHAT; N=371). Participants were grouped based on their M-CHAT scores: those screening positively (using two methods: critical-positive (failing at least 2 critical items); non-critical-positive (failing any 3 items, but less than 2 critical items)) and negatively. At 4 years (N=177), the Social Responsiveness Scale, Second Edition measured ASC traits: social communication and interaction (SCI) and restricted interests and repetitive behaviours (RRB). Neonatal brain volumes (quantified using Tensor Based Morphometry) and childhood ASC traits (SCI and RRB) were compared between the three M-CHAT groups. Results: M-CHAT critical-positive scorers showed smaller neonatal cerebellar volumes compared to non-critical-positive and negative scorers. They additionally showed smaller neonatal brainstem volumes relative to negative scorers. Both positive groups displayed similarly elevated SCI and RRB scores compared to negative scorers in childhood. Conclusions: Differences in neonatal cerebellar volumes between the two positive screening groups, but similar ASC traits in childhood, suggest that distinct aetiological trajectories may lead to elevated ASC traits following VPT birth.

1-H-152 Tertiary sulcal morphology and cognition in autism spectrum disorder

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Objective: Quantifying the relationship among brain structure, brain function, and cognition in different neurodevelopmental disorders is a major goal of developmental cognitive neuroscience. Parallel recent findings i) identify links between the morphology of the mid-fusiform sulcus (MFS), a later-developing, smaller indentation (tertiary sulcus) in ventral temporal cortex (VTC), and cognition in individuals with

Autism Spectrum Disorder (ASD; Ammons et al., 2021) and ii) identify a new tertiary sulcus, the inframarginal sulcus (IFRMS; Willbrand et al., 2022), that serves as a tripartite landmark within posteromedial cortex (PMC), a portion of the cerebral cortex that is structurally and functionally different in individuals with ASD compared to neurotypical controls (NT). Here, we integrate these two tracks for the first time. Methods & Results: We first tested if there are morphological differences in VTC and PMC sulci between 50 NT and ASD individuals. Then, we tested if tertiary sulcal morphology in particular was linked to cognition in ASD individuals. Our twofold approach replicates and extends recent findings in five ways. First, in terms of replication, the standard deviation (STD) of MFS cortical thickness (CT) was increased in ASDs compared to NTs. Second, MFS length was shorter in ASDs compared to NTs. Third, the CT STD effect extended to other VTC sulci and PMC sulci. Fourth, individual differences in tertiary, but not primary, sulcal morphology in VTC and PMC were correlated between regions in ASD individuals. Fifth, IFRMS depth was negatively associated with ADOS scores. Conclusions: Our findings add to increasing evidence that shifts the focus from morphological analyses of primary structures in different syndromes and diseases to tertiary structures, which are either hominoid- or human-specific, making them ideal targets for future studies striving to better understand the neuroanatomical underpinnings of human developmental disorders.

1-H-153 Early life metal exposure is associated with reduced fractional anisotropy in the corpus callosum in children

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Background: The corpus callosum (CC) is the largest white matter structure in the brain, connecting the left and right hemispheres into functional networks subserving cognition and behavior. Neuroimaging studies demonstrate rapid CC development during the first years of life. During these early-life critical windows, the CC is vulnerable to perturbation by neurotoxicants including heavy metals. Most environmental studies consider single neurotoxicant exposures at a single time point, potentially missing the effects of joint exposure across a developmental stage. Here, we investigated associations between early life metal mixture exposure and CC white matter microstructure integrity in children. Methods: In a preliminary analysis of 47 children (8-13 years; 22 females) enrolled in a neuroimaging substudy within the Programming Research in Obesity, Growth, Environment and Social Stressors (PROGRESS) study, we estimated weekly exposure (22nd week gestation through 43rd week postnatal) to manganese (Mn), zinc (Zn), and lead (Pb) using laser ablation-inductively coupled plasma-mass spectrometry of teeth. We estimated CC white matter microstructure integrity using fractional anisotropy (FA) from diffusion tensor imaging (DTI) acquired in a 3T Siemens scanner. We used lagged weighted quantile sum (lWQS) regression to estimate the time-varying mixture effect on FA in the CC. Results: A higher metal mixture index in the 24th-43rd postnatal weeks was associated with decreased FA in the CC genu, body, and splenium (maximum β = -0.65 [95% CI -0.25, -1.07]), driven mainly by Zn and Pb. Conclusion: The CC may demonstrate a postnatal critical window to metals, with higher exposure to Zn and Pb associated with

reduced FA. These results may help understand the role of exposure timing in driving neurodevelopmental outcomes, pointing to future optimal and timely public health interventions.

1-H-154 Independent contributions of polygenic risk scores for externalizing behaviors and brain structures to parent-reported externalizing behavior in late childhood

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Externalizing behaviors are considered to violate social norms and can be harmful to self and others. Current evidence suggests a genetic contribution to externalizing behaviors and that it is associated with several brain structures. However, the mediating role of brain structures in the association between genetics and externalizing behaviors in youth is unresolved. We extracted data on externalizing behavior, as measured by the parent-reported CBCL, three polygenic risk scores (PRS) for antisocial behavior, ADHD-DBD diagnosis, and irritability, and MRI brain volumes and white matter integrity in 11.878 youth aged 9 to 10 years from the ABCD cohort. Here, we examined the associations between the PRS, brain structures, and externalizing behavior. More pronounced externalizing behavior was associated with older age (<0.5% variance explained), male sex (~2%), lower parental education and household income (~2%), Caucasian background (<0.5%), and acquisition site (2%). More pronounced externalizing behavior was associated with lower volumes of total brain and focal gray matter volumes, and with lower fractional anisotropy of regional white matter tracts. Higher PRS for externalizing behaviors was associated with lower cortical gray matter volume and reduced white matter integrity. Brain structures and the PRS each explained up to an additional ~0.5% of variation in externalizing behavior, with no indication that the association between PRS and externalizing behavior is mediated through brain structures. We conclude that externalizing behavior around late childhood can be predicted from a combination of sociodemographic factors, genetics and brain structures, explaining up to 8% of individual variation in externalizing behavior. Brain structures and the PRS contributed independently from each other, leaving over 90% of variance unaccounted for. Therefore, several genetic and environmental factors must still be unknown in externalizing behavior in late childhood.

1-H-155 A new tripartite landmark in posterior cingulate cortex: implications for brain network development

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Objective: Understanding brain structure-function relationships, and their development and evolution, is central to neuroscience research. Human neuroimaging shows that the posterior cingulate cortex (PCC) is an anatomically and physiologically unique brain region, being a hub of functional brain networks with one of the highest cortical metabolic rates. However, the functional anatomy of PCC remains poorly understood. Therefore, in the present study, we investigated whether the sulcal

morphology of PCC varies across the lifespan and is linked to macroanatomical, microstructural, and functional features of PCC. Methods & Results: Manually labeling 4,319 sulci in 552 hemispheres, we discovered a consistently localized shallow cortical indentation (termed the inframarginal sulcus; ifrms) within PCC that is absent from neuroanatomical atlases. Subsequent analyses revealed four main findings. First, the ifrms identifies a focal cluster of high cortical thickness and light myelination in PCC. Second, the ifrms co-localizes with, and predicts the location of, a functional sub-region of the cognitive control network (CCN). Third, the ifrms is identifiable from childhood through old age in humans. Fourth, morphological analyses showed that unique properties of the ifrms differ across the lifespan - and between hominoid species. Conclusions: Altogether, our results reveal that the ifrms is a new tripartite landmark in human PCC that is developmentally and evolutionarily relevant. These findings help reconcile prior discrepancies regarding where the default mode network ends and the CCN begins in PCC. Further, they support a classic theory that shallow, tertiary sulci serve as landmarks in association cortices, laying the groundwork for future investigations of the development of PCC functional neuroanatomy.

1-H-156 Testing developmental cascades: the relationship between pubertal timing, social support, and cortical development in early adolescence

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Our current understanding of how adverse experiences (AE) influence development is centred on how childhood AE predicts later outcomes in adolescence. While this is important, we must extend the scope of inquiry to establish how concurrent AE influence the brain during adolescence. Adolescence begins with the onset of puberty and is characterised by a pivot towards peer and romantic relationships. The timing of pubertal onset can vary greatly between young people. While there is currently no single accepted theory as to the consequences of early pubertal timing, the evidence suggests early pubertal onset might initiate a cascade of negative effects on neurodevelopment and behavioural outcomes, particularly in females. At the beginning of adolescence, young people's social support system - friendships, school engagement, neighbourhood safety and parent support - becomes increasingly important. There is emerging evidence to suggest that these factors can affect the rate of cortical thinning, a key characteristic of adolescent brain development. Investigation of how environmental exposures, particularly early AE and lower SES, accelerate cortical thinning has found more prominent effects in females, but not in all studies. Each of these factors have thus far been studied in isolation. We need to assess the cascading mechanisms of pubertal timing on environmental exposures and brain structure in early adolescence to address gaps in current theory. In this study, we will leverage ABCD data at two time points and will fit a Multi-Group Latent Change Score model to assess how social support factors (family support, neighbourhood cohesion, school environment, prosocial behaviour, and friendships) predict the rate of change in cortical thinning between age 9-10 and 11-12 years. This will allow us to test a developmental cascade model and understand the longitudinal effects of pubertal timing on cortical development in the context of the adolescent social support system.

1-H-157 Dissociable and shared associations between puberty, body mass index and brain microstructure

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Pubertal maturation is associated with physical changes, including increased body mass index (BMI), and concurs with a critical time in neurodevelopment linked to alterations in brain microstructure. However, the association between these phenotypes is unclear. We analysed associations between pubertal development scale (PDS) scores, BMI, and brain microstructure in 11047 observations from baseline and 2 year follow up data from the ABCD study in subjects aged 9-14 years. Brain microstructure was assessed using the restricted normalized isotropic (RNI) index from restriction spectrum imaging, a measure of the isotropic, intracellular proportion of the total diffusion-weighted MRI signal. Whole-brain voxelwise linear mixed effects analyses were used to study the associations between PDS, BMI, and RNI, controlling for fixed effects of age, sex, household income, parental education, ethnicity, top 10 genetic principal components, scanner ID and software, PDS by sex and PDS by age interactions, and random effects of subject and family. After controlling for the familywise error rate ($p<0.01$), greater PDS was associated with greater RNI in decision-making and reward-seeking gray matter (GM) structures such as the nucleus accumbens, caudate, putamen, thalamus, and lower RNI in the brain stem, frontal white matter (WM) and corona radiata. BMI showed similar positive associations with RNI in subcortical GM, but not WM. There were distributed main effects of sex across the brain but the PDS by sex interaction was not significant. When including BMI and PDS in the same model, BMI significantly mediated the PDS effects. Associations were attenuated and only remained significant in the medial and posterior thalamus, brain stem, corona radiata and frontal WM, while there was little change in BMI-brain associations. This mediation in GM structures, but not in WM, suggests that some neuroanatomical changes during puberty are dissociable from BMI-RNI associations.

1-H-158 Left hippocampus changes among first-time fathers are associated with family adversity, hormones, and adjustment to parenthood

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The hippocampus, which supports learning and memory, shows stress-sensitive remodeling across the lifespan and appears uniquely plastic across the transition to parenthood in human mothers. The current study examined left hippocampal volume changes among 37 men scanned before and after having their first child. Fathers' history of family adversity was negatively associated with left hippocampal volume change across the transition to parenthood, whereas fathers' prenatal oxytocin levels were positively associated with left hippocampal volume change. Left hippocampal volume changes were also negatively associated with postpartum testosterone after adjusting for prenatal testosterone. Left hippocampal volume increases predicted better parenting outcomes at six months postpartum, including stronger bonding and attachment, more effective parenting, and lower parenting stress. These findings are unique to the left hippocampus and did not replicate to the right hippocampus or to subcortical gray matter volume in general. In conclusion, the remodeling of the left hippocampus across the transition to new fatherhood may be linked with hormones and family background, and be a unique marker of successful adaptation to parenthood in human males.

1-H-159 Associations Between Cortical Myelination and Chronological Age in Early Childhood

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Introduction. Myelination during development builds efficient neural networks but limits plasticity. The T1w/T2w ratio (or "myelin map") can be used as a proxy measure of cortical myelin (Grydenland et al., 2013; Norbom et al., 2020; Shafee et al., 2015). Here, we seek to understand how cortical myelination changes with age in early childhood, in order to support future research examining environmental modulators of human neuroplasticity. Methods. Typically-developing children ages 4 to 10 (N = 159, 87 girls) underwent T1w and T2w structural MRI scanning. We created "myelin maps" for each participant using a processing pipeline that normalized intensities to CSF, skull, and soft tissues (Ganzetti et al., 2014). Whole-brain analyses were corrected for multiple comparisons at z = 2.3 using cluster-wise permutation testing in Freesurfer. Analysis. T1w/T2w values were strongly and positively associated with age in primary sensory (somatosensory, auditory, and visual) cortices and posterior cingulate cortex, controlling for gender. There were no significant clusters showing negative associations between T1w/T2w values and age. Implications. Consistent with prior work, our results suggest that myelination in sensory cortices increases during early childhood. These findings mirror established hierarchical patterns of cortical maturation, whereby sensory areas mature earliest, and association cortices supporting complex cognition mature latest. Accelerated myelination may stabilize neural networks earlier in life and thus lead to shortened windows of neuroplasticity and limited learning. Future analyses will examine whether T1w/T2w ratios are associated with adversity or markers of accelerated development (e.g., pubertal hormones, molar eruption).

1-H-160 Puberty and Structural Brain Development: It's About Time

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Introduction: Pubertal timing and tempo vary between individuals, which may explain some observed differences in patterns of brain development as there are associations in model systems between sex steroid hormones and neurodevelopment. There is also a suggested link between pubertal processes and adolescent-emergent mental health disorders, and thus a theory that neurodevelopment mechanistically relates puberty and mental health in adolescence. Therefore, we need to look closer at pubertal timing and tempo in the context of neural development during adolescence using longitudinal samples to further explore this potential relationship. Participants: This preregistered study uses data collected in 174 adolescent girls across three time points to explore how the pattern of structural brain development differs by pubertal timing and tempo. Methods: The brain data is processed and quality-assured through the Freesurfer pipeline. We quantified cortical thickness for 68 cortical regions, as defined by the Desikan-Killiany parcellation, and subcortical volume for 12 regions, as defined by the ASEG atlas. Saliva data is assayed for estradiol, testosterone, and DHEA using Salimetrics Enzyme-Linked Immunosorbent Assay (ELISA) kits. We are using the Pubertal Development Scale and line drawing scores to approximate Tanner Stage. Pubertal timing is defined as the random intercept and pubertal tempo is defined as the random slope for each participant in a model predicting pubertal stage from

age. Conclusion: This exploration can lead to better-informed questions regarding puberty's impact on the way brains develop and in turn, produce more efficient and translatable work.

1-H-161 Linked development of diffusion and NODDI white matter measures throughout early childhood

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Introduction: Multi-modal MRI has the potential to improve our understanding of early neurobiological development. Here, we used diffusion tensor imaging (DTI) and neurite orientation dispersion and density imaging (NODDI) to investigate coinciding changes in white matter throughout early childhood. Methods: Participants (age range 2.4-8.0 years) were selected from the Calgary Preschool MRI Dataset. Children with high-quality diffusion imaging at two b-values (b=750, 2000 s/mm2) were included (90 participants; 200 scans, mean age [SD]: 5.2 [1.3] years, 98 females/102 males). Diffusion images were analyzed using FSL's tract-based spatial statistics to produce skeletonized fractional anisotropy (FA) and mean diffusivity (MD) maps. Neurite density (NDI) and orientation dispersion index (ODI) maps were created with the NODDI Matlab toolbox. Linked independent component analysis quantified inter-subject variations across white matter measures. Linear and quadratic mixed effects models were used to identify age-related neurobiological patterns, including a sex interaction. Results: One linked pattern demonstrated a significant quadratic relationship with age ($T = 6.51$, $p < 0.0001$) with global increases in FA and decreases in MD, combined with increasing NDI and decreasing ODI in the corpus callosum and inferior/posterior white matter. This relationship involved a significant sex interaction, where females showed earlier white matter development than males during the preschool period, and males and females converged later in childhood. Conclusions: This study identified white matter developmental patterns across early childhood that likely underlie rapid cognitive changes. Global changes in diffusion parameters coincided with localized changes in NODDI measures. Sex-specific differences in developmental trajectories during the preschool period were observed, where females demonstrated earlier white matter maturation, consistent with previous literature.

1-I-162 Investigating the temporal dynamics and maturation of the brain resting-state functional networks in premature infants using EEG

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By interfering with the normal sequence of mechanisms serving the brain maturation, premature birth and perinatal stress can alter peri-natal experiences, with potential long-term consequences on the child development. The early characterization of brain functioning is thus of critical interest in premature infants who are at high risk of atypical outcomes. We aimed to characterize the resting-state activity in infants (gestational age at birth: 25-31weeks) studied at the equivalent age of pregnancy term (n=20)

and longitudinally 2-months later (n=12), using high-density electroencephalography (EEG; recording duration: 2.8-8.3mins). The temporal dynamics of brain activity were characterized by parsing it into "microstates", defined as sequences of short-lasting scalp topographies (Michel & Koenig, NeuroImage, 2018). K-means clustering algorithm identified 7 dominant microstate templates that explained more than 50% of the signal variance across infants. These templates were back fitted to each infant recording and individual characteristics were measured and compared across ages. Metrics of Duration (i.e. average time a microstate lasts before changing to a new one), Occurrence (i.e. rate per second) and Coverage (i.e. proportion along recording time) showed developmental changes. While the duration of all microstates decreased between the two ages, their occurrence frequency mainly increased. Furthermore, the coverage of 4/7 microstates changed. These suggest both an acceleration of the temporal dynamics and an evolution in the spatiotemporal organization of brain activity with maturation. This preliminary work highlights the potential of microstates characterization to investigate resting-state functional networks in infants. This approach may provide clinically-useful quantitative measures of the developing brain activity, and help to evaluate atypical deviations related to early insults.

1-I-163 Functional connectivity of the paraventricular nucleus of the thalamus in children and adolescents

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Background: The paraventricular nucleus of the thalamus (PVT) is gaining attention for its roles in integrating salient experiences, arbitration of motivational conflict, retrieval of long-term fear memories, and behavioral regulation. In rodents, the PVT has been found to encode early-life experiences, granting it the potential to influence consequential motivated behaviors later in life and modulate susceptibility to neuropsychiatric disorders. However, little is known about the development of PVT circuitry in humans. Our group recently demarcated the functional network of the PVT in adults using resting state functional magnetic resonance imaging (rsfMRI). The developmental trajectory of the PVT network in children and adolescents remains unknown. Objective:To characterize the PVT network development in children and adolescents to allow for future investigation of network changes in psychiatric disorders. Methods:We investigated functional connectivity (FC) of the PVT circuitry in 178 children (age range: 9-17 years) using 3T rsfMRI. We entered a PVT mask as a seed region and mapped the PVT FC while controlling for nearby thalamic subnuclei. Results:Preliminary results suggest the PVT circuitry is detectable in children and adolescents, with broadly similar networks engaged as our work in adults. Prepubescent children are significantly different in PVT FC where females (ages 8-13) have significant connectivity to expected anterior regions of the PVT network, where males appear to have more posterior connectivity. Conclusions:Sex differences in PVT connectivity seem to change as children age, perhaps attributable to separate developmental trajectories. Earlier frontal connectivity in females is consistent with an earlier puberty initiation and frontal lobe development. Understanding the trajectory of neurotypical PVT development may provide insight into the role the PVT plays in an array of neuropsychiatric conditions and the encoding of early-life experiences.

1-I-164 Developmental trajectories of functional connectivity reveal distinct patterns of age effects across the first two years of life

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Objective: Early infancy is defined by dramatic growth in the brain's functional architecture. However, little is known about distinct longitudinal developmental trajectories of different parts of the brain over the first 2 years of life. Methods: Subjects included 101 infant participants with longitudinal rsfMRI data collected at 3 weeks, 1 year, and 2 years of age. A novel whole-brain heatmap analysis was performed. For each functional parcellation region of interest (ROI), we fit 4 mixed-effect models to determine the significance of 4 continuous age predictors, each assessing a distinct pattern of age-dependent change: 1) Growth: linear-age predictor, 2) Emergent: log-age predictor, 3) Pruning: negative-quadratic-age predictor to detect inverted-U effects, and 4) Transient: positive-quadratic-age predictor to detect U effects. For each ROI, the best-fit model was determined by the Akaike information criterion and a summary measure defined as the percentage of connections showing significant age effects was assigned to the seed ROI. Resulting heatmaps for each model indicated the spatial distribution of age effects on FC. Results: Growth effects were localized to higher-order temporal, frontal, parietal, and middle cingulate regions and least prevalent in lower-order sensory, visual, and parahippocampal areas. Emergent effects were dominant in parietal, frontal, and inferior visual regions, and least prevalent in mid/posterior cingulate, auditory, and subcortical areas. Pruning effects were localized to anterior cingulate, orbitofrontal, temporal, and parahippocampal regions. Transient effects were concentrated in anterior cingulate and orbitofrontal areas. Conclusions: Consistent with previous findings showing sequential FC development during infancy, we found unique patterns of age effects on FC. Importantly, distinct patterns across the brain were associated with growth, emergent, pruning, and transient effects on FC during the first 2 years of life.

1-I-165 Progressive Voxelwise Homotopic Connectivity (VMHC) from childhood to adulthood: age-related asymmetry in Resting-State fMRI

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Interhemispheric communication contributes to brain function, but the degree and nature of hemispheric asymmetry in resting state functional connectivity has been the topic of debate. Moreover, how functional asymmetry develops from childhood to adulthood is largely unknown. Homotopic connectivity describes the connectivity between mirror brain regions and has been proposed as a marker of neurological and psychiatric conditions. In this cross-sectional study, we examined age effects on homotopic connectivity from childhood to adulthood. Voxel-Mirrored Homotopic Connectivity (VMHC) was evaluated in a sample of 85 neurotypical individuals aged from 7 to 18 years. VMHC associations with age, handedness and gender were explored voxel-wise, and within 14 functional networks. Primary and secondary outcomes were repeated in a sample of 107 adults aged from 21 to 50 years. Control analyses estimated the effect of motion (mean Framewise Displacement). In adults, VMHC was negatively correlated with age only in the posterior Insula (False-discovery-rate $p<0.05$, >30-

voxels clusters), while a distributed effect was observed among the medial axis in minors. Four out of 14 considered networks showed significant negative correlations between VMHC and age in minors (Basal Ganglia r=-0.280 p=0.010, anterior Salience r=-0.245 p=0.024, Language r=-0.222 p=0.041, Primary Visual networks r=-0.257 p=0.017), but not adults. In minors, an effect of motion on VMHC was observed in the Putamen. The results indicate significant reductions in VMHC from childhood to adulthood, but only limited reductions from young adulthood to middle age, supporting the notion that interhemispheric interactions change during late neurodevelopment.

1-I-166 Altered Developmental Trajectory of Dorsal DMN Connectivity in Youths with Subclinical Depression and PTSD Symptoms

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The default mode network (DMN) plays a crucial role in internal self-processing, rumination, and social functions. Aberrant DMN connectivity has been identified in children with diagnosed mental health disorders; however, the impact of subclinical psychopathology on DMN functional development is not well-characterized. We investigate how subclinical symptoms can alter the longitudinal trajectory of DMN functional connectivity during this sensitive developmental period. Resting state fMRI data were collected from 190 participants (ages 8-15 years, 94 female) yearly at three timepoints and preprocessed using the DPABI Toolbox. We computed within-network connectivity for the DMN using the Yeo 7 and 17-network atlases. We estimated a latent growth curve model to explore longitudinal changes in DMN connectivity. The model included age, sex, site, and three Trauma Symptom Checklist for Children (TSCC) subscores for anxiety, depression, and posttraumatic stress. In the baseline growth model without predictors, we found no systematic changes in DMN connectivity over time (slope = .001, p = .916). However, we observed significant modulation after adding psychopathology predictors; greater depressive symptomatology was associated with decreases in connectivity over time (b=-.008, β=-.325, p=.041) whereas PTSD symptoms were associated with increases in connectivity over time (b=.006, β=.429, p=.028). Exploring the same models with DMN subdivisions using the Yeo 17 atlas revealed that the noted effects were driven by connectivity measured from dorsal medial prefrontal cortex (dMPFC) regions. Subclinical anxiety and PTSD symptoms alter DMN connectivity over time in developing youths, specifically in the dMPFC, a nexus of clinical significance in several mental health disorders.

1-I-167 Latent Typologies of Sleep Patterns: Associations with Resting-State Functional Connectivity, Internalizing and Externalizing Problems

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Objective: Neural connectivity develop rapidly during adolescence. Yet, less is known about how resting-state functional connectivity (rsFC), specifically Default Mode Network (DMN), is associated with different sleep patterns and youth psychosocial outcomes. The present study used a latent profile

analysis to identify sleep profiles based on sleep duration, latency, efficiency, wake count, and wake minutes, in 2887 youth (47.8% female; Mage = 10.1) from the Adolescent Brain Cognitive Development study. We hypothesize that 1) lower within and between regions of DMN rsFC will be linked with poorer sleep profiles, and 2) adolescents with a poorer sleep profile will evince higher levels of internalizing and externalizing symptoms. Method: Pre-processed fMRI data assessed within DMN rsFC and between regions (e.g., DMN-caudate) at T1. Sleep patterns were measured using Fitbit devices at T5. Internalizing and externalizing problems were measured at T7. A 3-step modeling approach was utilized to compare predictors (e.g.,DMN- caudate rsFC) and evaluate between-group differences in internalizing and externalizing problems. Results: Four subgroups of sleepers were identified: healthy (47%), low sleep efficiency (22%), low sleep duration (19%) and high sleep latency (12%). Profiles differed significantly on aggressive behaviors, thought and social problems, but not on anxiety and depression symptoms. Overall, healthy sleepers were less likely to report internalizing and externalizing problems. Interestingly, adolescents with lower DMN-right Caudate rsFC connectivity were more likely to classify in lower sleep efficiency, lower sleep duration, and higher sleep latency groups than the healthy group. Conclusion: Our study provides preliminary results on how DMN-Caudate rsFC is related to different sleep patterns. Adequate, good-quality sleep is critical to preventing youth development of psychopathology.

1-J-168 The Maternal Tryptophan-Kynurenine Pathway Mediates the Association between Maternal Adiposity and Child Risk for Psychopathology

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Mounting evidence indicates an association between developmental exposure to maternal obesity and increased risk of neurodevelopmental disorders; however, the mechanisms for this association remain unknown. We hypothesize that maternal obesity causes alterations in offspring neurobehavioral development by increasing maternal peripheral inflammation and altering the tryptophan (TRP)-kynurenine (KYN) pathway. Here we focus on the neuroactive metabolites of the kynurenine pathway: quinolinic acid (QA; considered neurotoxic) and picolinic acid (PA; considered neuroprotective). We examined this hypothesis in a longitudinal, prospective study. In this study participants (N=310) had their body composition measured using a BodPod and their blood collected during the 2nd trimester of pregnancy. TRP, serotonin, KYN and KYN metabolites (kynurenic acid (KA), QA, and PA) were measured in plasma samples using liquid chromatography tandem mass spectrometry. At 6 months postpartum, participants completed the Infant Behavior Questionnaire to track infant temperament and a subcohort of N=69 completed an EEG visit when their infant was 1-month old. Path model analysis revealed that increased maternal percent body fat was related to increased KYN:TRP (ß=0.18, p<.01) and decreased PA:QA (ß=-0.12, p<.01) in the second trimester (2T). Further, decreased 2T PA:QA was related to increased infant negative affect at 6 months of age (ß=-0.12, p<.01). Interestingly, 1-month EEG frontal asymmetry mediated the relationship between 2T PA:QA and 6-month child negative affect (β=-.06, p=.03). Lastly, when considered together, we found evidence of serial mediation from 2T percent body fat to 2T PA:QA to 1-month EEG frontal asymmetry to 6-month infant sadness (β=.01, p=.02) and fear (β=.01, p=.007). We provide evidence that alterations to the maternal tryptophan-kynurenine pathway

during pregnancy is a mechanistic link between obesity and child behavioral impairments and risk for psychopathology.

1-J-169 Longitudinal changes in Glutamate and GABA balance through adolescence

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Recent work in animals and humans suggests that critical period plasticity mechanisms may underlie cognitive development in prefrontal cortex (PFC) through adolescence. This work has identified changes in glutamate (Glu) and gamma-aminobutyric acid (GABA), indicating a shift in excitation/inhibition (E/I) balance toward inhibition, akin to mechanisms underlying critical periods in sensory cortices. In this study, we will examine changes in GABA and Glu in dorsolateral PFC, medial PFC, anterior cingulate cortex, and anterior insula through adolescence longitudinally using 7T Magnetic Resonance Spectroscopic Imaging. Prior analyses (Perica et al., Flux 2021) have identified cross-sectional age-related decreases in Glu across regions of PFC, as well as decreases in GABA in some regions but stability in others. We also identified indices of increases in GABA-Glu balance by assessing the correlation between Glu and GABA across regions, from adolescence to adulthood. Here, we plan to extend these findings using newly acquired longitudinal follow-up data in a sample of 162 10 - 30 year olds with up to 3 visits per participant. At each visit, an oblique MRSI slice was obtained of 24x24 voxels (1.0x0.9x0.9mm) using a J-refocused spectroscopic imaging sequence (TE/TR=35/1500ms). Leveraging the longitudinal data, we will examine how change in PFC GABA (e.g., from visit 1 to visit 2) predicts change in Glu to characterize shifts in E/I balance. We will then examine whether Glu and GABA balance at time 1, as measured by individual deviation from the mean, predicts the magnitude of Glu and GABA change at subsequent visits. We hypothesize that indices of Glu/GABA balance will increase through adolescence at the individual level, eventually stabilizing in adulthood. These results will inform a model of adolescent development in where E/I becomes balanced into adulthood providing evidence for critical period plasticity in association cortex.

1-J-170 The role of anterior cingulate GABA and glutamate concentrations in emotion regulation in adolescents and adults

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Emotion regulation concerns extrinsic and intrinsic processes intended to change the nature, duration, or intensity of the experience and expression of emotions. Adolescence is a period with profound changes in emotion regulation as well as in the proposed underlying neural components, including γ aminobutyric acid (GABA) and glutamate. However, it is not known how developmental changes in GABA and glutamate concentrations from adolescence to adulthood relate to changes in emotion regulation. The aim of this study is to compare self-reported emotion regulation in adolescence and adulthood and to test for the contribution of GABA and glutamate concentrations to emotion regulation and potential age-group differences. We hypothesize that adolescents will report less efficient emotion regulation compared to adults. We also expect emotion regulation to be related to GABA and glutamate

concentrations. This cross-sectional study will include 40 adults and 40 adolescents, typically developed. Data collection will be completed by May 2022. Single voxel dorsal anterior cingulate cortex (dACC) MEGA-PRESS magnetic resonance spectroscopy will be used to assess GABA and glutamate concentrations, quantified as the ratio to creatine. The Emotion Questionnaire will be used to measure emotion regulation for anger, fear, sadness, worry, and elation (Rydell et al, 2003). Tests of age-group differences in self-reported emotion regulation will be conducted. The contribution of GABA, glutamate and their ratio to emotion regulation will be assessed using regression analyses. This study will shed light on the typical development of emotion regulation and its neural correlates, specifically the contribution of GABA, glutamate, and their ratio.

1-J-171 Navigating the Multiverse in Longitudal Neuroscience

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Author order is alphabetized. Variability in analytic decisions may be a major contributor to irreplicable findings in psychology. Preregistration of a single analytic pipeline has been proposed as one solution, but is too brittle in the presence of unexamined arbitrariness of decisions and true uncertainty about correct model specification. Multiverse analyses (including specification curves) test the robustness of findings through systematic investigation of all reasonable analyses. Multiverse analysis is a useful method for clarifying uncertainty in the young field of developmental cognitive neuroscience. These methods are themselves still quite new and under development, making it an optimal time to introduce them to this field. We review the literature on multiverse methods, highlighting some pitfalls. We then provide a detailed walk-through of their application to a developmental fMRI dataset. We then demonstrate how to use these tools to ask cross-sectional and longitudinal research questions in task fMRI data provided by adolescent girls over two waves, 18 months apart. First, we investigate the association between individual differences in social trait endorsements and self-referential processing. Second, we examine the trajectory of self-referential processing in relation to pubertal development. In both cases, we examine variation in results across modeling decisions, including: choice of ROI, parcellation atlas, registration template, smoothing kernel, motion metric, exclusion rule, and covariate inclusion. Most importantly, we demonstrate how the approach can be used in confirmatory and exploratory contexts to identify where further theoretical and empirical work is needed, and generate hypotheses to guide this future work.

1-J-172 Hormonal Development in Rhesus Macaques Can Inform Human Models of Pubertal Effects on Neurocognitive Development

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Investigating neurocognitive maturation in adolescence is critical for understanding how adult trajectories are established. Adolescence is marked by puberty driven by hormonal changes whose contributions to neurocognitive maturation have been difficult to assess in humans given limitations in

controlling for the effects of environmental forces on hormonal fluctuations. Primate models of puberty and brain development allow for rigorous and controlled characterization of hormonal changes through puberty, but there is a paucity of studies using this approach and the need for repeated sampling is challenging across species. Here, we characterize hormonal changes in a macaque model and compare it to humans to establish areas of overlap in which non-human primate models can be leveraged to inform human models of neurocognitive maturation during puberty. 117 human participants (10-30 years old, 68 F; 1-2 visits each) and 8 rhesus macaques (2.8-5.6 years old, 2 F; sampled every 3 months) provided hair samples, which were assayed for testosterone (T) and dehydroepiandrosterone (DHEA) in all individuals, and estradiol and progesterone (P) in all macaques and female human participants. All individuals also completed an antisaccade task. Analyses revealed age-related change in P and T levels across human participants and in T, DHEA, and estradiol in macaques ($p<0.05$). Importantly, we found similar correlation patterns among hormones in both species, with the exception of P and T, which are highly correlated in humans ($r=0.51$), but uncorrelated in macaques ($r=0.002$) suggesting important similarities and differences critical for informing human models of pubertal influence on cognitive development. We will extend these analyses to estimate age/sex effects in hormone levels, as well as associations between hormones and task performance in humans to be compared with past work showing marked improvement in antisaccade performance over this period in both species.

1-J-173 Probing Dopaminergic Deficits in Adolescent Depression

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Depression is a chronic and impairing mental health condition that often peaks during adolescence. Prior work implicates alterations within the RDoC Positive Valence Systems in adolescent depression, including anhedonia and blunted striatal reward response. These alterations generally rely on dopaminergic projections from the midbrain (substantia nigra, ventral tegmental area) to striatal and prefrontal circuits. Yet, the hypothesized role of dopamine is largely based on animal, pharmacological, post-mortem human, and adult studies utilizing methods too invasive for pediatric research (e.g., lumbar puncture, positron emission tomography). Recently, a safe and non-invasive alternative means of characterizing midbrain dopamine has been developed using magnetic resonance imaging (MRI) to assess neuromelanin, a key product of dopamine metabolism. As part of ongoing data collection, we have collected preliminary neuromelanin-MRI data from 18 adolescents (13-18 years old; Target N=60), primarily with a history of major depressive disorder. Lower midbrain neuromelanin-MRI signal associates with social anhedonia (ACIPS; B=-0.54, t=-3.23, p=.006) and suicidal ideation (SSI; B=-0.45, t=-2.37, p=.03), controlling for age and sex. These novel data confirm the role of midbrain dopaminergic function in adolescent depression. Future analyses will examine associations with real-world depression and social anhedonia over the month following scan via smartphone ecological momentary assessment as well as associations with other neuroimaging modalities, i.e., linking midbrain neuromelanin with reward response during functional MRI. We aim to probe the utility of neuromelanin-MRI, in combination with other measures, as predictors of course and continuity of depression symptoms in this time of rapid adolescent development. Future studies will build on this to probe potential dopaminergic risk marker in earlier child development to predict depression onset before this adolescent peak.

1-K-174 A method to deliver individualized rTMS in youth with Tourette Syndrome

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Tourette Syndrome (TS) is a neurodevelopmental disorder characterized by chronic tics, repetitive involuntary movements and vocalizations. Current interventions target tic reduction and include pharmacotherapy and Comprehensive Behavioral Intervention for Tics (CBIT), but many youth do not experience meaningful symptom improvement. Repetitive transcranial Magnetic Stimulation (rTMS) holds promise for treating tics, as it enables non-invasive modulation of circuitry involved in tics. In TS, inhibition of the supplementary motor area (SMA) with rTMS has shown initial promise for reducing tics in open label trials. In prior research using rTMS to probe or treat TS and other neurodevelopmental and psychiatric disorders, the coil position is informed by standardized scalp coordinates or individual brain morphology, without considering spatial variation in location of brain function. Recent clinical trials in adults with major depression suggest that utilizing individualized structural and functional information to guide the coil placement may improve treatment efficacy (Cole et al. 2021; Cash et al. 2021). In the current study, we use individualized TMS coil positioning in a clinical trial augmenting CBIT with rTMS to target SMA. In a cohort of 14 young adolescents (Conelea et al. 2021), we used task functional MRI (fMRI) to identify the motor cortex (M1) and SMA for each individual. An Efield is simulated with Simnibs (Saturnino et al. 2019) and used to estimate the coil position where the projected EField reaches highest correlation with the activation map within SMA (Beynel et al. 2019). We present the spatial variability within participants between the position of the coil informed by the individualized SMA region and the traditional approach informed with morphological landmarks. This method permits to inform individual-specific targets in order to improve symptoms in patients with TS using rTMS treatment.

1-K-175 The role of body movement for the development of visual attention in infancy ? investigation with automatic movement quantification methods

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In everyday life, we continuously explore the environment around us. During this exploration, we voluntarily move our eyes from one location to another while we process all information present at these locations by keeping our eyes focused there. This process of visual orienting involves moving the eyes and the head in response to, or in anticipation of a new sensory stimulus (Johnson & de Haan, 2015), and it appears to play a central role in human learning and development (Sokolov, 1963). Initial studies in the area of eye and body movements in infancy have shown that 1-month olds move their body soon after initiating a gaze shift and that these body movements were shorter already at 3 months of age, suggesting a developmental change in the coupling of those movements (Robertson et al., 2011).. However, although the developmental trajectories of eye movements are well documented, little is known about how mastering effective eye movement control relates to (i) movements of other body parts (ii) and the impact it has on later cognitive development. To shed more light into this topic we used a computer vision algorithm to study the coupling between the motor system and visual studies using a series of completed studies with infants ranging from 4.5 months to 14 months (total N~=500).

We applied Deeplabcut (DLC; Mathis et al., 2018), to precisely track user-defined body parts and extracted four different features (i.e., left and right hand, trunk and head). DLC returns a series of x and y coordinates which were later converted into movement by computing the Euclidean distances between two consecutive frames. Consequently, each Euclidean movement of the labelled body parts was aligned to the onset of each saccade. Here, we present the preliminary results of the decoupling of eye movements in different eye-tracking tasks in relation other body movements. We discuss the implications of this relation for the correct function of the attentional networks.

1-K-176 Individual neural signatures of infants' preference for social auditory stimuli: towards real-time infant fMRI

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Infants' brain responses to social cues are associated with later individual differences in socialisation (Lloyd-Fox et al., 2018) and could shape how neural networks involved in social skills develop (Jones et al., 2016). Mapping infants' responses to social and non-social stimuli could inform us about their interest in the social world (Shultz et al., 2018). Neuroadaptive Bayesian Optimisation (NBO) rapidly identifies individuals' task-specific brain activation (Lorenz et al., 2016) by analysing data in real time and use them to predict the stimulus producing the strongest response among those available in a stimulus space. Here, we conducted offline analyses of existing infant fMRI data to test feasibility of using NBO to study the social brain development (Figure 1). Data from 14 3-7-month-old infants reported in Blasi et al., 2011 were analysed. Infants heard 32 21s-sound sequences (happy, sad, neutral vocalisations, environmental sounds). Data were analysed in FSL, ANTs and R. We developed a single-block pre-processing pipeline producing individual-level brain responses (n_discovery=7, n_validation=7). We analysed distance between the predicted and empirical optimum, how many iterations are needed for the algorithm to map the space, and which balance of exploration/exploitation (k value) allows fastest performance. In the discovery sample, the pipeline produced reliable responses over the temporal lobe on a single-block level (Cronbach's alpha M=0.68, SD=0.09; split-half reliability M=0.80, SD=0.19), and a decrease in Euclidean distance to the optimum was obtained in 86% of the sample with k=0.1 (Figure 2). The pipeline allowed identification of the optimum in 71% of the validation sample within 10 iterations. NBO is a promising approach to capture individual differences in brain responses in infants and can be applied in future experiments to study specialisation of the individual infant social brain.

1-K-177 Optical flow reveals the development of top-down propagations across the neocortex

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The hierarchical organization of the cortex underlies bottom-up sensory integration and top-down control. Evidence suggests that global hierarchical organization is not established in youth, but instead is a product of protracted development. Critically, hierarchical processing necessarily involves activity

propagating to higher or lower-order areas. However, prior fMRI studies of hierarchical organization have chiefly quantified BOLD fluctuations over time, rather than over space. To track cortical propagations, we used a computer vision technique on resting-state data in HCP-D (n=388 after QC). Specifically, within continuous TR sequences uninterrupted by head motion, we estimated directions of BOLD signal propagations between consecutive TRs using spherical Optical Flow. To quantify hierarchical ascent and descent, we derived the gradient (∇) of a validated map of cortical hierarchy. The resulting vector field described the direction of hierarchical ascent across the cortex. Finally, BOLD directions were compared to hierarchical directions, and alignment between them was assessed relative to spin test permutations. We found that BOLD signal tends to either ascend ("bottom-up") or descend ("top-down") the cortical hierarchy following a bimodal distribution (pspin <0.005 in 362/388 subjects, pspin < 0.022 in all). Further, top-down propagations were associated with top-down cognitive processing: more top-down propagations were observed under task-demands relative to resting-state scans (t = 2.37-13.97, pfdr <0.05). Finally, adults exhibited more top-down propagations compared to children both globally (panova < 0.0001) and across many parts of the cortex (pfdr <0.05). In sum, we found that BOLD-indexed activity propagation is robustly bimodal across a cortical hierarchy, with both top-down and bottom-up propagations being common. Further, our results suggest that top-down propagations become more prevalent both under task demands and with age in development.

1-K-179 Precision mapping of functional networks in newborns - a pilot investigation

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Efforts in precision functional mapping of adult brain networks have opened up a new avenue for precision medicine. However, similar efforts in infants have been sparse due to the general difficulty of collecting functional data in infants, which is compounded by the extended data collection time needed for generating reliable functional connectivity networks. The use of multi-echo (ME) fMRI has shown to be an option for acquiring reliable signals in shorter recording times in adults. Building up on this knowledge, we aim to establish a procedure for precision mapping in infants. In addition to using ME, we tested NORDIC as a tool for thermal noise reduction to improve overall signal quality. We acquired pilot data from one newborn from whom we recorded 141.75min of ME resting state fMRI data over four consecutive days. We were able to obtain 84.37min of low motion data with a frame wise displacement < 0.3. We examined network reliability by comparing networks generated from one half of the dataset to networks generated from various minutes of randomly chosen data (100 permutations) from the other half of the dataset. Overall network reliability reaches a mean value of r=0.8 with 40min of data and r=0.84 in data with additional NORDIC denoising. Reliability values reach a reasonable plateau using approximately 15min of data (mean r=0.77, min=0.75, max=0.79) which was further elevated in ME data with NORDIC denoising (mean r=0.82, min=0.8, max=0.84). Additional construction of vertex by vertex reliability maps show that in contrast to adults, this newborn shows the highest reliability in areas around the motor strip. This pilot experiment shows the feasibility of precision functional mapping in newborn infants and suggests a large benefit of ME scanning with NORDIC signal denoising. We plan to substantiate these results by collecting data in further infants and additionally comparing reliability values between data collected with single echo and ME fMRI sequences.

1-K-180 Examining the influence of training on the balance between goal-directed and habitual control using time-varying GAM models in adolescents and young adults

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With practice and repetition across extended periods of time, initially goal-directed behaviors can shift to habitual responses. Research suggests that gradual, quantitative change in brain function may underlie this seemingly qualitative transition. In this study, we seek to better characterize the effects of extensive training on changes in brain connectivity in adolescents and young adults by modeling within-person dynamics at the individual level. Modeling within-person dynamics 1) avoids the problem of making within-person inference from between-person data and 2) may reveal differences in the effects of overtraining in brain regions that support the balance between habitual and goal-directed systems. Participants (n = 12, 6 adolescents, 6 young adults), underwent fMRI while undergoing an instrumental training task designed to induce habitual responding. We use time-varying generalized additive models (GAMs) to examine the effects of training across days. Specifically, we examine the time-dependent changes in functional connectivity parameters (i.e., edge weights) among select corticostriatal regions (e.g., putamen, ventral striatum, motor cortex) within each scanning session and across lab visits. We hypothesize that adolescents and young adults will display heterogeneous patterns of connectivity change, by either displaying aspects of change that are linear or nonlinear, time-varying or time invariant, or some combination of either dimension. Additionally, we will examine how patterns of change at the individual level relate to behavioral performance, questionnaire responses, and demographic data. Our exploratory approach of modeling within-person brain dynamics at the individual level may better characterize how extensive training influences the gradual formation of habitual behaviors.

1-K-181 Utilizing functional connectivity to identify neuropsychological subgroups in typically developing and ADHD-diagnosed youth

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Historically, the heterogeneity problem, the idea that underlying biological mechanisms for a given symptom can vary between individuals, limited neurological biomarker discovery for neurodevelopmental disorders. Relatedly, behavioral studies have discovered that some heterogeneity within ADHD individuals may be nested in typical variation (Fair 2012, Cordova 2020). Work characterizing brain heterogeneity related to unique profiles in the typical population has been slow due to the inability to conduct Brain Wide Association Studies (BWAS) in large samples. With the onset of the ABCD study, BWAS studies which leverage the contribution of small effects across the brain are changing this trend. Here, we mapped functional connectivity to higher-order cognitive functions and behavior (general ability, executive function, learning & memory, and emotion regulation), in a discovery sample (ABCD cohort,N=6,352). These weighted contributions were then applied to a target sample (Oregon-ADHD-1000 cohort, N ct=217, N ADHD= 336) to generate an individual PolyNeuro Risk Score (PNRS), similar to a PolyGenic Risk Score, per outcome of interest. Patterns in these PNRSs were examined via

community detection to identify similar neurophysiological profiles within typically developing (TD) and ADHD-diagnosed youth. Preliminary findings show seven neuropsychologically distinct subgroups within the Oregon-ADHD-1000 sample. The general pattern of scores was similar across ADHD participants and TD youth within each subgroup, similar to previous results using neuropsychological tests. The PNRSs of executive function and emotion regulation had the most notable variation across the identified subgroups. Our findings reveal subgroups characterized by unique brain behavior associations with ADHD-diagnosed youth nested within TD variation. Future work will include the validation of the subgroups utilizing independent samples and an investigation into their utility as biomarkers of ADHD symptoms.

1-L-19 Sensory over-responsivity in childhood is common, has robust neural correlates, and indicates diverse psychiatric risk

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Although sensory over-responsivity (SOR), or strong negative reactivity to sensory stimuli, is a well-known feature of autism spectrum disorder (ASD), it is also common in other childhood psychiatric disorders and found in typically developing children. Its clinical significance and neural bases remain unclear. We used linear mixed-effects models on data from the large, multi-site ABCD study to characterize the clinical relevance and functional neural correlates of SOR in a longitudinal community sample of adolescents that excluded children with moderate/severe ASD. Among children with parent-report measures of SOR (ages 10 - 11 years; N=11,210), 18% exhibited mild or severe SOR. Controlling for ASD symptoms, site/family, and demographic variables, both mild and severe SOR were associated with greater symptoms of depression, anxiety, obsessive-compulsive disorder, and attention-deficit/hyperactivity disorder (ADHD). Controlling for the above covariates and internalizing/externalizing symptoms, mild SOR predicted subsequent increases in anxiety and ADHD symptoms, whereas severe SOR predicted increases in anxiety and prodromal psychosis symptoms. To study stable differences in network-level functional connectivity (FC) associated with severe SOR, we identified FC pairs of interest related to SOR in baseline fMRI data and then tested those relations in the Year-2 scan data. Controlling for site/family, demographic variables, psychiatric and ASD symptoms, and amount of scan data, these analyses identified robust SOR-associated FC differences relevant to sensory processing and salience, including reduced FC within and between somatomotor networks, enhanced somatomotor-salience FC, enhanced cingulo-opercular-amygdala FC, and altered FC between sensory networks and bilateral hippocampi. These results suggest that SOR is an important phenotype for understanding diversity in normative neurocognitive development and its relevance for psychiatric risk.

1-L-182 Changes in emotional and behavior problems, and brain morphometry following mild traumatic brain injury in early adolescence: A pre-post study design

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Introduction: Studies comparing children with and without a traumatic brain injury (TBI) have shown that pediatric TBI is associated with difficulties in a large range of functional domains, including emotion

and behavior (Catroppa et al 2015), as well as with changes in brain morphometry (King et al 2019). However, whether these differences already existed before the injury remains an unsolved question. The large population-based Adolescent Brain Cognitive Development (ABCD) Study (Casey et al 2018) provides a rare opportunity to explore it. Objectives & hypothesis: This pre-post design study aims to examine changes in emotional and behavioral problems, and brain morphometry following pediatric mTBI. Given its exploratory nature, no a priori hypothesis is formulated. Methods: The following baseline and 2-year follow-up data from the ABCD 4.0 curated data release will be used: 1) The Parent Ohio State TBI Screen-Short Modified report (Bogner et al 2017) to identify children with no-TBI (n=6,394; baseline mean age = 9.9years; 3102 girls) and children who sustained a mild TBI between baseline and 2-year follow-up (n=132; baseline mean age = 9.9years; 58 girls); 2) The syndrome scales of the Child Behavior Checklist (Achenbach & Rescorla 2000), and 3) Volumes and cortical thickness in 68 Desikan regions (Desikan et al 2006) computed on T1-weighted images by the ABCD group. Scanner effects will be removed before analyses using longitudinal ComBat (Beer et al 2020). Sex and parental education will be included as covariates. Analysis plan: Multigroup latent change score models will be constructed with the lavaan 0.6-8 package (Rosseel, 2012) to estimate latent difference scores between baseline and follow-up for child behavior and brain structure. Group differences in 4 parameters of interest (mean of the baseline score, rate of change over time, and variances of the baseline and of the change) will be tested using chi-square difference tests (Kievit et al 2018).

1-L-183 Testing and assessing for multiple dyslexias, cases of double-dissocitations

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A deficit in any of the visual and language processes involved in reading can lead to a different type of dyslexia, resulting in a diversity of reading difficulties in acquired and developmental dyslexia (Friedmann & Coltheart, 2018). Much research has been focused on finding a central deficit in dyslexia, leading to screeners that filter for certain errors while ignoring others. We draw upon the Dual-Route model of reading (Coltheart, 2005) to test for selective deficits in French. Our screener, the Malabi (Dehaene & Friedmann, 2015), includes reading 161 single words, 40 pseudowords, and 44 word-pairs. Each word was chosen for its potential to induce a specific error type. Types of dyslexia are determined according to the types of errors made. We tested 17 French dyslexics and 141 typical readers (middle school, mean age 12). We identified 3 selective cases of attentional dyslexia, an impairment in letter-to-word binding manifesting as a migration of letters between words (reading bar cat as "bat car"), and one case of letter-position dyslexia, an impairment in letter position encoding within words (reading destiny as "density"). The dyslexic students were later asked to read another test addressing letter-position dyslexia and attentional dyslexia. We found a double-dissociation between letter position errors and migrations between words, suggesting that the encoding of letter positions within words and of letter-to-word binding are separate functions. Results of further tests also provide further exploration of factors that aggravate the specific deficit. For the first time in French, we provide support to the diagnosis and evidence for the existence of dissociable deficits corresponding to developmental attentional dyslexia and developmental letter-position dyslexia. Our findings help specify the conditions

that are most likely to yield errors in French and provide discussion for educators as to the best possible remediation.

1-L-184 Impact of cannabis use on brain maturation in a Canadian longitudinal cohort

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Adolescence is a time of behavioural change, brain maturation and increasing incidence of psychiatric illnesses. Adolescent exposure to cannabis is associated with increased risks for adverse outcomes including psychotic disorders. The impact of adolescent cannabis exposure on brain maturation is poorly understood and few studies have examined brain structure and cannabis use at more than two time points, which permits examination of within-person effects. We used a longitudinal design and participants from a population-based cohort study (n=3871) to study substance use, mental health, and brain maturation. Participants completed annual assessments for 5 years starting at age 13. Participants in the neuroimaging sub-cohort (n=150) completed structural MRI scans at three time points for each participant (at ages 13, 15, and 17). MRI images were processed using the ENIGMA consortium's Freesurfer longitudinal neuroimaging pipeline. We will apply random intercept cross-lagged panel models to investigate temporal precedence in the relationship between cannabis and brain structure. We hypothesize that cannabis use will affect the normal trajectory of age-related changes in cortical thickness and subcortical volume, that this effect will favour a cannabis-to-structure direction of association, and that the effect will be strongest with a younger age of exposure. This analysis will contribute to our understanding of the impact of cannabis exposure on brain maturation during adolescence.

1-L-185 Examining Prosocial Choice and Effort in Adolescents with Conduct Problems and Varying Levels of Callous-Unemotional Traits

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Prosocial behaviours (performing acts that benefit others) are of crucial importance for human social development. There are, however, individual differences in how people behave in relation to others, and a minority of individuals exhibit remarkably low levels of prosocial behaviour. Conduct Problems (CP) in adolescence are characterised by severe and premeditated antisocial behaviour, and reduced prosocial behaviour. This pattern appears particularly pronounced in adolescents with CP and high levels of callous-unemotional traits (CP/HCU) who are at a potentially increased risk of developing psychopathy in adulthood. While a substantial amount of research has been devoted to the neurocognitive mechanisms that underlie antisocial behaviour in adolescents with CP, particularly in relation to negative emotion processing, much less is known about mechanisms associated with scarcity of prosocial behaviours in this group. Here we break new ground by employing a task that captures both prosocial intentions, through choice to engage in a prosocial action, and prosocial action , through actual effort exerted on behalf of others in adolescent boys with CP and their typically developing (TD) peers (age 11-16; 25 CP/HCU; 29 CP/LCU; 33 TD). We also employ computational modelling to probe the mechanistic processes that are involved when choosing to engage in prosocial behaviour. We show that

adolescents with CP were less likely to choose to initiate prosocial acts - regardless of whether they had high or lower levels of CU traits (CP/HCU or CP/LCU). Furthermore, we show that adolescents with CP/HCU exerted markedly less prosocial effort than other groups after they had chosen to engage in a prosocial act. This observation of seemingly 'superficial prosociality' in CP/HCU supports a growing literature documenting a divergence between, on the one hand, the ability and, on the other, the propensity to engage in processes that have the potential to benefit themselves or others.

1-L-186 Clinical and neural profiles of youths on atypical developmental trajectories of psychotic experiences

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This study aimed to investigate the clinical and neural profiles of atypical developmental trajectories of psychotic experiences, before the onset of clinical psychotic symptoms. 86 youths were recruited from a general population-based sample of over 3,800 adolescents that were followed for 4 years. Three groups were determined based on validated developmental trajectories of psychotic experiences: a low-decreasing control trajectory, a decreasing trajectory, and an increasing trajectory. At age 17, fMRI data was collected during two tasks looking at self-other and facial emotion processing, and activation analyses were conducted. Clinically, the decreasing trajectory displayed more negative psychotic symptoms while the increasing trajectory displayed more positive psychotic symptoms. During facial emotion processing, both atypical trajectories exhibited hypoactivation of the right inferior frontal gyrus, and hyperactivation of the precuneus and dorsal anterior cingulate cortex, and the decreasing trajectory also displayed decreased precentral gyrus activation. During self-other processing the increasing trajectory displayed hypoactivation of the dorsomedial prefrontal cortex, while the decreasing trajectory showed hypoactivation of the middle occipital gyrus, superior temporal gyrus and the inferior frontal gyrus. In sum, the two atypical trajectories displayed different clinical and neural profiles during these two tasks. The increasing trajectory, which may present an increased psychosis risk, exhibited changes in areas of emotional salience and self-other differentiation, similarly to what is reported in schizophrenia. The decreasing trajectory displayed further deficits that suggest more generalized cognitive impairments, which could explain their negative psychotic symptoms. Together, our results highlight the relevance of utilizing trajectories of psychotic experiences to investigate the neural changes that precede clinical symptoms of psychosis.

1-L-187 Probing individual differences in visual attention and autism traits: A large-scale online eye-tracking study

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Eye tracking has proven useful to reveal atypical viewing behavior in autism spectrum disorder (ASD). For example, individuals with ASD present fewer gazes and shorter looking times to faces or target locations of a person's gaze, but more gazes to the background or low-level salient features (e.g., contrast), compared to matched controls (Wang et al., 2015 Neuron). Due to the practical challenges of

in-lab eye trackers, however, most eye tracking studies have been limited to participants who can afford to come into the laboratories and thus often rely on group-level comparisons. In this study, we aim to utilize webcam-based eye-tracking technology (WebGazer; Papoutsaki et al. 2016) to examine autism-related atypical gaze patterns in the general population (adults; n>5,000) broadly recruited online, regardless of their diagnostic labels. We will present photographs and movie clips that consist of social interactions and natural scenes. Participants will view the stimuli in two task contexts: free exploration and visual search. Building on previous findings from our lab, we will examine fixation maps and apply a computational saliency model to compute saliency weights for different feature types (e.g., from low-level, object-, and semantic-level saliency) for each participant. We will then compare these weights to standardized behavioral measures, such as the Social Responsiveness Scale-2 (Constantino, 2012) and Autism Quotient (Wheelwright et al., 2006), across individuals. We will discuss a possibility of developing this paradigm into a longitudinal study to characterize intra-individual variability, as well as benefits and limitations of online tools. Once validated, this technology may help understand individual differences and developmental trajectories in gaze patterns in relation to autism traits, and ultimately provide objective and quantifiable measures of ASD symptoms and effective diagnostic tools that can reach broader populations.

1-L-188 Through the looking glass: the neural basis of self-concept in young adults with varying levels of psychopathic traits

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Recent theories suggest that a positive self-concept, and differences in underlying neural activity during self-evaluation, may play an important role in different antisocial behavioral trajectories in early adulthood. Here, we test this hypothesis. A self-concept task was performed by 94 young adults (age range 18-30-yrs). During the task, participants with a persistent or desistent antisocial trajectory (N = 54), and typically developing young adults (N = 40) rated whether positive and negative traits in different domains (prosocial, physical) described themselves. To account for heterogeneity in antisocial behavior, we also examined associations with individual differences in psychopathic traits. Most young adults endorsed more positive than negative trait statements, which did not differ between groups. However, psychopathic traits were negatively associated with prosocial self-concept and mPFC activity during self-evaluation. Together, these findings suggest that antisocial tendencies might indeed be reflected in how young adults evaluate their prosocial traits. As such, our study provides important starting points to understand why and how self-concept and identity play a role in desistance from crime and antisocial behavior.

1-L-189 Shared neural mechanisms underlie the development of risk-taking and anxiety in adolescents

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Anxiety disorders often emerge in adolescence and are marked by persistent avoidant behavior. Conversely, adolescence is also characterized by approach behaviors such as risk-taking. Research

suggests that shared mechanisms underlie adolescent changes in anxiety and risk-taking but a neurobiological link contributing to the rise of both phenotypes remains elusive. 107 youth (MAgeT1=11.28, 47F, 34.6% white, 24.3% Latino, 19.6% Asian, 13.1% Black, 8.4% Mixed Race) were assessed across 2 timepoints as they played a task involving risky decision-making and cognitive control during fMRI. Using representational similarity analysis, we compared 3 key adolescent behaviors: risky choice, cautious choice, and response inhibition. As anxiety has been associated with excessive avoidant behavior, we predicted that youth whose anxiety worsened between Time 1 and Time 2 would show less neural differentiation between voluntary cautious decisions and instructed response inhibition, denoting a shift from goal-directed behavior to habit-based avoidance. The group showed increases in risk-taking and decreases in anxiety from Time 1 to Time 2. Changes in anxiety were not related to changes in task risk-taking; however, increases in anxiety were linked to self-reported decreases in decision confidence and increases in decision avoidance. Increases in risk-taking were paralleled by increased neural similarity between risky and cautious choice and neural dissimilarity between cautious choice and response inhibition. Conversely, increases in anxiety were paralleled by greater neural dissimilarity between risky and cautious choice and neural similarity between cautious choice and response inhibition. In this way, neural representations of cautious choice shifted towards risky choice or response inhibition depending on risk-taking and anxiety trajectories. Overall, results suggest that overlapping neural mechanisms underlie changes in risky behavior and anxiety in adolescents.

1-L-190 Altered development of the Hurst Exponent in medial prefrontal cortex in young children with autism spectrum disorders

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Atypical balance of excitation (E) and inhibition (I) in the brain is thought to contribute to the emergence and symptomatology of autism spectrum disorders (ASD). The E/I ratio can be estimated from resting state functional magnetic resonance imaging (fMRI) using the Hurst Exponent (HE). A recent study (Trakoshis et al. 2021) reported decreased ventromedial prefrontal cortex (vmPFC) HE in male adults with ASD. As part of the default mode network (DMN), vmPFC plays an important role in emotion regulation, decision making, and social cognition. It has frequently been reported to show altered function and connectivity in children, adolescents, and adults with ASD. The current study aims to extend previous findings and presents the first fMRI evidence of altered early development of vmPFC HE and its link to DMN functional connectivity (FC) and emotional control in a cohort of toddlers and preschoolers with ASD. 45 children with ASD (n=32 male) and 38 typically developing (TD) children (n=21 male), ages 15-65 months, underwent natural sleep fMRI as part of a longitudinal study. In a cross-sectional analysis, vmPFC HE decreased with age in children with ASD, reflecting increasing E/I ratio, but not in TD children (group-by-age interaction: $F(1,76)=5.1$, $p=.027$, $\eta^2=.06$; ANCOVA controlling for in-scanner head motion). This effect remained significant when additionally controlling for gestational age at birth, socioeconomic status, or ethnicity. The same pattern was also observed in the subset of children with longitudinal fMRI acquisitions (n=21; average time between scans 23 months), with vmPFC HE decreasing in children with ASD but increasing in the TD group. Lower vmPFC HE was further

associated with reduced FC within the DMN as well as with reduced emotional control (as measured with the Preschool BRIEF). These results suggest an early onset of E/I imbalances in vmPFC in ASD with likely consequences for the maturation of the DMN and neurodevelopmental outcome.

1-M-192 Sensory Prediction and Repetition Suppression in the tactile modality as early markers of executive attention development at preschool age

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Study's objective Sensory Prediction (SP) in the tactile modality was suggested as an early precursor of cognitive development (Dumont et al.,2017). Predictive mechanisms would form the basis of attention development by sustaining self-regulation processes such as habituation or anticipation (Bubic et al., 2010). The aim of this study is to investigate how tactile prediction and other tactile processing phenomena are related to executive attention at preschool age. Methods and Hypothesis Children (aiming at N=70) between 4 and 5 years old, either born at term or born prematurely, perform the following tasks in random order while 128-electrodes electroencephalography is being acquired: an adapted version of the Child-Attention Network Task (ANT, a measure of executive attention) (Rueda et al., 2004), and a tactile SP task (vibrotactile stimuli are presented on the forearm randomly interspersed with deviant and omitted stimuli). We will perform regression analyses using the generalized linear model to test the following hypotheses: 1) children who have the most impaired responses to executive conflict in the Child-ANT - reaction time in ms and neuronal evoked potentials (EP) amplitude in µV - will also have the most atypical EP to deviant stimuli and omissions in the tactile SP task. 2) children with impaired attention will have lower repetition suppression (RS, the decrease of EP amplitude) of tactile stimuli along the sequence. 3) children born at term will have better ANT scores, SP and RS than prematurely born children. General implications of the study If sensory regulation mechanisms are markers of attention development, we could use such measures to screen for children at-risk of atypical attentional development, and to design suitable remediation programs. This study is pre-registered with the US National Institute of Health registry of clinical trials (NCT04548245): https://www.clinicaltrials.gov/ct2/show/study/NCT04548245?term=MEDiATE&cntry=FR&draw=2&rank

1-M-193 Exploring the developmental trajectories of voluntary and involuntary auditory attention

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Selective attentional control is dependent on the balance between voluntary and involuntary mechanisms. Voluntary attention allows us to focus on goal-relevant information while attention can be captured involuntarily by task-irrelevant but potentially important events outside the current focus. The development as well as the interaction of these attention mechanisms throughout childhood is still not yet sufficiently understood, particularly for the auditory domain. By employing complementing psychophysiological measures (ERP, pupil dilation and behavior), this project aims at disentangling the exact developmental time courses of voluntary and involuntary attention by comparing attention-related markers in children of two pivotal age-groups (6-8 y and 10-12 y) as well as adults. The paradigm

used includes target and non-target sounds, which are presented equiprobably (Go/NoGo). To distract attention, deviant sounds which also carry task-relevant information, are presented with a 20 % probability (oddball). This combines the investigation of voluntary (targets/non-targets) and involuntary (standards/deviants) attention mechanisms. Distraction effects are expected to decrease with age and will be assessed by comparing reaction times to deviants vs. standards as well as error rates between different age groups. Further, the pupil dilation response (PDR) is expected to increase in response to target and deviant sounds to a higher extent in the youngest age group compared to older children and adults. ERP differences between Go and NoGo trials will provide information about age-related changes of voluntary attention mechanisms including conflict monitoring and inhibitory control (NoGo N2, NoGo P3, P3b). ERPs related to involuntary attention will be evaluated in the deviant-minus-standard difference (P3a). Statistical assessment will be performed using frequentist and Bayesian analyses.

1-M-194 Associations Between Intraindividual Reaction Time Variability, Psychopathology, and White Matter Microstructure

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Background and objectives Adolescence marks a period of extensive cognitive development and for some, the emergence of mental health problems. Typically, increased cognitive stability, often measured by intraindividual variability (IIV) in reaction times (RT), is observed. However, increased IIV (i.e., less cognitive stability) is consistently seen in attention problems, and also, less consistently, in other dimensions of psychopathology. While studies have linked IIV to brain white matter microstructure (WWM), large studies testing the robustness and spatial specificity of these associations are needed. As such, the current study seeks to identify the associations between IIV and dimensions of psychopathology and on brain WMM in youth. We hypothesise that greater IIV is associated with both general risk for psychopathology (p-factor) and a specific attention problems factor. Additionally, in relation to the diffusion tensor imaging (DTI) metrics, we predict that greater IIV is associated with widespread lower fractional anisotropy (FA) and higher mean diffusivity (MD). Methods and analysis plans We will utilise data from the Adolescent Brain Cognitive Development (ABCD) Study baseline assessment, consisting of 11,878 9-10-year-olds. IIV will be quantified as the standard deviation of RT in correct response go trials in the stop signal task (SST). Psychopathology will be measured by the Child Behaviour Checklist. A bifactor confirmatory factor analysis will be used to extract a general p-factor, as well as specific factors internalising, externalising, and attention problems. To investigate WWM, tabulated data of FA and MD will be examined in 23 atlas-based tracts. Scanner effects will be controlled for using ComBat. We will use separate linear mixed effects models, with psychopathology and DTI metrics as the dependent variables for each model, and IIV as independent variable, controlling for age, sex, ethnicity, and genomic relationship.

1-M-195 Enhanced processing of task-irrelevant information during tablet PC interaction

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Mobile digital media play an increasingly important role in everyday life for many children. However, little is known about the direct impact of digital media use on children's perception and attention. Thus, we investigated brain activity in response to task-irrelevant sounds while children interacted with a tablet PC or a human opponent. Children (6-9 years) played an identical card game with a virtual partner on a tablet PC or face-to-face with the experimenter while a to-be-ignored oddball sound sequence was presented. The sound sequence included frequently repeated standard sounds and rarely and randomly presented environmental novel sounds. Event-related potentials in the EEG (P1, P2, P3a), that reflect sound-related processes of perception and attention, were analyzed using a temporal principal component analysis. We observed increased amplitudes of P1, P2, and P3a in the tablet PC condition compared to the human partner condition. Results indicate enhanced early processing of task-irrelevant sounds and increased allocation of attention toward task-irrelevant novel sounds during the interaction with a tablet PC compared to the interaction with a human opponent. In conclusion, tablet PC use modulates the immediate perception of irrelevant auditory information and the allocation of attentional resources in primary school-aged children. These results provide evidence for the direct influence of digital media use on information processing from a neuroscientific perspective and can be applied to the development of digital interactive learning programs for teaching purposes.

1-M-196 Framing the area for avoiding visual interference and optimizing visual search in adolescents and adults

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Adults and even more adolescents exhibit difficulties for dealing with distracting information. Previous studies showed that participants have difficulties to avoid distraction from global visual information when searching for local details. We investigated an ecological method to enhance the processing of local details in adolescents and adults. We combined a cueing paradigm with a global/local visual search task by adding a frame on screen during this task. Forty one adolescents (M = 12.4 years, SD = 0.6) were randomly assigned to either frame or no-frame groups. Forty six adults (M = 22.5 years, SD = 5) were also assigned to the frame group. The stimuli were hierarchical figures representing a global shape composed of local elements. Participants had to indicate whether a square was present or not (50% present) at the local or global level. For the frame group, the target was located inside the gray frame with either 1, 3, or 5 inside-frame distractors and either 3, 9, or 15 outside-frame distractors. The same items were used for the no-frame group except that the frame was absent. Adolescents' and adults' responses times (RTs) analyses showed that the increasing number of distractors impacted significantly the local visual search but did not impact global visual search RTs. For the no-frame group, all distractors negatively impacted local target processing. Critically, frame group analyses showed that even if the distractors located inside of the frame affected significantly the RTs during local target processing, the distractors located outside of the frame did not impact RTs. In addition, statistical analyses revealed a similar benefit effect from the frame in adolescents and in adults. These results suggest that using a frame is an efficient approach for optimizing the attentional resources during time-consuming visual searches throughout development.

1-M-197 Neural mechanisms underlying paying attention to external versus internal representations

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Daily life is filled with a constant influx of sensory information. Attention--specifically selective attention--helps filter out unnecessary information to focus on what is most important and relevant at any given moment. This crucial role of resolving competition between stimuli makes attention an integral aspect of cognition and tightly links it to other higher-level functions. In particular, working memory works closely with attention to help guide flexible and adaptive behavior. Given that working memory has rigid capacity constraints, attention serves two main functions at their intersection: 1) to help prioritize which information is most important to store in working memory, and 2) to strengthen and select relevant information from working memory stores. We will compare these two interactions by implementing a task commonly utilized in the literature that employs two types of attention cues, one which is presented before a stimulus display (pre-cue) and another which is presented while the stimulus is held in working memory (retro-cue). Research has shown that, while both adults and children as young as seven reap large benefits in performance due to pre-cues, children are unable to use retro-cues as effectively as adults. Interestingly, a comparative EEG study in children and adults showed that while adults displayed similar neural markers for pre- and retro-cues, the processes were dissociated in children. In this ongoing study, we establish the previously reported behavior on pre- and retro-cues and, importantly, plan to use electrocorticography to compare, with unprecedented resolution, the modulatory effects of pre- and retro-cues in childhood and adulthood to shed light on how these complex and overlapping cognitive functions are developed. Understanding how these two systems that use distinct neural mechanisms during childhood converge into a unified neural network in adulthood may provide profound mechanistic insight into complex cognitive process.

1-N-198 Neural adaptation in children with varying reading skills

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Introduction Repeated stimulus presentation leads to reduced neural activity in brain regions involved in its processing. Neural adaptation (NA) paradigms in fMRI can thus be used to assess the magnitude and spatial location of selective neural processing in specific cortical networks. A recent study showed a general deficit in NA to speech, print and object processing in adults with developmental dyslexia, suggesting dysfunctional adaptation as a core feature of dyslexia (Perrachione et al., 2016). We aimed to investigate whether this NA effect for written words occurs in children and sought to clarify its association with reading skills. Methods More than 70 fifth grade children with varying reading skills (11.41 ± .43 y) performed a visual adaptation paradigm during fMRI, consisting of block-wise presentation of repeated and non-repeated words, objects and pseudowords. To derive adaptation effects, we performed one-sample t-tests on a whole-brain level. NA effects were correlated with reading skills. Results Our results reveal NA effects to words, objects and pseudowords in the ventral visual stream, NA to words in the left superior temporal gyrus and to pseudowords in the left precentral gyrus. NA to words in the right precuneus was associated with lower reading skills, while NA to

pseudowords in the left precentral gyrus and other regions of the reading network was associated with higher reading skills. Conclusion As expected, we found an NA effect for words and pseudowords in the reading network and for objects in the occipitotemporal region. Correlation analyses with reading scores did not support deficient NA in poorly reading children during word or object processing. Our results in children therefore speak against a general deficit in neural adaptation as a cause for dyslexia.

1-N-199 Functional-connectivity language laterality reliably predicts a greater proportion of the variance in task performance as the linguistic skills needed for the task increase

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Language is an extremely important cognitive function that develops a distinct left-hemisphere bias through adolescence. We studied the development of the language network through laterality in the Adolescent Brain Cognitive Development (ABCD) resting-state data using a novel functional connectivity approach. Traditional connectivity maps from a single seed show higher ipsilateral connectivity than contralateral. If the underlying circuitry is not lateralized, connectivity maps from a seed comprising equal proportions of the given seed and its homotope would have a laterality index (LI) of 0. If the circuitry is truly lateralized, such a map would show a hemispheric preference, independent from LIs calculated from the left or right homotopes. To control for ipsilateral bias, we calculated the integrated LI (ILI) which first generates LIs from ?mixed? seeds comprising grayordinates from both homotopes, at 100 different left/right proportions in independent resting-state samples and integrates the resulting curve. We applied this procedure to left-hemisphere seeds from the traditional language network: Broca?s and Wernicke?s areas and the medial temporal gyrus (MTG). Broca?s and MTG ILI showed a significant left-hemisphere preference, but Wernicke?s did not. ILIs were not associated with handedness, socioeconomic or bilingual status. Among a set of 15 established behavioral scores (Thompson et al., 2018), we found Broca?s ILI explained more of the variance as the language skills needed for the task increased. This pattern was stronger for MTG, but Wernicke?s area showed no clear pattern, perhaps due to that ROI?s small size. We validated our findings in a split-half replication. Our findings highlight nuances of functional connectivity in traditional language areas and their association with behavior. They also suggest a new approach to examine the development of laterality and its association with the onset of language abilities in younger populations.

1-N-200 From vision to language: Subregions of the visual word form area show distinct patterns of functional connectivity

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The Visual Word Form Area (VWFA) is a region of ventral occipitotemporal cortex (VOTC) which responds to text. Recent findings suggest that this word-selective cortex comprises at least two distinct subregions: the more posterior VWFA-1 is sensitive to visual features, while the more anterior VWFA-2 processes higher level language information. Complementary evidence suggests that these subregions differ from each other not only functionally, but also in white matter structural connectivity. Here, we

explore whether these two subregions exhibit different patterns of functional connectivity, and whether these patterns have relevance for reading ability. A sample of 90 children and adolescents was selected from the HBN database (Alexander et al., 2017; 47 males, age 13±3.5y, range 6.5-20y). Selection criteria included the availability of two high quality resting-state functional runs and a reading assessment. Whole brain functional connectivity analysis revealed that VWFA-1 was more strongly correlated with bilateral visual regions including VOTC and posterior parietal cortex. In contrast, VWFA-2 was more strongly correlated with language regions in the frontal and lateral parietal lobes, particularly bilateral inferior frontal gyrus (IFG) and intraparietal sulcus (IPS). Further, we found that the connectivity patterns of these subregions were differentially associated with reading ability, such that better readers have stronger connectivity between frontal language regions and VWFA-2, but not VWFA-1. Our findings support the distinction between subregions of the VWFA, showing that adjacent regions are coupled with distinct networks, and that the connectivity patterns of VWFA-2, but not VWFA-1, are selectively related to reading ability. Together these findings reveal an elegant correspondence between white matter anatomy, functional connectivity and the development of reading skills.

1-N-201 The relation between home language environment and structural neural connectivity in infants with and without an elevated risk for oral language disorders.

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For most children, language acquisition is an early, effortless process considered to result from the interaction between neuroanatomical foundations and the language environment. Past research has emphasized the importance of the quality and quantity of early language exposure for the development of language skills. However, only a limited number of studies have attempted to explore the neural mechanisms underlying the relation between home language exposure and children's language skills. Combining a natural sleep MRI protocol and the Language ENvironment Analysis (LENA) technology in 12-to-24-month-old children, the present study aims at investigating how variations in early language exposure relates to structural neural connectivity in children with or without an elevated risk for oral language disorders. Two-day long naturalistic audio recordings were acquired as a measure of a child's language environment and development. Estimated counts per hour for conversational turns, adult words, and child vocalizations together with qualitative measures of caregivers' responsiveness were extracted as relevant markers for quantitative and qualitative early language exposure. Preliminary results investigating the relation between these ecological measures of a child's early language development and environment and white matter connectivity measured through fractional anisotropy will be presented.

1-O-18 Cortical responses to music and speech measured with fMRI in one-month-old infants

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A population of neurons in human non-primary auditory cortex responds selectively to music, and a distinct neural population responds selectively to speech. These selective responses cannot be explained

by the differing low-level acoustic properties of speech and music. Does newborn infant cortex exhibit a similarly selective response to speech and music? To answer this question, we collected functional magnetic resonance imaging (fMRI) data from 45 sleeping infants (2.0- to 11.9-weeks-old) while they listened to single-source instrumental lullabies and female-produced infant-directed speech. To match acoustic variation between music and speech sounds we (1) recorded music from instruments that had a similar spectral range as female infant-directed speech, (2) used a novel excitation-matching algorithm to match the cochleagrams of music and speech stimuli, and (3) produced "model-matched" stimuli that had matched spectrotemporal statistics to those of the music and speech stimuli. As expected, we found that cocheleagram-matched music and speech stimuli and modulation-matched music and speech stimuli activated primary auditory cortex similarly. Additionally, we found a set of voxels in non-primary auditory cortex with a preferential response to speech that could not be explained by the spectrotemporal features of speech, and another set of voxels that had a response to music that could not be explained by the spectrotemporal features of music. Taken together, these results provide preliminary evidence that shortly after birth, humans have music and speech responses in auditory cortex that cannot be explained by the acoustic features of these stimulus categories.

1-O-202 Action-related sound perception and prediction in children

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Presented in this poster is an initial EEG-study that is followed-up by a second EEG-MEG-study that is in progress. In the initial study, sounds were unexpectedly omitted from an action in a group of 6-8-year old children and a group of adults. Interestingly, ERP responses to unexpected sound omission were very similar between adults and children, while sound responses exhibited large differences. These differences are characterized by a prominent positive waveform around 100ms after sound onset in children and a more differentiated waveform including a N1 component in adults. This shows that sound prediction matures early relative to sound processing, implying that prediction-related processes might drive the development of sound processing. Additionally, the use of temporal principal component analysis (PCA) revealed that the large positivity observed in the child ERP in response to sounds consists of three subcomponents. Although this positivity in children has been described extensively in existing literature, there is much uncertainty and speculation about its subdivision in separable components. Therefore, our follow-up study will explore whether PCA can reliably subdivide this positivity in separate subcomponents, and whether these can be localized to separate brain areas. In order to achieve this, the study takes a combined EEG-MEG approach. Moreover, in order to analyze how subcomponents react to different inter-stimulus-intervals (ISI), three conditions are presented in which sounds are presented at different rates. This study will show (1) whether PCA of the ERP waveform results in a similar decomposition compared to the previous study, (2) whether subcomponents can be localized to different brain areas using MEG, and (3) whether identified subcomponents have independent reactions to manipulation of the ISI. Results will offer valuable insights into the development of functions of the auditory system.

1-O-203 Examining frontomedial theta in fear conditioning and extinction during adolescence

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The increased vulnerability to experiencing high levels of anxiety and anxiety disorders in adolescence may partly result from differences in fear conditioning and extinction learning during this developmental period relative to adulthood. Human and animal studies have found that the amygdala and frontomedial brain regions are critically involved in conditioned fear and that frontomedial oscillations in the theta range (4-8 Hz) may support communication between these brain regions. However, age-dependent differences in theta oscillations between adults and adolescents during fear conditioning and extinction have not been explored. To address this, we analysed EEG data from adolescents (N =25, 13-14 years) and adults (N= 23, 25-26 years) collected during differential Pavlovian fear conditioning task (Linton and Levita, 2021). Specifically, we examined potential age-related differences in theta power in response to a conditioned stimulus (CS+) predictive of an aversive sound, and the safe CS-. Preliminary findings suggest age differences in occipital theta, with adolescents showing greater theta power to the CS+ compared to the CS- during fear acquisition, and no extinction of this difference during the fear extinction phase. In contrast, adults showed greater occipital theta power to the CS- compared to the CS+, which was extinguished during the fear extinction phase. In the frontomedial cortex, there were no age differences in theta power, with both adults and adolescents showing greater theta power to the CS- compared to the CS+ during fear conditioning (acquisition). During the extinction phase, theta power increased to the CS+ such that there was no longer a dissociation in occipital theta power between the CS+ and CS- in both age groups. The analysis is ongoing to further examine and validate these results and their significance

1-O-204 White matter organization predicts subtle motor signs in children with ADHD

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Objective: Children with ADHD often present with greater incidence of subtle developmental motor signs than their peers. Despite prior suggestion that atypical white matter organization in senosorimotor tracts may, at least partly, explain the presence of motor signs in ADHD, no study has directly investigated this important question. This study aimed to do so. Methods: The sample comprised 92 children with ADHD aged 8-12 years (MAge : 10.17; Female=24), and 185 non-ADHD controls (MAge : 10.30; Female=64). The Physical and Neurological Examination of Soft Signs (PANESS) was used to examine the presence of subtle motor signs. Measures of white matter organization in sensorimotor tracts were obtained following diffusion MRI. Diffusion weighted imaging data (b = 700 s/mm2, 2 x 32 directions) were collected on a 3T MRI scanner. The corticospinal tract (CST), corpus collosum (CC), superior longitudinal fasciculus (SLF) and frontopontine tract (FPT) were reconstructed using TractSeg. For each tract, we derived measures of fiber bundle cross-section (morphology) using Fixel-Based Analysis. Results: Across the entire sample, higher (more impaired) PANESS 'Total' scores were significantly associated with lower FC within the CC and bilateral CST. A significant association was observed between increased right-sided motor overflow movements and lower FC in the CC. Slower speed of movements on both right and left were significantly associated with lower FC in the CC,

bilateral CST and FPT. Finally, a significant association was observed between poorer performance of gaits and stations and decreased FC in the bilateral CST. Linear mixed models demonstrated that FC was significantly reduced in those with ADHD compared to controls in regions where associations between PANESS scores and FC were observed. Conclusions: Findings suggest that anomalous white matter organization in sensorimotor tracts may be a marker of subtle developmental motor signs in children with and without ADHD.

1-O-205 Neurobiological markers of familial risk for depression among healthy youth in the Adolescent Brain Cognitive Development (ABCD) Study

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Depression is a leading cause of disability and suicide among adolescents. Family history of depression is a robust predictor of early-onset depression. Family history of depression may confer risk through alterations in neural circuits implicated in reward and emotional processing. These brain changes may be evident in youth who are at high familial risk for depression but do not presently exhibit symptoms. However, the identification of robust and replicable findings has been hindered by a limited number of studies and small sample sizes in prior work. The current study aims to identify distinct patterns of functional connectivity (FC) in emotion- and reward-related networks between healthy youth at high familial risk for depression versus healthy youth at low familial risk for psychopathology. Participants include healthy (i.e., no current/past psychiatric diagnoses) youth at high familial risk for depression (HR, n=1,564) and low familial risk for psychopathology (LR, n=3,915) aged 9-10 from the Adolescent Brain Cognitive Development (ABCD) Study. The HR group includes youth who have at least one biological parent with a history of depression, and the LR group includes youth whose parents have no lifetime history of psychopathology. Youth completed resting-state functional magnetic resonance imaging (fMRI) scans. We will utilize a whole-brain seed-to-voxel approach using the CONN Toolbox to examine group differences in FC patterns with the amygdala, ventral striatum, and dorsal striatum as regions of interest. Covariates include age, sex, scanner site, and framewise displacement. We hypothesize that relative to LR youth, HR youth will exhibit amygdala-prefrontal hyperconnectivity and striatum-prefrontal hypoconnectivity. The identification of robust brain-based signatures of depression risk in youth will advance knowledge of the neural underpinnings of depression, which may improve early detection and treatment approaches.

1-P-206 Neurodevelopmetal changes after adverse experiences in adolescence

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Approximately 2/3 of the population experience at least one adversity before the age of eighteen, including diverse experiences ranging from parental divorce to physical abuse. There is evidence that adverse childhood experiences (ACEs) are linked to detrimental outcomes during adulthood, such as depression. Existing work on adverse experiences has been focused on early childhood experiences, which has left another potential sensitive period for adversity neglected: Adolescence. Adolescents experience a range of social and biological changes that may lead to a second period of increased

susceptibility to environmental influences after early childhood. Neurological changes have been hypothesized to follow adverse experiences, and understanding neurodevelopment is a critical step in uncovering the mechanisms by which adversity shapes developmental trajectories. Hence, this study aims to understand the influence of adversity on brain development in adolescence. This study will use data from the longitudinal Adolescent Brain Cognitive Development study (ABCD, N ≈ 12.000, participants aged 9-12). Structural brain connectivity will be assessed using fractional anisotropy data in canonical white matter tracts. A range of adverse experiences will be included (e.g., bullying). Using latent basis models, we will determine average trajectories of brain development. This model will be adapted into an unrestricted growth mixture model to identify subpopulations showing distinct developmental trajectories. Next, we will fit machine learning models to predict the brain development subpopulations from adverse experiences. We will train the model separately using XGBoost models and regularized logistic regression to determine the best model fit. We hypothesize that (1) there are subpopulations in adolescence showing distinct structural brain connectivity trajectories. We additionally expect that (2) adverse life experiences predict structural brain connectivity later in life.

1-P-207 Refinement of Functional Connectivity in Development Aligns with the Sensorimotor to Association Axis

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A recent neurodevelopmental hypothesis posits that cortical maturation progresses along the sensorimotor-association (S-A) axis, which spans from unimodal sensorimotor to transmodal association cortices. Prior work suggests that patterns of functional network development vary across this cortical hierarchy. In this pre-registered analysis, we will use multiple large-scale datasets to replicate and extend prior work. We hypothesize that integration of unimodal networks increases and segregation of transmodal networks increases during functional development in youth. We will use resting-state functional MRI in youth ages 5-22 from four large datasets. The Philadelphia Neurodevelopmental Cohort (N=1601) will be used for discovery and feature selection; Human Connectome Project: Development (N= 1300), Healthy Brain Network (N=1362), and Nathan Kline Institute-Rockland (N=1700) will be used to replicate all results in triplicate. Data will be processed with fMRIPrep and eXtensible Connectivity Pipeline; all results will be evaluated across multiple parcellations. To characterize functional development, we will quantify multiple facets of connectivity, including global connectivity strength and within- and between-network coupling. To model both linear and non-linear associations between functional connectivity metrics and age, we will fit generalized additive models with penalized splines and adjust for sex and in-scanner motion. The developmental relationship effect size will be quantified by the change in adjusted R-squared between a full model and reduced model with no age term. Correspondence of developmental effects to the S-A axis will be assessed with Spearman's rank correlation, with significance testing done with spin-based spatial permutation tests. Taken together, results from this study will robustly establish how patterns of functional brain development align with a major axis of brain organization.

1-Q-208 Do verbal and mathematical skills rely on similar neuroanatomical systems?

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Previous studies indicate a connection between various language skills in children and their mathematical achievement. For example, the development of grammar skills (cf. Chow et al., 2021; Viesel-Nordmeyer et al., 2021) or phonological processing skills (cf. de Smedt, 2018) has been associated with the development of math skills. To date, however, the neural mechanisms underlying this relation are unknown. To identify the brain structures involved in both verbal and math abilities in children, we made use of two data sets of brain imaging studies of French children from age 8 to age 12 (n = 42 for sample #1, n = 53 for sample #2) as well as one data set of brain imaging studies of children from the US with age 11 (n = 132 for sample #3), for a combined data set of 227 children. All children underwent structural MRI scanning as well as behavioral testing on different verbal (grammar, reading, phonological processing, vocabulary) and arithmetic tasks. Using voxel based morphometry (VBM) analyses, we identify the brain regions in which grey matter volume (GMV) is associated with individual differences in verbal and math skills.

2-A-214 Personalized functional brain network topography is associated with multiple domains of cognition in the ABCD study: A replication and extension of Cui et al. 2020

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Objective: Recent studies have shown marked inter-individual heterogeneity in the spatial topography of functional brain networks supporting cognition. However, most neuroimaging studies rely on standardized atlases that assume a 1:1 correspondence between structural and functional neuroanatomy across individuals. Here, we define personalized functional brain networks (PFNs) in youth that account for inter-individual heterogeneity and can predict cognitive abilities in held-out data. Methods: We conducted a replication of a previously published study (Cui et al., 2020) in an independent dataset: the Adolescent Brain and Cognitive Development (ABCD) study (n=11,878 participants; 9-10 years old; Release 3.0). Cognitive abilities were operationalized by three established domains (Thompson et al., 2019). We identified 17 PFNs using non-negative matrix factorization and investigated associations between PFN topography and cognition using linear mixed effects models controlling for age, sex, motion, and family after ComBat harmonization across sites. We then used cross-validated ridge regression to predict cognitive abilities from held-out participants' data. Results: We successfully replicated findings from Cui et al. (2020) in matched discovery (n=3,749) and replication (n=3,712) sub-samples from ABCD. We identified 17 PFNs and found that the total cortical representation of two fronto-parietal PFNs were associated with General Cognition (all ps<.001). In cross-validated ridge regression models, PFN topography successfully predicted cognitive abilities, with significant correlations between actual and predicted scores in held-out test data (General Cognition: r=0.44, p<.001; Executive Function: r=0.23, p<.001; Learning/Memory: r=0.34, p<.001). Conclusion: We

successfully replicated and extended findings from a previous study in two independent samples of youth, demonstrating that PFN topography can reliably predict cognitive abilities.

2-A-219 Examining reciprocal associations between interpersonal functioning and executive functioning during early adolescence: Disaggregating between- and within-person effects

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Objective: Adolescence is a period of substantial brain maturation (Blakemore & Choudhury, 2006), and there is great interest in the impact of socioenvironmental experiences on Executive Functioning (EF; Moffit et al., 2011). Indeed, the development of EF is facilitated by strong interpersonal relationships and experiences that help scaffold development of these mental abilities (Carlson 2009; Geeraerts et al., 2021). Moreover, EF predicts healthy interpersonal functioning across the parenting, peer, and school contexts (Eisenberg et al., 2015). Despite compelling theory, reciprocal associations between interpersonal functioning and EF have not been well-studied in adolescence. We aimed to address this gap. Method: The current study utilized three annual Waves (W) from 387 (55% female) adolescents (W1 Mage=12.1). Parents reported on parent-child relationship quality, and adolescents self-reported on peer friendship quality and school connectedness. EF was assessed using the Stop Signal Task (SST) and parent report on the Effortful Control (EC) scale of the Early Adolescent Temperament Questionnaire-Revised. Results: Latent Curve Models with Structured Residuals were used to examine growth trajectories of EF and to distinguish between- and within-person associations. There was evidence for growth in EF (for both EC and SST measures). High initial levels of EC were related to adaptive interpersonal functioning across the three contexts (parents, peers, school). No between-person associations were supported for the SST. There was no support for within-person associations between EF and interpersonal functioning. Conclusion: Results suggest that EF increases across early adolescence, and support positive associations between EC and interpersonal functioning at the between-person level. Findings highlight the importance of disaggregating within- and between-person effects when testing reciprocal associations between interpersonal functioning and EF.

2-A-220 Distinct Developmental Trajectories in the Cognitive Components of Complex Planning

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This study aimed to adjudicate between the developmental trajectories of different candidate cognitive component processes underlying planning decisions. Participants (8-25 year olds) completed a planning task called Four-in-a-row. By fitting a Best-First-Search computational model, we distinguished between three cognitive component processes of planning: planning depth, heuristic quality, and attentional oversights. All three bolstered playing strength, but they differed in their age-related contributions. Specifically, from early to mid-adolescence, heuristic quality rapidly improved and contributed to better playing strength. From mid to late-adolescence, planning depth increased and supported better playing strength. Fewer attentional oversights were associated with better playing strength and this relation did not show age differences. Together, these results suggest an order in which the use of cognitive

component processes of planning develop, starting by first refining the heuristic strategies, then gradually increasing the number possible future actions, states, and outcomes considered towards young adulthood. The findings move the field of cognitive development towards a more complete account of the development of planning and its component processes.

2-A-221 Longitudinal developmental trajectories of inhibition and white-matter maturation of the fronto-basal-ganglia circuits

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Objective: Alterations in fronto-basal-ganglia white matter have been implicated in the development of response inhibition in children. Nevertheless, the interpretability of past findings is limited given the use of nonspecific measures. The present work employed advanced cognitive modelling and diffusion MRI analyses to examine the mechanisms underlying developmental trajectories of fronto-basal-ganglia white matter and response inhibition in typically developing children. Methods: Participants were a longitudinal sample of 138 children aged 9-14 who completed the Stop-signal Task across three time-points. Response inhibition was estimated using traditional stop-signal reaction time (SSRT) and the parametric race model, a bespoke method of disentangling potential non-inhibitory mechanisms from overall stopping performance. Fixel-based Analysis, a novel fiber-specific framework, was used to estimate properties of the fronto-basal-ganglia circuit for a subsample of 73 children. Results: Longitudinal modelling demonstrated that whilst SSRT improved with age, this effect was primarily driven by reductions in variability (sigma) and extreme responses (tau), suggesting the potential importance of attentional processes on the efficiency of inhibitory control. In parallel, neuroimaging analysis revealed bilateral increases in white matter morphology (fiber cross-section) with age. Contrary to predictions, no significant associations between maturational trajectories of fronto-basal-ganglia white matter and developmental improvements in inhibition were observed. Conclusions: Findings suggest that improvements in response inhibition are largely susceptible to inter-individual variation in the underlying attentional mechanisms subserving stopping performance. Further, despite the development of fronto-basal-ganglia morphology in childhood, our results show that fronto-basal-ganglia white matter properties and stopping performance follow distinct maturational trajectories.

2-A-222 Differential effects of mindfulness meditation and cognitive training on cool and hot inhibitory control in children and adolescents

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Inhibitory control (IC) is the ability to resist automatisms or interferences and to adapt to conflicting situations. Several studies have shown that IC abilities is associated with academic and professional success and social adjustment. IC can integrate different aspects depending on the context, i.e. a neutral

context that do not include affective components (Cool IC) or social contexts involving emotion (hot IC). Cool and hot IC have specific developmental trajectories, the cool IC performance linearly improving from childhood to adulthood and the hot IC capacities following a non-linear, quadratic trajectory. Several studies have reported that some activities can improve the IC, including Cognitive Training (CT) and Mindfulness meditation (MM). The aim of our study was to compare the effects of 5 weeks of computerized MM vs. CT on IC abilities in 66 children (9-10 y.o.) and 63 adolescents (15-17 y.o.) by specifically analyzing the cool and hot dimensions in the same participants and in a developmental perspective. We fit a linear mixed-effect model on the Stroop interference score with Time (Pre-test vs Post-test) and Type of conflict (Cool vs Hot) as within-subject factors, Intervention group (CT vs MM) and Age group (Child vs. Adolescent) as between-subject factors. The findings revealed that CT globally improved Cool IC but not Hot IC while MM practice improved Hot IC but not Cool IC. In addition, children were found to improve Hot IC following MM and Cool IC after CT while adolescents improved only Hot IC following MM. This study supports the benefits of MM and open educational perspectives focused on improving emotion regulation. This is particularly important for adolescence since this developmental period is characterized by impaired emotion regulation, which can trigger poor decision-making skills. Integrating MM practices into schools may be key to improve soft skills, including empathy, that can reduce misbehavior while improving school well-being.

2-A-224 Near- and far-transfer effects of cognitive control training in middle childhood

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Introduction: Cognitive control describes a set of processes critical for flexible goal-directed behaviour. Childhood cognitive control is linked with a range of social, academic and mental health outcomes and reliably predicts later success and wellbeing. As such, cognitive control functions (i.e. working memory, cognitive flexibility and inhibition), have been primary targets for interventions. Results have been mixed and inconsistent and multi-level accounts of changes on distally related outcomes have been noticeably absent. It is unclear if these mixed findings are due to poor training intervention designs (i.e. small sample size, unengaging training protocol) failing to target processes that may underlie far-transfer. Further, a thorough understanding of individual differences that may contribute to far-transfer is necessary in assessing the effectiveness of interventions. Methods: Here we used a randomized-control trial with an adaptive, complex and diverse gamified training protocol targeting cognitive control in a large sample of children aged 6-11 years (N = 226). We assayed real-world outcomes through parent ratings of attentional control (e.g. CASI ADHD). Mixed models were employed to examine pre-post transfer in our measures. Latent change score models were used to examine how individual differences and processes may predict far-transfer. Results: We observed training-related changes in cognitive control that were sustained at 1-year follow-up. Further, cognitive control training led to improvements in real-world attentional control, which in turn were linked to training-related decreases in functional activity in the inhibition network. Further, baseline ADHD symptoms and functional activity in the inhibition network were crucial predictors of far-transfer to ADHD. Conclusions: Our study provides a

multi-level account to processes and individual differences that contribute to training success to real-life outcomes.

2-A-225 Longitudinal Change in the Engagement in Positive and Maladaptive Risk-Taking and Associations with Risk-Related Factors in Adolescence

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Studies interested in adolescent risk-taking use a multitude of behavioral and self-report measures to test assumptions about developmental changes in risk-taking behavior. To investigate whether measures commonly associated with risk-taking, like impulsivity, sensation seeking, and reward sensitivity, tap the same underlying dimensions of individual differences, as well as how and whether they predict changes in the engagement in maladaptive and positive risk behaviors during adolescence, we used a multivariate approach. In this study, we implemented a multitude of self-reports and behavioral tasks to assess behavioral tendencies and engagement in positive and maladaptive risk-taking. This battery was administered to children and adolescents of a broad age range (N = 193, 9-19 years old) at two time points within two years. We will conduct a series of latent factor models to a) examine the associations among self-report questionnaires and behavioral tasks measuring traits commonly associated with risk-taking behavior and b) their ability to predict developmental change in positive and maladaptive risk-taking during adolescence. We hypothesize that higher levels of risk-related behavioral tendencies at T1 predict 1) a higher rate of engagement in risk-taking behavior at T1 and 2) a steeper increase in the engagement from T1 to T2. Moreover, we presume that 3) there is a correlated increase in such behavioral tendencies across adolescence. We will also compare models that account for differences between the genders and time-varying covariates, like age, pubertal development, and intellectual functioning. As such, we will be able to conclude about developmental pathways of risk-taking in adolescence that have long been described by developmental models but seldomly tested with multiple indicators over time in a large age range spanning pre- to late adolescence.

2-A-226 Neural sensitivity to peer feedback and depressive symptoms: Moderation by executive function

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Adolescence is a period of heightened social connectedness and sensitivity to peer evaluation. Sensitivity to peer feedback allows youth to navigate a socially complex world but also may lead to rumination about social stressors and has been proposed as one factor that contributes to increasing depressive symptoms during adolescence, particularly among girls. Adolescence is also a period of improving executive function (EF), a transdiagnostic protective factor that supports regulatory control and is linked to reduced depression among emotionally reactive adolescents. This study leveraged a multi-modal design to examine whether (a) elevated neural reactivity to the receipt of negative peer feedback predicts more depressive symptoms in adolescent girls, and (b) EF dampens this association. 38 adolescent girls (mean age=17.06, SD=.53) completed a functional magnetic resonance imaging

(fMRI) task in which they indicated their preferences across several domains and received randomly generated negative, positive, or neutral feedback that they were told reflected whether peers agreed with each preference. Girls also completed an interview of depressive symptoms and teachers reported on girls' EF. Multiple regressions using activation from regions responsive to negative relative to neutral feedback yielded a significant brain-EF interaction in the left (beta=.48, t=2.36, p=.02) and right (beta=.43, t=2.81, p=.01) inferior frontal gyri and left temporoparietal junction (beta=.56, t=2.93, p=.01). Heightened activation in these social-emotional processing regions to negative (vs. neutral) feedback predicted more depressive symptoms in girls with lower EF but fewer depressive symptoms in girls with higher EF. Results suggest that neural reactivity to social evaluation may sensitize adolescent girls to their environment in ways that can confer risk for, or resilience against, psychopathology depending on their ability to regulate their behaviors in maladaptive or adaptive ways.

2-A-227 Emotional inhibitory control development from childhood to adulthood: a behavioral and electrophysiological study

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Inhibitory control (IC) plays a critical role in cognitive and socio-emotional development in normal and pathological conditions (Borst et al. Dev Med Child Neurol 2015). IC may be applied either in an affectively neutral ("Cool" IC) or charged ("Hot" IC) context. While several studies already investigated the development of the neural bases of Cool IC (e.g., Luna et al. Annu Rev 2015; Rubia et al. Hum Brain Mapp 2006), few works investigated the development of the neural bases of Hot IC (vs. Cool IC), especially using the electroencephalography (EEG) which brings precise temporal information on the process studied (e.g., Lewis et al. J Cogn Neurosci 2006). In this context, children (9-11 y.o.), adolescents (13-15 y.o.) and young adults (18-20 y.o.) performed a Cool and a Hot version of the Stroop task while we simultaneously recorded their electrical brain activity using a high density EEG system. Participants with performance < 70% of correct responses on either congruent or incongruent trials in one of the two tasks were excluded from the analysis. Preliminary behavioral results showed a greater accuracy interference effect in children compared to adolescents and adults, especially in the Hot Stroop task. Indeed, the differences between children and adolescents ($p = .002$) and children and adults ($p < .001$) was noticed only in this condition. Nevertheless, no age effect or age x task interaction was noticed on the reaction time interference score. We however hypothesized to show greater interference effect on adolescents who show emotional hypersensitivity. These preliminary findings should thus be confirmed. Moreover, the results obtained from EEG analyses should shed light on the underlying processes of the development of inhibitory control in an emotional context. We will, at least, study two event-related potentials, known as to be neurofunctional indices of IC, the N2 and P3, and look for other electrophysiological indices.

2-A-228 Examining the influence of reward and efficacy in development of the expected value of control

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Cognitive control enables us to reach a goal, but requires mental effort and is costly. Incentives increase mental effort to overcome this cost and improve performance. Performance efficacy, the likelihood that better performance translates into better outcomes, also influences control allocation. According to the expected value of control (EVC) theory, incentive components (reward and efficacy) are integrated to determine the EVC and control allocation. Behavior and EEG results showed adaptive control allocation for high reward and efficacy in adults. The current study will investigate age differences with respect to control allocation in the EVC theory. Adolescents and children may be particularly sensitive to reward in cognitive control tasks. Further, inferring environment controllability increases during adolescence, but controllability and reward in cognitive control have not been examined in development. Using a Stroop task to dissociate reward and efficacy during cognitive control, we will test their contribution to control allocation in participants aged 7-30 years. EEG will measure neural activity during incentive cue evaluation, putatively indexed by post-cue P3b, and proactive control allocation for upcoming trials, putatively indexed by contingent negative variation (CNV). We expect to replicate a reward×efficacy behavior interaction, with CNV amplitude reflecting this integration. We expect age×reward and age×efficacy interactions on performance. We expect behavioral effects to be reflected in age×reward, age×efficacy, and age×reward×efficacy interactions in P3b and CNV amplitude. Analyses will use model comparison with age as a continuous versus age-squared predictors. These analyses will test whether integration occurs as a linear trajectory, an inverted U, or plateaus in adolescence. Our results will contribute novel behavioral and neural evidence during incentive processing of reward and efficacy across development in the EVC model.

2-A-229 Cognitive mechanisms underpinning age-related change in delay discounting behavior

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Individuals of all ages face decisions that vary along two dimensions: magnitude of reward and time until reward receipt. The delay discounting (DD) task operationalizes such decisions by presenting participants with a series of 'smaller sooner' (SS) and 'larger later' (LL) choices. However, the cognitive mechanisms underpinning SS vs. LL choice tendencies across the lifespan remain contended. Given previous research implicating inhibitory control and valuation brain networks in DD decisions, the current study will leverage data from the Human Connectome Project in Development (N > 1000 healthy youth ages 8 to 21 years) to examine how measures of inhibitory control and/or reward sensitivity impact the maturation of DD behavior from late childhood to early adulthood. Namely, the analyses will characterize how linear and nonlinear age-related changes in inhibitory control and/or reward sensitivity predict SS vs. LL choices. If DD decisions were to be driven by inhibitory control, then individuals exhibiting higher levels of inhibitory control would make more LL choices, reflecting their ability to withhold prepotent responses for immediate rewards in favor of greater, but temporally-distant, outcomes. If DD decisions were to be driven by reward sensitivity, then individuals exhibiting enhanced reward sensitivity would make either more SS choices, reflecting their desire for immediate reward

receipt, or more LL choices, reflecting their preference for greater magnitude of reward. Moreover, inhibitory control may interact with reward sensitivity to determine the direction of influence that reward sensitivity bears on SS vs. LL choices. Taken together, the evaluation of these competing hypotheses will shed light on the maturational trajectories of the cognitive mechanisms contributing to the selection of monetarily and temporally varying choice options.

2-A-230 Dissociable effects of positive feedback on the capture and inhibition of impulsive behaviour in adolescents with ADHD versus typically developing adolescents

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A deficit in interference control is commonly found in adolescents with Attention Deficit Hyperactivity Disorder (ADHD). This has mainly been interpreted as difficulties in inhibition, but interference control relies on both the susceptibility to activate impulsive responses and the ability to inhibit them. The present study investigated how enhancing motivation by delivering positive feedback (a smiley) after a successful trial could affect interference control in adolescents with ADHD and in their typically developing (TD) peers. The interference control was investigated by using a Simon task, which interpreted in the theoretical framework of the "activation suppression" model allows to separately investigate the expression and the inhibition of impulsive motor behaviour. The motivation level was manipulated by the delivery of a positive feedback after each successful trial. The experiment included 19 adolescents with ADHD and 20 TD adolescents in order to explore whether data found in adolescents with ADHD were similar to those found in TD adolescents. Participants performed the Simon task in two conditions: a condition with feedback delivered after each successful trial and a condition with no feedback. The main findings were that increasing motivation by delivering positive feedback increased impulsive response in both groups of adolescents. It also improved the efficiency of impulsive motor action inhibition in adolescents with ADHD but deteriorated it in TD adolescents. We suggest that 1/ increased motivation could lead adolescents to favor fast responses even if incorrect, and 2/ the differential effect of feedback on the selective suppression of impulsive motor action in both groups could be due to different baseline dopamine levels.

2-A-231 Effects of physical activity on cognition, meta-cognition and academic achievement during development: a multi-level meta-analysis

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Objective: Previous meta-analyses have reported positive effects of physical activity interventions on cognition and academic outcomes in typically developing children. We sought to consolidate this research by incorporating a broader range of physical activity and applying a recently developed three-level meta-analytic approach, which handles nested effect sizes. Method: A wide range of physical activities were included, from dance to aerobic exercise, across 75 randomised control trials in typically developing 5-12-year-old children (N = 19,078). Outcomes considered were executive functions, fluid intelligence, creativity, on-task behaviour and academic achievement. Control group type and the extent to which interventions fostered creative physical activity as well as other characteristics of the

intervention and study were explored as potential moderators. Results: Physical activity interventions improved on-task behaviour with a large effect size (g = 0.85 (95% CI: 0.34, 1.37)). Interventions led to smaller improvements in mathematics (g = 0.17 (0.07, 0.27)), fluid intelligence (g = 0.16 (0.02, 0.30)), and working memory (g = 0.19 (0.05, 0.33)), but no benefit was observed for the other outcomes. Higher creativity ratings of physical activity interventions associated with greater beneficial effects on mathematics (β = 0.04 (0.00, 0.09)) and on-task behaviour for studies with sedentary control groups (β = 0.59 (0.14, 1.03)). Conclusion: These results provide further evidence that physical activity may benefit specific aspects of cognition and academic performance in childhood. Future intervention studies could explore whether changes in on task behaviour, working memory and fluid intelligence may mediate improvements in mathematics performance.

2-A-232 Multilevel modeling of exercise frequency and four measures of cognition in 3800 adolescents from age 12 to 17

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Objective. Exercise demonstrates major benefits on cognitive functions. However, research is lacking in examining the effects of exercise on cognitive functioning during critical developmental periods and the potential long-term benefits of exercise on cognitive development. Most research is conducted on the older populations, with cross-sectional designs, small sample sizes, and mostly measure acute physical activity. Therefore, the aim of this study is to examine the associations between exercise frequency and four cognitive measures in a large adolescent population as they develop: spatial working memory, perceptual reasoning, delayed recall memory and inhibition. Method. Data was obtained from the CoVenture trial; a 5-year longitudinal randomized controlled trial, which examined 3779 adolescents from 31 high schools in the greater Montreal area from grade 7 to 11. Four multilevel models with random intercepts and Bayesian estimators are used for the data analysis of each of the four cognitive measures as separate outcomes, exercise frequency as the predictor and substance use as a covariate. Results. Preliminary results indicate a negative association between physical activity and the cognitive measures at the between level. By contrast, at the within level, lagged effects of exercise were revealed to have a positive effect on the development of inhibition and perpetual reasoning. No concurrent effects were observed at the within level. Conclusions. This research suggests that the relationship between exercise and cognition is complex, with opposing between- and within-person relationships, suggesting that people who are prone to low levels of exercise throughout adolescent have higher cognitive function (potentially through a selection effect). However, this study did provide some support for a causal hypothesis, with respect to exercise frequency promoting enhanced cognitive development over and above these between-person effects.

2-A-233 Beyond the boundaries: Event representation across childhood

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Adults maintain event models throughout their experiences, which situate these experiences in schematic knowledge while carving them into manageable chunks. This process can be observed

neurally, as regions related to working memory (lateral prefrontal) and schematic knowledge (medial prefrontal) steadily increase activation over the course of an event, only to drop activity at the start of the next event (Ezzyat & Davachi, 2011). Yet, given ongoing development of the prefrontal cortex, working memory abilities, and the slow accrual of schematic knowledge, it is largely unknown how events are represented in the developing brain. While children self-report experiencing fewer event boundaries (Glebkin et al., 2019), their reduced working memory and schematic knowledge predicts the opposite: dropped event models and more boundaries than adults. Given this discrepancy, brain imaging may uncover event segmentation otherwise obscured in self-reported methods. Using fMRI data acquired while children (ages 5 to 19 years old) watched an animated movie clip (Alexander et al., 2017), we will use a parametric event regressor to identify brain regions showing increased activation over the course of previously normed events. We predict that adolescents will show steadily increasing activation of the PFC and midline structures throughout an event, much like adult studies, while younger children will show a shallower slope in the activation of these regions. These findings would suggest that, due to the cognitive demand required, young children either asymptote before an event's completion as they reach their working memory capacity or experience drops in activation as they lose track of the event. In either case, a shallower slope would suggest that children segment ongoing experience differently than adults, perhaps in a more finely grained way. This has important implications for understanding their unique learning needs and outcomes.

2-A-234 Familism moderates the effect of discrimination on self-regulation via brain connectivity

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Objective: The adolescent brain reorganizes itself in response to environmental experiences, with lasting implications for still-developing functions like self-regulation. Discrimination is a salient experience for racially minoritized youth, yet the neural mechanisms linking discrimination and self-regulation are poorly understood. This study examines functional brain connectivity as a mediator of discrimination and self-regulation and explores the protective role of familism and school support. Methods: Data were used from non-White participants (n = 4.667) identifying as Latinx (35%), Black (34%), Asian (11%), Other (11%), Indigenous (7%), and Pacific Islander (2%) from the ABCD study. Using moderated mediation, we estimated the longitudinal association between self-reported discrimination (T1) and self-regulation (Flanker Inhibitory Control Task; tT2) via functional brain connectivity (resting state fMRI; T2). We explored connectivity among fronto-parietal, attention, and salience networks using Gordon Network correlations. Self-reported familism (T2) and school support (T2) were moderators. Results: Discrimination was associated with greater connectivity between the dorsal and ventral attention networks (B=.005, SE=.001, p<.001) and worse self-regulation (B=-.074, SE=.019, p<.001). Connectivity between the dorsal and ventral attention networks was associated with worse self-regulation (B=-1.03, SE=.291, p<.001). The indirect effect of discrimination on self-regulation via network connectivity was moderated by familism only (B=-.004, SE=.002, p=.025). Specifically, discrimination was associated with greater functional connectivity among youth with low familism (B=.007, SE=.002, p< .001). Conclusions: Results address a gap in the neurodevelopmental literature by identifying the neural networks affected

by discrimination during adolescence, as well as by identifying environmental factors that may buffer the negative effects of discrimination.

2-A-235 Transient food insecurity during the juvenile-adolescent period in mice affects adult weight, cognitive flexibility, and dopamine neurobiology

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A major challenge for neuroscience, public health, and evolutionary biology is to understand the effects of scarcity and uncertainty on the developing brain. Currently, a significant fraction of children and adolescents worldwide experience insecure access to food. The goal of our work was to test in mice if transient experience of insecure versus secure access to food during the juvenile-adolescent period produced lasting differences in learning, decision making, and dopamine system in adulthood. We manipulated feeding schedule in mice from postnatal day(P) 21 to 40 as food insecure or ab libitum and found that when tested in adulthood (after P60), males with different developmental feeding history showed significant differences in multiple metrics of cognitive flexibility in learning and decision making. Adult females with different developmental feeding history showed no differences in cognitive flexibility, but did show significant differences in adult weight. We next applied reinforcement learning models to these behavioral data. The best fit models suggested that in males, developmental feeding history altered how mice updated their behavior after negative outcomes. This effect was sensitive to task context and reward contingencies. Consistent with these results, in males we found that the two feeding history groups showed significant differences in AMPAR/NMDAR ratio of excitatory synapses on nucleus accumbens-projecting midbrain dopamine neurons and evoked dopamine release in dorsal striatal targets. Together, these data show in a rodent model that transient differences in feeding history in the juvenile-adolescent period can have significant impacts on adult weight, learning, and decision making.

2-A-237 Developmental pathways to self-regulation at 6 years: The role of parent-child relations in infancy and "hot" and "cool" executive function in toddlerhood.

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Self-regulation (SR) in childhood, the capacity to modify behavior, emotion and cognition, is associated with a range of positive outcomes in later life, including brain health and mental health. SR depends on cognitive capacities (including "hot" and "cool" executive functions; EF) that begin to develop in the first years of life, and are known to be affected by extrinsic factors such as caregiver sensitivity and attachment security. Specific contributions and interplay of these infant-caregiver variables, as well as hot and cool EF in SR development are, however, unclear. This longitudinal study will investigate the associations between parent-child relations in infancy, hot and cool EF in toddlerhood, and different aspects of SR in the first year of school (at 6 years of age). Data collection is completed. An initial sample of 124 mother-child dyads participated in the study. Maternal sensitivity was measured at 10 months using the Maternal Sensitivity Scales, and attachment security was measured at 12 months using the

Strange Situation Procedure. EF abilities were measured at 4 years using behavioral tasks measuring hot EF (impulse control) and cool EF (working memory). SR was measured at 6 years using two subscales of the parent-report questionnaire Adaptive Behavior Assessment II. Data analysis is currently underway and will be completed by summer 2022. A path analysis model will reveal the strength and direction of associations between the study variables, and enable us to see how EF abilities in toddlerhood affect the association between early caregiving and SR at 6 years. We expect to see positive associations between the study variables, but lack of evidence precludes us from hypothesizing on the strengths of these associations. Elucidating the pathways to favorable development of SR and its components in childhood, and highlighting potentially malleable predictors, may reveal opportunities for early interventions.

2-A-238 Variable folding of the lateral prefrontal cortex supports reasoning in children and adolescents

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OBJECTIVE: A central question in cognitive neuroscience is how the structure of the brain supports the development of complex cognition. Yet, much is still unknown about the relationship between structural variability in late-developing regions such as the prefrontal cortex and the development of higher-order cognitive skills throughout childhood. Traditionally, research has focused on large-scale changes across cortex and has not considered how variable expansion of structures within a region may impact cognitive development. Recently a subset of small, late-developing sulci in lateral prefrontal cortex have been shown to have functional and behavioral relevance. The depth of one such sulcus, the para-intermediate frontal sulcus (pimfs), shows a high level of intersubject variability and has been associated with reasoning in children. We set out to characterize the morphology of this structure and assess its behavioral relevance using targeted, cross-validated analysis. METHODS & RESULTS:We manually identified the pimfs in 72 participants ages 6-18 years old. We assessed pimfs morphology as both a discrete and a continuous metric. We then leveraged the neuroanatomical and cognitive variability intrinsically present in a developmental sample to explore whether the variability in the number of components and prominence of the pimfs was related to individual and developmental variability in performance on a relational reasoning task. We find that pimfs morphology is associated with reasoning performance using both morphological metrics. Model comparison revealed that pimfs morphology explains additional variance in reasoning not captured by age. CONCLUSIONS: These findings show that multiple features of sulci can provide insight into the development of complex cognitive skills and highlight the importance of considering individual differences in local morphology when exploring the neurodevelopmental basis of cognition.

2-A-239 Grey and white matter microstructure play complementary roles supporting cognitive performance in adolescence

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During development, grey and white matter changes enable children to adapt to their environment and to reach the maximum of their cognitive abilities. Scientifics in the field tend to specialize their research

on one of these brain structures, thus it is still unclear if grey or white matter microstructures are playing distinct roles supporting cognitive development or if the information brought by these two modalities is complementary. To compare and contrast their role, we used a structural equation modelling framework predicting cognitive performance with grey and white matter measures. Specifically, we compared morphometric grey matter measures (volume, cortical thickness and surface area) as well as indices of white matter microstructure (volume, fractional anisotropy and mean diffusivity). The models were tested in a large longitudinal cohort of young adolescents (ABCD Study, N=11 876) at 10 and 12 years old. We will also move beyond cross-sectional data and analyse the roles of grey and white matter changes in supporting cognitive development between 10 and 12 years old. We found that grey and white matter brain metrics bring partly different information to predict cognitive abilities. The models with only grey matter or white matter explained respectively 22% and 19% of the variance in cognitive performance, but the model with both grey and white matter explained 32% of the variance, meaning that there is similar and different information in these two structures. In particular, different metrics within grey matter and white matter had different predictive power (e.g. surface area was overall more predictive of cognitive performance than cortical thickness) and different regions of interest for grey and white matter had the biggest impact on cognitive abilities. These results show that studies focusing on a single metric in either grey or white matter to study the link between brain structure and cognitive development are missing a key part of the equation.

2-B-213 Intergenerational transfer effects on corticolimbic gray matter volume of mother-child dyads

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Aims: Intergenerational transfer effects are reflected in traits' transmission from parents to their children. While behaviorally well documented, studies on intergenerational transfer effects for brain structure or functioning are less prominent and studies examining the combination of behavioral and neurobiological endophenotypes in familial context are missing. Here, we test intergenerational transfer effects on corticolimbic brain structure in mothers and children. Corticolimbic brain areas are crucial for socioemotional development, strongly influenced by parenting behaviors and alterations thereof are reported in childhood psychopathologies. Methods: Structural brain data was acquired in 39 dyads (33 mothers; 26-52y/ 39 children; 7-14y; 16 girls). T1-weighted images were pre-processed in FreeSurfer and gray matter volume (GMV) of the corticolimbic circuitry was extracted (bilateral amygdala, hippocampus, nucleus accumbens, anterior cingulate, and medial orbitofrontal area). Dyadic similarity was calculated by Pearson's correlation coefficients and familial specificity was assessed by comparison of mother-child dyads to unrelated mother-child pairings using a permutation approach. Results: First analyses indicate significant corticolimbic mother-child similarity ($r=0.58$, $p<0.001$). Similarity was higher in mother-child dyads compared to unrelated mother-child pairings ($p=0.001$). The similarity index for male and female children did not differ. Mothers' subcortical GMV explained 64% of the variance in children's subcortical GMV ($p<0.001$). In the neocortical regions, mothers' GMV explained 36% of the GMV variance in children ($p=0.002$). Conclusion: An increase in knowledge on the mechanisms underlying intergenerational transfer effects reflected in biology and behavior of parent-child dyads may

impact our understanding of complex skill transmission. Knowledge of socioemotional skill transfer can enhance our understanding of trajectories leading to health and dis

2-B-241 Contribution of cognitive abilities in predicting altruistic behavior in childhood

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Research on altruism, considered as a voluntary and intentional behavior meant to benefit another with no reward for the actor, has often spotlighted empathy or considerations of fairness as motivators. Cognition, however, has not garnered as much attention, despite parallel developments in cognition and altruistic behavior throughout childhood. Objective: This study aims at understanding whether cognitive skills, notably visual analysis, attention, inhibition, and theory of mind, interact with empathy in the development of altruistic orientation and behavior in middle childhood. Method: For this pre-registered study (osf.io/de7cp), French-speaking children ages 8 through 11 (n = 66; 30 boys and 36 girls) completed a series of cognitive behavioral tests including a visual analysis task, selective attention and attentional flexibility tests, an inhibition task, and a theory of mind test, while a parent completed an empathy and executive function parent-report scale. Altruistic orientation and behavior were assessed using a validated scale and a dictator game involving eight opportunities to donate part of an endowment, respectively. Data analysis: The relative contribution of each cognitive and social-emotional variable included in the battery of participant tasks and in parent reports will be tested using a Bayesian framework, with a regression model and spike-and-slab priors. General implications: Results from this study will underline which cognitive abilities support the development of altruistic orientation and behavior in children, and how they interact. From a theoretical perspective, this research will take an important step towards creating a unified model of altruistic development that includes cognition. A stronger understanding of the relationship between cognition and prosocial behavior may also shed light on underlying mechanisms of atypical prosocial development.

2-B-242 Task Design Confounds our Inferences about the Neural Substrates of Self-Referential Processing

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Self-referential processing reliably recruits cortical midline structures; this is among the most widely replicated findings in social neuroscience. However, this inference relies on a corpus of self/other task designs that suffers from extreme homogeneity. We have identified at least three pervasive features of many self/other fMRI tasks that may contribute to a biased and incomplete picture of the neural correlates of self-reference: 1) overreliance on evaluative decision-making; 2) lack of external validity; and 3) conflation of social and nonsocial aspects of self. To address these issues, we designed a new self-referential processing task and administered it to a large sample of adolescent girls (n=72; aged 12-15yrs). For this task, participants were told that we were interested in brain function when we meet someone new. We explained that we would be synchronizing our scanner with an offsite scanner to allow the participant to "meet" another girl virtually during imaging. Participants were asked to record an introduction video describing themselves while another girl (a prerecorded confederate) was

ostensibly making her own introduction video. We told participants that both girls' videos would be displayed in 10-20s clips via in-scanner screen sharing. Critically, participants viewed three conditions: screen sharing watching self, screen disconnected watching self, and screen sharing watching partner. This paradigm allows us to evoke strongly evaluative and naturalistic self/other cognition, distinct from positivity and/or decision-making. Results contrasting brain activity for self-blocks versus other-blocks will be presented alongside a more traditional self-referent trait judgment task administered to the same participants. Both "self" activation maps will be submitted to a conjunction analysis to determine which neural substrates of self are task-dependent and which constitute a task-independent signature of self-reference.

2-B-243 Developmental Differences in Neural Representations of Affect

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BACKGROUND AND AIM: The intensity with which children feel the joys of eating birthday cake or the fear of skulking monsters under the bed has few parallels in the adult world, and this may be attributable to developmental differences in how emotions are represented within affect-related neural circuitry. We hypothesized that adults and children would demonstrate differences in activation patterns in the amygdala, nucleus accumbens (NAcc), and ventromedial prefrontal cortex (vmPFC) in response to valenced stimuli. METHODS: Using Representational Similarity Analysis (RSA) on functional magnetic resonance imaging (fMRI) data, we examined fine-grained pattern level responses from children (n = 25, aged 4 - 10, mean = 7.4) and adults (n = 20, aged 20 - 44, mean = 26.7) during passive viewing of positive and negative clips from popular children's films in 2 (age group: children, adults) x 3 (valence type: positive, negative, mixed) Mixed ANOVA models. RESULT: Compared to adults, children generated greater pattern similarity in neural activation within the vmPFC, regardless of emotional valence. No differences in pattern similarity were measured between age groups within the amygdala or NAcc. However, when comparing pattern similarity within age group and across ROIs, adults demonstrated comparable representational similarity, while children generated statistically significant differences across the vmPFC, NAcc, and amygdala, such that the vmPFC produced the highest pattern similarity score and the amygdala produced the lowest pattern similarity score. CONCLUSIONS: These results may suggest a maturation from visceral emotional responses which merely assess how significant an affective experience is to more evaluative analyses that modulate emotional responses. This project represents the first examination of pattern similarity analyses differences between a developmental and adult population for affective responses in the amygdala, NAcc, and vmPFC structures.

2-B-244 Oh Behave! Individual differences in developmental trajectories of social emotion regulation

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During the transition from childhood to emerging adolescence, peer relations and long-lasting friendships become more salient. Dealing with social situations, such as peer feedback and social rejection, is an important prerequisite for developing and maintaining such peer relations. Prior studies

have shown that social rejection can result in behavioral aggression, but little is known about how brain mechanisms related to social aggression regulation develop, and how these developmental trajectories might differ between individuals. Therefore, we will study individual differences developmental trajectories of social emotion regulation from childhood to emerging adolescence, specifically by examining aggression regulation following negative social feedback. Using a longitudinal design including three waves of fMRI data, we will examine individual differences in developmental trajectories of behavior and the associations with individual differences in underlying brain mechanisms. Specifically, we will focus on three regions of interest: the bilateral anterior insula (AI), the medial prefrontal cortex (MPFC) and the dorsolateral prefrontal cortex (DLPFC). Previous literature has indicated that the AI signals for social salience in general, whereas the MPFC shows increased activation after negative social feedback. The DLPFC has also been related to negative feedback, but in relation to aggressive behavior. That is, both studies in children and adults have shown that more activation in the DLPFC was related to less subsequent aggression after negative feedback. Our preregistered study will examine individual differences in developmental trajectories of aggression regulation and related brain regions (AI, MPFC and DLPFC) in a large (N=512) developmental sample across the ages of 7-14-years-old.

2-B-245 Fear conditioning and generalization in underrepresented preadolescent youth: A replication study

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Childhood anxiety predicts risk for adult anxiety disorders, which may reflect persistent brain dysfunction. Prior work has shown different engagement of ventromedial prefrontal cortex (vmPFC) between anxious and healthy youth using functional MRI (fMRI) paradigms assessing generalization of extinguished threat cues (Britton et al., 2013; Michalska et al., 2016). However, most studies have focused on non-Hispanic white, treatment-seeking samples, which raises questions about generalizability. We aim to replicate and extend previous findings to a community sample of U.S. Latina youth, a population at elevated anxiety risk (McLaughlin et al., 2007) that has received scant consideration in extant work. Thirty-five Latina girls (Mage = 10.05; SD = 1.17) underwent discriminative threat conditioning and extinction in the lab, in which they viewed two female faces. One face was paired with a loud scream (CS+) and the other was not (CS-). Six weeks later, they completed an fMRI paradigm in which they viewed the CS+, CS-, and blended generalization stimuli. Daughters and parents completed the Screen for Child Anxiety Related Disorders (Birmaher, 1997). Successful conditioning was evidenced by children's self-reported anxiety (phase x CS type: p = .014) and skin conductance response (SCR) (phase x CS type: p = .050), such that the CS+ elicited greater anxiety and a larger SCR (ps = .006) than the CS- during acquisition. Following established procedures, we will conduct linear mixed-effects, random-effects analysis in AFNI to test the hypothesis that elevated anxiety will be associated with increased vmPFC response to the CS- and generalization stimuli, reflecting a reduced ability to distinguish between threat and safety cues. Generalizing functional differences in vmPFC activity to Latinx youth may represent a key biomarker to be targeted in future work examining sociocultural influences on brain function, especially among preadolescent girls at an elevated anxiety risk.

2-B-246 Identifying a biomarker of adolescent psychosocial adjustment across peer environments in the ABCD study

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Background. Adolescent social reorientation towards peer relationships confers a heightened sensitivity to peer contexts, rendering adolescents particularly susceptible to positive or negative social environments. However, not all adolescents are equally susceptible to social contexts. As such, there is potential for an underlying biomarker predictive of adolescent psychosocial adjustment, such as the dorsal anterior cingulate cortex (dACC). The current study proposes to clarify the moderating role of dACC response to emotional stimuli (positive and negative) on the relation between peer environments (positive and negative) and psychosocial outcomes. We hypothesize that greater dACC response to emotional stimuli will amplify the relations between peer experiences (positive and negative) and psychosocial outcomes (adaptive and maladaptive). Methods. We will conduct secondary analysis of data collected from the Adolescent Brain Cognitive Development Study. The ABCD study sample includes 11,875 subjects, however, the current study will include participants with completed two-year follow-up data (age 11-12; Life Events Scale, Peer Experiences Questionnaire, Child Behavior Checklist, Prosocial Behavior Survey, Emotional N-back task). Analysis. The following moderation effects will be tested using structural equation modeling: (1) bilateral dACC activation [positive vs neutral] moderating the effect of positive peer environment on adaptive outcomes (2) bilateral dACC activation [negative vs neutral] moderating the effect of negative peer environment on maladaptive outcomes. Implications. Findings have the potential to support the biological sensitivity to context theory by identifying a biomarker predictive of individual differences in psychosocial adjustment, for better or for worse. This has the potential to help identify youth most at risk or resilient to peer victimization, and those most responsive to supportive peer groups, for tailored interventions.

2-B-247 A cross-sectional fMRI study on societal trust in adolescence

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Adolescence, a transition phase between childhood and adulthood, is an important formative period for prosocial experiences. This study used an adapted version of the Trust Game, an economic game based on two-person exchanges of trust and reciprocity, to examine prosocial behavior towards various partners. Whereas previous studies focused on trust choices to close targets (e.g., friends), currently less is known about trust towards society. Adolescents not only develop more mature relationships, but adolescents also develop a broader perspective on their position within society. Prior studies have suggested brain regions involved in reward sensitivity and emotional reactivity peak in activity during adolescence, whereas regions involved in goal flexibility show protracted development. This leads to the hypothesis that adolescence is a sensitive period where creating positive circumstances for prosocial development can foster social competence. Heightened emotional reactivity in combination with flexible recruitment of social brain networks (PFC, TPJ, and STS) may help adolescents to successfully navigate a complex social world, which helps them to develop new social relations based on values such as trust and reciprocity. This study therefore examines the neural correlates of trust directed at societal

targets in adolescence; specifically, a youth participation organization. Participants played multiple rounds of the Trust Game with three age-matched players: unknown peer, friend, and societal partner. We aim to finish data collection in May 2022, including 130 adolescents aged 12-22 (current N=90). We expect that adolescents give most trust to friends, intermediate trust to societal partners, and least to unknown peers. For neural comparisons, we aim to examine whether showing trust to others is associated with neural activity in the PFC, TPJ, and STS, and whether an increasing engagement of these regions with age is related to improving sociocognitive development.

2-B-248 Neurodevelopmental changes in friendship stability and adaptive risk taking for best friend in adolescence

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Adolescence is marked by rapid transformations in one's social world, which bring increased opportunities to make risky decisions that can benefit or harm others. One factor that characterizes adolescents' changing social landscape is the maintenance and dissolution of friendships across time. Yet, there are inconsistencies as to whether friendship stability is linked to better or worse social interactions. One way of disentangling adolescents with stable and unstable friendships is how they process information at the neural level, particularly in brain regions implicated in reward and social-cognitive processing. The current 5-wave longitudinal fMRI study seeks to understand differences between adolescents with stable and unstable friendships in how they take adaptive risks (i.e., sensitivity to the expected value [EV] of reward during risk taking) for their best friend from 6th to 11th grade. 173 adolescents participated between 1-5 waves in a 5-wave study (mean age at wave 1 = 12.8), during which they completed a risky decision-making task in a fMRI scanner where they took risks to win money for their best friend. Preliminary results from waves 1-3 show that 70% of participants changed their best friend at least once across their years of participation. Behavioral analyses will examine developmental changes in EV sensitivity during risk taking for best friend, as a function of friendship status. Neural analyses using ROI approach will examine developmental changes in activation in the ventral striatum, medial prefrontal cortex, and temporoparietal junction that track EV during risk taking for best friend, as a function of friendship status. Friendship status will be defined as the change in best friend selection from the prior participation year. Results from this study will elucidate how adolescents' shifting social environment shapes their decision-making that impacts their peers, which has implications for how youth strategically interact with others.

2-B-249 Is the feeling of regret related to the adoption of protective behaviors to limit the spread of COVID-19?

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Since 2019, the whole world has been preoccupied about the Covid-19 and its consequences. The governments of numerous countries have put in place preventive measures to limit its spread. In order for these measures to be efficient, it is vital that a large number of citizens choose to respect them. Decision making has been shown to be influenced by socioemotional processes, including regret

avoidance -people tend to avoid the decisions they would subsequently regret (Camille, 2004; Habib & Cassotti, 2015; Zeelenberg & Pieters, 2007). Thus, we investigated the influence of regret experience on the attitude regarding the preventive behaviours aimed to limit the spread of Covid-19 and on the reported adoption of these behaviours, from adolescence to adulthood, and we examined the mediating effect of age on the relationship between these measures. Between December 2020 and May 2021, 410 French participants aged from 14 to 58 years reported their attitudes towards preventive behaviours to limit the spread of Covid-19, their engagement in preventive behaviours, and their regret experience and anticipation when they did not engage in preventive behaviours. Participant age was positively related to the feeling of regret ($r = .26$, $p < .001$), the compliance with preventive behaviours ($r = .34$, $p < .001$) and with positive attitudes towards preventive behaviors ($r = .24$, $p < .001$). Feeling of regret was positively related with compliance with preventive behaviours ($r = .62$, $p < .001$) and with positive attitudes towards preventive behaviors ($r = .62$, $p < .001$). These results suggest that the emotion of regret contributes to a higher compliance with preventive measures and thus with the reduction of Covid-19-related risk-taking. Furthermore, the link between regret feeling and preventive behaviors appears to be modulated by age ($p < .001$). Thus, the older the participants get, the stronger the link between regret and preventive behaviours to limit the spread of the Covid-19.

2-B-250 Self-Narration, Prefrontal Cortex Functional Connectivity, and Psychopathology in Early Childhood Development

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Self-narration, the universal experience of talking to oneself mentally, helps in regulating one's emotions and occurs in various contexts, particularly, during emotional challenges. However, the early emergence of self-narration is largely unknown. This study examined self-narration and its neural mechanisms in early childhood, as well as its association with psychopathology. Preschoolers (N = 53, Mage = 4.70 years, SD = 0.70) completed a self-narration task comprised of two cartoons: a cartoon child in a frustrating situation and in a pleasant situation. Children had two minutes to generate self-narrations for the character. Self-narrations were coded on two criteria:1) emotional ("he is mad") vs. non-emotional ("he likes TV"), 2) complete (i.e., contained a subject and verb; "she is watching TV") vs. fragmented responses ("so sad"). Functional near infrared spectroscopy (fNIRS) continuously measured prefrontal cortex functional connectivity during self-narration. Parents completed questionnaires about their child's behavior problems. Self-narratives significantly predicted internalizing problems ($F(5, 47) = 2.92$, $p = .023$), irritability ($F(5, 47) = 4.00$, $p = .004$), and self-regulation ($F(5, 47) = 2.13$, $p = .032$). Significant relations ($p's < .05$) were such that: more non-emotional narratives resulted in more internalizing problems ($b = 1.83$); more non-emotional ($b = 0.20$) and fragmented emotional ($b = 0.21$) narratives resulted in higher irritability; more complete emotional narratives ($b = -0.43$) resulted in less irritability; more non-emotional ($b = -0.22$) and fragmented emotional ($b = -0.14$) narratives resulted in worse self-regulation. Non-emotional self-narrations were associated with higher functional connectivity, and fragmented emotional narratives were associated with lower functional connectivity. The present study suggests early mature vs. nascent emotional self-narrations depends on in-vivo PFC functional connectivity and relates to psychopathology.

2-B-251 Assessing neural similarity for emotion processing in adolescence

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In adolescence, emotional well-being and mood are often similar amongst close friends, (Elmer et al., 2017) but the mechanisms behind this similarity are still being studied. Remarkably, individuals who are closer in their real-world social networks also tend to show more similarity at the neural level (Parkinson et al., 2018), suggesting that close friendships are more likely amongst those who, on a neural level, interpret the world around them in a similar way. In adolescence, when friendship networks are more fluid, individuals may be more likely to seek and maintain friendships with those who process emotions similarly. The proposed study will test whether similarity in neural responding to affective images will predict proximity in adolescents' social networks. We will examine the extent to which regions associated with affective reactivity (e.g., amygdala) and conceptualization and abstraction about emotion (e.g., dMPFC) each relate to social network proximity. Friendship nominations from 6th and 7th graders (n= 873) from three middle schools were used to generate social networks for each grade (6 networks total). Of these participants, 148 also completed an affective picture rating task during an fMRI scan. Using representational similarity analysis for amygdala and dmPFC seed regions, we will assess whether neural similarity to emotional images (Negative > Neutral and Positive > Neutral) is related to proximity in the social network. We hypothesize that, regardless of valence, greater similarity in affective processing in these regions will be associated with greater proximity in the social network. Although emotional processing plays a large role in adolescents' social development, the degree to which emotional similarity shapes social networks is under-studied. Studying neural similarity in emotion processing will contribute to our knowledge of adolescent social networks.

2-B-252 Examining the motives that alter adolescent risk preferences in social contexts

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Adolescence is a period of escalated rates of participation in health risk behaviors, and peer involvement is a crucial moderating factor in risk taking during this stage of life. With a cohort of typically developing adolescent and young adult friend dyads (N = 128, 11.98-22.82 years), the current pre-registered study investigates motives underlying risk taking in social contexts using an economic decision making task with peer-relevant contexts. We establish participants' baseline risk preferences with a condition absent of any friend information or involvement and examine two potential routes to peer influence by contrasting this baseline with peer-relevant conditions: (1) whether adolescents are more willing to select non-preferred risks for themselves if their friend stands to benefit, and whether this potential trend diminishes with increasing age; (2) whether direct observation by friends change adolescents' behavior in (1), and whether age has an impact on the magnitude of influence from friend observation. Analyses use both a computationally derived risk preference parameter and behavioral measures. We aim to capture age effects with specificity by modeling age as a continuous variable in a Generalized Additive Model framework, rather than using discrete age bins. We hypothesize our sample is risk

averse as a whole, with risk taking declining as age increases. We hypothesize younger adolescents are most susceptible to peer-relevant conditions and peer observation, and thereby change their behavior more to accommodate their friend's wishes, especially when being observed by their friend. We also hypothesize that these effects weaken with increasing age. Examining these hypotheses will shed light on drivers of adolescent risky decision making in social situations.

2-B-253 Characterizing Within-Person Trajectories of Negative Affective Experience Across Adolescence

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Negative affect normatively increases during adolescence, and this change is critically linked to an increasing risk for the onset of psychopathology. Previous cross-sectional work has shown that within global shifts in negative affect, specific forms of negative affect show distinct age-related changes across development. However, adolescence is a time when emotional experiences stratify, or diverge, across individuals. Because most developmental research relies on cross-sectional approaches, little is known about individual trajectories in negative affective experience. In the current study, we aim to use a longitudinal approach to chart within-person trajectories of different forms of negative affect across late childhood and adolescence. We acquired a 3-wave longitudinal sample (N = 251, aged 9-15 years at baseline) as part of the Human Connectome Project in Development. Data were acquired ~15 months apart, totaling three measurements across ~2.5 years. At each time point, participants completed self-report measures assessing a range of negative affective experiences. To characterize differences in within-person affect trajectories, we plan to use a finite mixture regression approach to identify clusters of individuals who share similar changes in negative affective experience across time. Global negative affect will be broken down into previously identified forms of negative affect (i.e., general anxiety, anger, evaluative anxiety, and sadness) to allow trajectories for each subtype of negative affect to vary. We predict that 1) negative affect will stratify during adolescence into meaningful subgroups of individuals, and 2) within subgroups, different forms of negative affect will show distinct trajectories. Our results will allow us to characterize the heterogeneity in adolescent emotional experience and detect the emergence of trajectories of negative affective experience that may predict mental health both throughout and beyond the adolescent transition.

2-B-254 Uncertainty explains social information use in risky choice across adolescence

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Adolescents are known for their propensity to take risks, which may be especially strong in social contexts. However, in many laboratory tasks, adolescents take fewer risks than adults. This discrepancy was explained by the notion that many experiments are an inadequate proxy for the uncertainties and risks that adolescents face in real life. How subjective uncertainties develop and how they relate to the development of social susceptibility across adolescence is unknown. We, therefore, developed the marble task and asked 165 subjects (aged 10-26) to take risks under different levels of uncertainty, either by themselves or after observing the advice of someone else. We show that risk-taking and social

information use decrease across development despite uncertainty. Drawing on research showing that feelings of uncertainty correlate with social information use, we a propose cognitive model wherein uncertainty is a mechanism of belief change in the light of social information. This model revealed that people became less uncertain about how to decide across development. Age-related changes in uncertainty fully accounted for age-related changes in social susceptibility. Our results imply that their uncertainties are a previously overlooked mechanism behind adolescents' social susceptibility to risk-taking.

2-B-255 Neural feedback signals differentially guide impression updating of self and others across development

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As individuals enter adolescence, they have to navigate an entirely new social landscape that includes the near constant signaling of social inclusion and shifting social bonds. To ensure social belonging, adolescents must use these signals to flexibly update future social behavior. At the same time, this phase of development is a time of hypersensitivity to peer rejection, including intensified emotional and stress responses. Therefore, the way that this feedback is used to inform one's social standing may be subject to biases that differ with age. I have previously shown that--despite equivalent experiences of peer acceptance and rejection--adolescents internalize peer rejection and diminish self-views, whereas adults elevate self-views and devalue the peers who reject them. Here, I will examine the computational and neural indices that explain these age-related differences in how peer feedback differentially guides impression updating of the self and others. In the present study, 84 participants (aged 10-23) completed a reciprocal social evaluation task during fMRI to assess how peer acceptance and rejection modulate underlying neurocognitive processes that support the integration of peer feedback. Given its role in feedback-based learning, I hypothesize that differential neural functioning of the corticostriatal circuit would explain these age-related differences. In particular, I hypothesize that adolescents will preferentially upweight learning from rejection to inform self-views, while adults will boost self-views by upweighting acceptance, and these learning signals will be reflected in the striatum and medial prefrontal cortex. These findings will enhance our understanding of the developmental differences in learning from social evaluation by characterizing latent moment-to-moment neural responses using computational modeling approaches.

2-B-256 Contextual influences and cognitive mechanisms of learning in early adolescence

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Learning--specifically, reinforcement learning--is posited to support youth's ability to engage and adapt to their unique worlds with links to long-term social and emotional outcomes. However, individual differences in reinforcement learning across diverse environmental and experimental contexts remains poorly characterized in developmental samples. This preregistered study examines behavioral performance and the putative underlying cognitive mechanisms of reinforcement learning in early adolescence. With data collection on a sample of 12-15-year-olds currently underway, we will examine

whether youth's learning and decision-making strategies vary as a function of task stimuli (contextually arbitrary vs. socioemotionally-salient real-world). Specifically, we will test whether these various stimuli elicit different levels of performance accuracy and computationally-represented cognitive mechanisms, within and between individuals. Given that salient socioemotional stimuli likely enhance learning for youth, we predict performance and accompanying cognitive processes will be more optimal (i.e., higher accuracy and computational model parameters reflective of cognitive strategies that more closely align with task demands) in the real-world condition compared to the contextually arbitrary version. All models will be fit via hierarchical Bayesian analysis with a combination of informative and default priors. Computational model parameters including learning rate and inverse temperature will be generated using the hBayesDM R package (Ahn et al., 2017). Findings from this study will elucidate the complex ways in which youth learn from--and adapt to--different environmental demands. Descriptive associations with youth wellbeing measures will be highlighted and implications for informing programs that support youth's ability to thrive across diverse contexts will be discussed.

2-B-257 Age-related differences in the relationship between affect and emotion regulatory processes during the covid-19 pandemic

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Background: During the COVID-19 pandemic there has been a rise in common mental health problems compared to pre-pandemic levels, especially in young people. Understanding the factors that place young people at risk is critical to guide the response to increased mental health problems. Given that capacity to regulate affect is still developing in adolescence, and emotion regulation is a key risk factor for mental health problems, we examined the potential role of emotion regulatory processes in affective responding during the pandemic. Method: Participants (N=2367; 89.95% female, 11-100 years) from Australia, UK, and USA were surveyed thrice at three-month intervals during the first year of the pandemic (May 2020-April 2021). Participants completed measures of emotion regulatory processes (adaptive and maladaptive strategy use, worry, and mental flexibility) at baseline, and negative and positive affect and mental health problems (depression, anxiety and wellbeing) at all timepoints. Results: Younger age predicted greater negative ($p<.001$) and lower positive ($p<.001$) affect at baseline, but not change in affect across time ($p=.089$ and $p=.043$, respectively). A latent variable comprising items indexing use of maladaptive emotion regulation strategies and trait worry partially accounted for variance in the relationship between age and both negative ($p<.001$) and positive ($p=.004$) affect at timepoint 3. Conversely, tendency to use adaptive emotion regulation strategies and mental flexibility did not significantly account for variance in the relationship between age and affect at timepoint 3 (p's>.05). Conclusion: Our findings add to the growing literature demonstrating adolescent vulnerability during the COVID-19 pandemic, and suggest that tendency to use maladaptive emotion regulation strategies and trait worry may be fruitful targets for intervention. Targeting such processes, especially in young people, may lead to improved affect, and in turn, mental health.

2-B-258 Continuity and discontinuity in neural profiles of emotion processing and working memory during adolescence: a registered report

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Significant structural and functional brain development occurs during late childhood and adolescence, which underlies changes in central neurocognitive processes such as working memory and emotion processing. Investigations on adolescent brain development show substantial individual differences in neural development. Yet, the preponderance of studies modeling trajectories of brain development use variable-centered approaches that focus on mean level change, omitting attention to differences in inter-individual change. This is a striking limitation, given that individual-level deviations from normative trajectories may undergird neurobiological embedding of early life stress and attendant psychopathology. This preregistered, data-driven study will use latent transition analysis (LTA) to identify 1) latent profiles of neural function during a working memory and emotion processing task, 2) transitions of profile membership across 24 months, and 3) associations between latent profile transitions, parenting behaviors, and subsequent psychopathology. Using two waves of data from the ABCD Study (Mage T1 = 10; Mage T2 = 12), we expect to find 3-4 unique profiles of neural function within a priori defined ROIs, which will remain consistent between T1 and T2. We anticipate that: 1) a subset of youth will transition between functional neural profiles (from baseline to T2), 2) low parental support will increase risk for membership in less-adaptive neural profiles and likelihood of transitioning from normative to less-adaptive profiles, 3) profiles exhibiting elevated brain response to emotion within limbic and face-processing regions will show increases in internalizing and externalizing behaviors, and 4) profiles exhibiting elevated brain response within affective-orienting frontal regions and diminished brain response within attentional control regions during working memory will show increases in externalizing behaviors.

2-B-259 It's Who You Know: A Rat's Anxiety-Like Behavior and FGF2 Influenced by Its Cagemates

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Social relationships are thought to influence human development, but there is relatively little animal work examining the influence of a rat's cagemates on emotional maturation. In the present experiments, we assessed whether how fearful/"anxious" a rat's cagemates are affects the development of anxiety-like behaviour and related physiology. We have previously shown that infant rats that better retain an aversive association exhibit heightened anxiety-like behaviour in adulthood. In the present experiments, we similarly conditioned infant rats to associate a conditioned stimulus (CS) with footshock and tested their memory of the association ~1 week later. Rats were then randomly assigned to cage/cagemates. The mean CS-elicited fear of an animal's cagemates was used as an index of cagemates' memory, or "fearfulness". In Experiments 1 and 2, average cagemate memory negatively predicted hippocampal fibroblast growth factor-2 (FGF2; a biomarker of fear/anxiety) in adulthood, while a rat's own memory did not. In Experiment 3, both the average memory of a rat's cagemates, as well as a rat's own memory, positively predicted anxiety-like behaviour in adulthood. Furthermore, rats

that were highly fearful as infants were more affected by variations in the fearfulness of their cagemates than rats that expressed low fear in infancy. These results indicate that naturalistic social interactions alter anxiety-like behaviour and related physiology (e.g., FGF2) in rats. Additionally, these findings suggest that social interventions can be modelled in rats, and provide tentative support for the idea that social interventions could reduce the risk of developing anxiety.

2-B-260 Does Parental Ethnic Racial Socialization Moderate the Influence of Ethnic Racial Discrimination on Neural Representation of Threat in Latina Girls?

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Ethnic-racial (ER) discrimination can lead to psychosocial problems for Latina youth, including anxiety. Mexican-origin Latinx parents (N = 135 current, N = 150 anticipated) of pre-pubertal girls (ages 8-13) will be assessed to investigate how parental ER socialization strategies contribute to the association between parental discrimination experiences and changes in their daughter's anxiety and threat neurocircuitry. This study spans three waves. Wave 1 involves parent-reported surveys of ER discrimination and use of ER socialization practices. Latinx parents use six ER socialization strategies of value transmission, four adaptive and two avoidant (Ayón et al., 2019). Wave 2 involves parent and child-report surveys assessing children's experiences of ER discrimination. Wave 3 will test how latent changes in ER discrimination and parental ER socialization strategies across Waves 1-3 affect children's threat neurocircuitry and anxiety symptoms at Wave 3. Threat vigilance will be assessed through a well-validated fMRI threat perception task (Oosterhof & Todorov, 2008), during which sympathetic responding will be collected. Participants make binary social judgements about a set of White male face stimuli morphed along a threat continuum. Threat vigilance is indexed by the location along the continuum at which participants classify a face as threatening (Tashjian & Galván, 2020). Latent change score models will test the hypothesis that girls with greater change in experiences of ER discrimination will show: (1) an earlier threat set point, (2) higher physiological responding to ambiguous faces, (3) hypoactivation in brain regions key for safety learning (dlPFC, vmPFC), and (4) greater multivoxel representational similarity between ambiguous and threatening faces in fusiform gyrus. Exploratory analyses will test whether adaptive parental ER socialization practices moderate associations between ER discrimination and neurophysiological indices of threat vigilance.

2-B-261 Evaluating Candidate Mechanisms Underlying Sensory Over-Responsivity Following Early Caregiving Adversity

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Background: Youth who have experienced previous institutional (e.g. orphanage) caregiving 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). Emerging neurodevelopmental theories argue that SOR symptoms may reflect bottom-up differences in encoding of sensory stimuli, through either altered sensory perception

or initial affective responses to sensory input. Alternatively, SOR may be the result of disrupted top-down regulation of sensory responses. Objective:We will probe candidate mechanisms underlying SOR by applying multivariate pattern expression analyses to fMRI data recently collected from a population of previously institutionalized and comparison adolescents. Analysis Plan and Hypotheses:We will assess overlap between individual participant's whole-brain neural responses to aversive auditory stimulation and publicly accessible meta-analytic neural "signatures" of auditory perception, affective reactivity, and affective regulation drawn from Neurosynth. We hypothesize that the relationship between previous institutional caregiving and increased parent-reported SOR symptoms will be mediated by H1) increased affective reactivity (salience network) pattern expression and H2) decreased affective regulation (dorsal and lateral frontoparietal network) pattern expression. However, we expect auditory perception pattern expression estimates will not mediate the relationship between PI status and SOR symptoms (H3). We will conduct a mediation analysis for each hypothesis using PROCESS 3.4 with previous institutional care as a binary predictor, pattern expression as the mediator, and SOR as the outcome. Implications: Identifying neurodevelopmental mechanisms underlying sensory processing differences associated with institutional caregiving may inform more targeted treatments.

2-B-262 Preregistration: Caregiving instability, age, and performance and neural function during cognitive and affective theory of mind

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Theory of mind (ToM) refers to the ability to identify another person's mental state. Research examining the development of this process has largely focused on its development in early childhood, utilizing relatively simple tasks (e.g. Sally Ann) to identify whether children have or have not achieved the ability. More recent research suggests that ToM is more nuanced, and involves a cognitive component (understanding another's thoughts, intentions, beliefs) and an affective component (understanding another's feelings). Assessment of cognitive and affective ToM in adolescents and adults across a variety of more complex social scenarios suggests that ToM continues to develop through childhood and across the lifespan (Blakemore, 2008). To that end, this study examines the development of cognitive and affective ToM, and their neural bases, during middle childhood by adapting a complex task previously validated in older adolescent samples (Heleniak et al., 2017). In the context of an ongoing fMRI study, we have assessed behavioral and neural responses during cartoon vignettes requiring cognitive ToM, affective ToM or physical feature comprehension (control) in 47 children (7-13 years, 48.9% female). Planned analyses will examine the influence of caregiving instability, an under-studied yet potent form of early caregiving adversity (Fields et al., 2021) and age-related differences in cognitive and affective ToM accuracy, reaction time, and functional recruitment of social brain areas involved in these processes (e.g., mPFC, TPJ, pSTS). We aim to have analyses completed by the time of the conference, and aim to receive feedback on our processing and analysis plan and will present a first look at our results. In addition, the process of adapting a complex task for older adolescents for use with younger children will be discussed.

2-B-263 Adolescents exposed to early life adversity demonstrate greater similarity in neural representations of threatening and ambiguous social stimuli.

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Early life adversity (ELA) is thought to sensitize threat-responsive neural systems, resulting in heightened vigilance to potential threat. This may result in a tendency to interpret ambiguous cues, particularly social ones, as threatening. Notably, prior work suggests that responses to ambiguous social cues are predictive of mental health. However, it is unknown how exposure to ELA relates to neural processing of ambiguous stimuli. The current fMRI study examined multivariate representations of threatening (angry faces) and ambiguous (surprised faces) social cues in a sample of 41 late adolescents (aged 18 to 19 years) and tested whether similarity in these representations varied by ELA exposure (indicated by self-reported physical, emotional, and sexual abuse, and emotional and physical neglect during childhood). Using representational similarity analysis, we assessed the degree of similarity in neural representations of ambiguous and threatening images in the amygdala and nucleus accumbens, regions of the brain that are sensitive to salient and motivationally relevant stimuli. We found that individuals who experienced higher degrees of ELA evidenced greater similarity (i.e., less differentiation) in neural representations of ambiguous and threatening images within the amygdala and nucleus accumbens. Less neural differentiation between threatening and ambiguous social cues in ELA-exposed individuals may indicate a tendency to respond to ambiguous cues as threatening.

2-B-264 The association between heart rate variability, cortical thickness and self-regulation in adolescents with and without conduct disorder

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Aims: There is much debate about the association between measures of heart rate variability (HRV), aggressive behaviors and emotion-regulation (ER) difficulties in individuals with a diagnosis of conduct disorder (CD). This project aims to close the gaps in knowledge by investigating: (i) the specificity of the association between HRV and ER versus cognitive regulation (CR) skills; and (ii) the association between HRV and gray matter brain volumes (GMV) in key areas of the central autonomic network such as insula, lateral/medial prefrontal cortices or amygdala. Methods: Respiratory sinus arrhythmia (RSA) measures of HRV were collected from adolescents aged between 9-18 years (693CD (427F) /753TD (500F)), as part of a European multi-site project (FemNAT-CD). Reaction times (RT) and false alarms during an Emotional Go/No-go task were used to assess ER and CR abilities. The association between RSA and task performance was tested using regression models. T1-weighted structural MRI data were included for a subset of 577 participants (257 CD (125F); 32 TD (186F)). The CerebroMatic toolbox was used to create customised Tissue Probability Maps and CAT12 to segment brain images, followed by a 2x2 (gender x group) full factorial ANOVA with Threshold-Free Cluster Enhancement and RSA as regressor of interest. Results: RSA was negatively associated with RT during emotional control trials (p=0.04) however, this

was no longer significant when correcting for multiple comparisons. RSA was positively correlated with GMV in the left insula (pFWE=0.013) across all subjects. Conclusions: HRV measures were related to performance during emotional control trials in the Go/no-Go task and with increased cortical thickness in the left insula. The insula is a hub region involved not only in autonomic control but also interoception, motor control and emotion processing and regulation. Thus, our results suggest a specific association between HRV and emotional control processes.

2-B-265 Long-term impact of early experiences of relational and physical peer victimization on brain structure.

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Aims: Peer victimization (PV) is very prevalent during adolescence, with long-lasting adverse effects. However, the association between PV, its structural neural correlates, and long-term impacts is not yet fully understood. This study will investigate: a) the association between PV experiences and brain structure at age 21, b) the potential mediating role of brain structural properties between early experiences of PV and subsequent social adaptation and well-being measures at age 21. Methods: Participants were pre-selected from an ongoing longitudinal study and grouped as a function of their early PV experiences between the ages of 13 and 21 (relational, physical, relational + physical, no victimization). Details of the cohort, including the behavioural and demographics variables collected, have been published (Ribeaud et al., 2022). The data includes measures that quantify the presence and frequency of experiences of relational and physical PV, and measures of social adaptation and well-being (SBQ/ Conflict resolution/BMI). We will use Freesurfer to segment structural brain images and compute cortical thickness (CT) and subcortical volumes (SV). The CT and SV will be subject to a factor analysis to identify common underlying factors. We will use linear regression and structural equation models to test for associations between the factors and PV or mediation, respectively. Hypothesis: We expect that PV will be associated with reduction in CT and SV in factors composed of regions processing incentives and implementing self-regulation and increased CT/SV in factors composed of regions processing social stimuli. This combination of increases and reduction will in turn be associated with worse measures of social adaptation and well-being at age 21. Implications: An improved understanding of peer victimization consequences that can inform design of prevention and intervention strategies.

2-B-267 How music alters brain development: A longitudinal twin study on sensorimotor synchronization and brain plasticity

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Sensorimotor synchronization (SMS) is the human ability to synchronize motor action with external events that children use in many contexts, for example when learning motor skills and playing music. Only a minority of individuals become musical experts through intensive training in combination with certain genetic predispositions and through the age of onset of musical training in childhood where early training can contribute to brain development. Therefore, studying how musical capability relates to brain development, offers us a unique opportunity to investigate genetic and environmental factors

related to brain plasticity. As such, we examined whether individual differences in structural brain developmental patterns are predictive of SMS performance, and to what extent this relation is driven by environmental experiences or genetic factors. We used three biennial MRI assessments of a 7-14-years old longitudinal twin sample (NT1= 480, NT2 = 394, NT3 = 260). At T3, children (aged 11-13) performed an SMS paradigm consisting of in-phase, anti-phase, and music-cued tapping trials. Because the intercepts and slopes of structural brain development differ between boys and girls, we analyzed them separately. Our first results showed that attenuated brain development is positively correlated with SMS capability in several brain regions including the pars opercularis, postcentral gyrus, precentral gyrus, superior temporal cortex, and fusiform gyrus. This possibly suggests that this age period might be a sensitive window of brain development, where musical training affects brain developmental trajectories to a larger extent.

2-B-268 What do we know and what can we learn from multi-brain magnetic resonance neuroimaging research?

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Aims: Human brain and behavior are a result of various complex processes influencing each other. Amongst these, social relationships (e.g., caregiver-child, peer relations or partnerships) shape individuals' brain development, perception, and shared understanding of the world. Ultimately, an individual's brain and social network are intricately intertwined. Neuroimaging studies increasingly involve multi-brain paradigms, expanding the ecological validity of brain findings. Multi-brain designs include investigations of neural synchrony, similarity, and inter-brain coupling. Currently, a plethora of terms describing associated methods and processes exist. To overcome the terminological ambiguity and fragmentation within the field of multi-brain magnetic resonance neuroimaging (MRI) studies, we suggest a strandardized meta-analytic approach to provide a comprehensive overview of the present research. Methods/Results: Multi-brain MRI studies were identified by use of different keywords (e.g., brain-to-brain, intergenerational, interpersonal, similarity, synchrony, etc.) in combination with 'MRI/neuroimaging' through PubMed and reviewed using Covidence, a tool for systematic literature review. Following an abstract screening of 7710 articles, the full texts of 218 were reviewed and 94 articles remained after applying pre-defined inclusion/exclusion criteria (e.g., need to include dyads or network comparisons based on MRI data). Next, data categorization and extraction will be completed allowing activation likelihood estimations or meta-analytic effect strength modeling. Conclusion: An in-depth overview and understanding about the populations, incentives, paradigms, methodologies, and outcomes deriving from MRI-based multi-brain studies will provide the foundation for outlining novel frameworks and theories. Such knowledge may advance our understanding of intergenerational transfer mechanisms, social decision making, and complex skill acquisition in health and disease.

2-B-269 Moment-by-Moment Biobehavioral Flexibility in Infancy: Stability & Change Across Social Context

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Background. Interpersonal capacities emerge from neural, biological, and behavioral systems that are intricately coordinated, internally and with one another. Prior research has allocated comparatively less focus on the dynamic processes of how social interactions unfold early in development. Flexibility at multiple levels is a critical yet understudied component of social interactions. At the microscale, maintenance of biobehavioral systems that exhibit flexible, midlevel (not too random or too rigid) organization is essential. At the mesoscale, infants must flexibly respond to changes in social context. This study examined flexible 1) biobehavioral organization, as well as modulation of 2) intrapersonal physiology-behavior links and 3) physiological synchrony in the face of changing social contexts. Methods. 44 mothers and infants (9 mo) completed a modified 'Still-Face' task (face-to-face, text messages, recovery). Heart rate (interbeat intervals & respiratory sinus arrythmia (RSA) at each sec) and behavior (affect, gaze, movement coded from video; ~360 ea) were quantified from mothers and infants. Results.1) Entropy and fractal analyses revealed flexible unfolding of infant behavior and physiology, respectively, and less rigid organization was associated with more positive social engagement across the entire task. Stochastic vector autoregression models found 2) positive linkages between infant RSA and social engagement behavior at the subsequent second, but only when their caregiver was actively attending; and 3) RSA synchrony as a co-regulatory feedback loop only partially sensitive to social context. Conclusions. Findings offer a multi-dimensional picture of social flexibility achieved through the unfolding of biobehavioral systems, dynamic physiology-behavior links, and co-regulation exhibiting stability and change. They contribute to both basic science knowledge and potential monitoring and intervention targets to better support adaptive social development.

2-C-223 Using fMRI to study the neural basis of violation-of-expectation

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In studies of infant cognition, why do babies look longer at unexpected events (e.g. when objects float in midair, or someone acts inefficiently) than expected events? Here we test 3 candidate explanations, each with a distinct, non-mutually exclusive, predicted pattern of neural activity. First, infants could look longer because of perceptual features that vary between expected and unexpected events. Second, infants could look longer because they have detected a violation of a domain-specific expectation (e.g. objects are solid, agents behave efficiently). Third, infants could look longer because of curiosity and motivation to learn about the source of surprise. To test these 3 candidate explanations, we scanned 17 adults using fMRI while they watched videos of agents and objects, adapted from infant behavioral research. Confirmatory group-level analyses and exploratory functional region of interest (fROI) analyses showed that cortical regions shown to prefer social vs physical information in previous work, also show similar preferences for these stimuli. Further exploratory fROI analyses showed that regions involved in physical reasoning, including bilateral supramarginal gyrus (SMG), responded more to unexpected than expected physical events (and not social events), providing evidence for domain-specific prediction error. This analysis also revealed that regions encoding visual information, including bilateral lateral occipital gyrus and ventral temporal cortices, responded more to unexpected outcomes, regardless of domain, providing evidence for perceptual sources of novelty. Lastly, regions hypothesized to support endogenous control of attention and the reward of information gain, like inferior frontal and superior

cingulate cortices, responded more to unexpected events across domains, though effect sizes were smaller. Thus both domain-specific domain-general cortical regions encode violations of expectation involving agents and objects.

2-C-270 Safety Cue Learning as a Potential Mechanism Linking Childhood Trauma Exposure and Psychopathology in Youth

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Background: Trauma exposure during childhood is prevalent and is associated with elevated risk for psychopathology. Changes in threat and safety learning are one potential mechanism underlying the association between trauma and psychopathology (e.g., anxiety and posttraumatic stress disorder; PTSD). Safety cue learning (SCL) is based on conditioned inhibition of fear in the presence of safety and has been shown to reduce fear via an anterior hippocampal-dorsal anterior cingulate cortex (dACC) pathway. Delineating the associations between trauma exposure and SCL may shed further light on mechanisms of fear reduction and risk for psychopathology following early-life trauma. Methods: Leveraging a longitudinal dataset, this fMRI study will examine SCL in youth with and without trauma exposure (ages 9-19 at two-year follow-up from baseline assessment; n=102). The SCL task included stimuli for threat, safety, and a safety compound (i.e., CS and CS- were paired). Trauma exposure was determined using multiple measures (e.g., CTQ, PTSD RI). fMRI data (collected at follow-up) will be analyzed using FSL for a priori regions of interest (e.g., anterior hippocampus, dACC) activation and functional connectivity (FC) analyses. Mediation analyses will be conducted using a binary independent variable for trauma exposure (reported at baseline), continuous dependent variables for anxiety and PTSD symptoms (reported at follow-up), and continuous mediating variables for activation and FC during SCL. Hypotheses: We expect that trauma exposure will predict weaker hippocampal-dACC FC and activation during SCL and higher anxiety and PTSD symptoms at follow-up, and the degree of hippocampal-dACC FC and activation will mediate the association between trauma and symptoms

2-C-272 Molar eruption timing is associated with cognitive development

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Introduction Accumulating evidence suggests that exposure to adversity early in life may accelerate the rate of maturation. Accelerated brain development may shorten windows of plasticity, with consequences for cognition. Thus, accelerated maturation may be one mechanism underlying socially stratified patterns of cognitive performance. Recent work has identified molar eruption as a novel measure of the impact of experience on the pace of maturation. Here, we examine how accelerated maturation, as indexed by molar eruption, is associated with patterns of cognition in 4-7-year-old children. Methods Eruption status of the primary molars was evaluated from T2-weighted MRIs for 117 children (63 female) between 4 and 7 years old. To assess cognition, children completed four subtests of the WPPSI-IV: Matrix Reasoning, Picture Memory, Bug Search, and Information. Scaled scores were used

for all analyses. Parents reported their family income and their child's exposure to Adverse Childhood Experiences (ACEs). Relationships between molar eruption and cognition were examined using linear models, with age and sex as covariates. Results Earlier molar eruption was negatively associated with performance on WPPSI Information (β = -0.63, 95% CI [-0.99, -0.28], p < 0.001), Matrix Reasoning (β = -0.70, 95% CI [-1.05, -0.36], p < 0.001), and Picture Memory (β = -0.39, 95% CI [-0.76, -0.02], p = 0.037). Associations between molar eruption and both Information and Matrix Reasoning held controlling for exposure to ACEs. Molar eruption also remained significantly associated with performance on Matrix Reasoning after controlling for family income. Bug Search was not associated with molar eruption, ACEs exposure, or family income. Conclusion These findings suggest that accelerated maturation, as reflected in early molar eruption, may have consequences for cognitive development.

2-C-273 Are individual differences in procedural learning associated with organization of fronto-basal ganglia-cerebellar white matter pathways in healthy children?

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Objective: Procedural learning - the process of acquiring and retrieving information automatically and subconsciously - is fundamental for the learning and expression of many motor, cognitive and social functions. Though, the neural mechanisms underpinning this process remain unclear, and no study has explored the white matter correlates of procedural learning in healthy children. We intend to investigate this. Hypothesis: We hypothesize that measures of white matter organization in the superior cerebellar peduncles (SCP) and striatal-premotor tracts (STPMT) will be positively associated with procedural learning performance on the serial reaction time task in children aged 5 to 14 years. Methods: Data collection is underway and will be completed by the time of the conference (N=30). Diffusion weighted imaging data (b = 3000 s/mm2, 70 directions) are being collected on a 3T Prisma MRI scanner. TractSeg will be adopted to delineate the left and right SCP and STPMT for each individual. We will derive measures of fiber density (FD), fiber cross-section (FC), and a combination of density and cross-section (FDC) for each tract using Fixel-Based Analysis, a novel and fiber-specific analysis framework. Participants will complete the serial reaction time task, a common measure of one's capacity to implicitly learn a visuospatial sequence. Procedural learning will be indexed by the magnitude of the 'rebound effect' i.e., the difference in reaction time between the final block of sequence trials and the block of random trials. Preliminary results: Analyses on a sub-set of data indicate a relationship between the rebound effect and FC and FDC in the STPMT. Implications: Clarifying the association between white matter organization and procedural learning in healthy children will contribute to our understanding of individual differences in implicit learning, and its pathology in neurodevelopmental disorders (e.g., Developmental Coordination Disorder, Dyslexia).

2-C-274 Impaired learning to dissociate advantageous and disadvantageous risky choices in adolescents

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Adolescents display more real-life risk-taking behavior compared to adults. How this relates to developmental changes in experience-based learning remains largely unknown. In this preregistered study, we administered a novel task in which the advantageousness of risk-taking needed to be learned by experience. Results showed that adolescents dissociated advantageous and disadvantageous risky choices less well compared to adults. Computational-modeling results revealed that adolescents' suboptimal performance was due to them using a simpler, suboptimal, expectation-updating process, and a more stochastic choice policy compared to adults. Moreover, results showed that adolescents, but not adults, overvalued the best outcome. Together, these results suggest adolescent risk-taking can be explained by inefficient learning and choice processes.

2-C-275 Cognitive and motor adaptations across the lifespan

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Changes in the environment are followed by uncertainty and require adaptations across different domains to optimize behavior, such as in cognitive and motor learning that are traditionally studied separately. Evidence in both domains shows dependence on dopamine function and shared brain networks that are implicated in the formation und update of internal models, all undergoing developmental changes. We developed a touchscreen-based task suitable for participants from school age onwards, which combines probabilistic reversal learning with a reaching task that independently manipulates perturbations of cognitive and motor domains in a block design. Reversals of action-outcome associations induce cognitive uncertainty, whereas unpredictability in target movement leads to uncertainty during movement execution. Going beyond dual-task paradigms that study these domains as simultaneous and more competitive processes, our task engages interactions between them as sequential and more cooperative processes. Due to shared dependence on dopamine function, we expect adaptations in cognitive and motor behavior to be more protracted in childhood and to decrease earlier in later life, compared to predictable motor behavior with stable action-outcome associations. We hypothesize an inverted u-shape trajectory, with peak behavioral performance and lower behavioral variability around young adulthood. According to dual-task findings, older adults, in comparison to younger age groups, might focus more on the motor domain and preserve respective adaptive abilities longer. We aim to integrate both domains in a reinforcement learning framework that estimates cognitive learning rates as well as motor adaptation rates which might shed new light on common vs distinct computations underlying adaptations in cognitive and motor behavior across the lifespan.

2-C-276 Learning to fear social interactions: Dysregulated neural mechanisms of social learning in adolescent social anxiety.

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Social anxiety (SA) disorder is prevalent, chronic, and impairs quality of life. Typical onset occurs in early adolescence, when social relationships become more salient and complex. Difficulty learning from these newly complex, important interactions may potentiate SA. SA is associated with suboptimal adaptive learning rates in non-social and uncertain contexts. However, the impact of social contexts on learning

during social interactions with peers in SA remains unknown. Enhanced SA symptoms while anticipating social feedback is associated with dysregulated engagement of neural circuits implicated in salience and reward processing, which are critical hubs for learning. Despite this overlap, the neural mechanisms that support learning from social feedback remain relatively unexplored in SA. To study the influence of social context and feedback on learning in SA, we paired computational modeling with a novel social interaction fMRI task to determine the extent to which peer value as well as the valence and predictability of peer feedback modulate the neural bases of social learning about peers and their relation to adolescent SA. Fifty-nine youth (age 10-15yrs) with a range of SA engaged in real-time social interactions with purported peers while undergoing an fMRI scan. We will compare nine reinforcement and associative learning computational models that parameterize peer value and the valence and predictability of social feedback to examine their influence on social learning in SA. The best-fit model will be incorporated into a model-based parametric modulation with each participant's neuroimaging data to examine neural activation in the reward and salience networks and their relations to SA. Results will elucidate which aspects of the social context contribute to learning to fear social interactions on a neural and behavioral level that potentiate SA, which can inform specific intervention targets.

2-C-277 Balancing exploration and exploitation under cognitive constraints across typical and atypical development

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To navigate their uncertain world, humans must learn to allocate their finite cognitive resources to explore new options vs. exploit known rewards. The balance between exploration and exploitation implicates risk taking and impulsivity--common behaviors that emerge in adolescence and often persist into adulthood in borderline personality disorder (BPD). Research suggests impulsivity in adolescents and adults with BPD reflects dysfunction in fronto-limbic-striatal neural circuits that facilitate the integration of value and control signals during goal-directed behavior in typical development. The current study will test how exploratory behavior is shaped by 1) environmental uncertainty and finite cognitive resources and 2) typical and atypical maturation of fronto-limbic-striatal circuits from adolescence to adulthood. 13- to 30-year-olds who were high in BPD features (n=46) and age and sex-matched controls who were low-to-average in BPD features (n=46) completed functional neuroimaging during a reinforcement learning (RL) task in which they learned to stop a rotating clock hand to win points. Exploratory choices will be indexed by larger swings between previous and current trial response times (RTs), whereas exploitative choices will be indexed by convergence toward RTs near the perceived value maximum. Computational RL modeling of trial-level behavior will examine how the shift from exploration to exploitation is moderated by age and BPD differences in how individuals learn to reduce their uncertainty about which action to choose among competing alternatives (entropy). We hypothesize that suboptimal exploration (e.g., premature shifts to exploitation) will be associated with poor fronto-limbic-striatal encoding of entropy, with exaggerated effects in high vs. low BPD individuals that persist from adolescence to adulthood. Our results may identify typical and atypical neurodevelopmental circuits underlying goal-directed exploration under real-world cognitive demands

2-C-278 Re-examining selective attention: Children show neural processing of and learning from distractors

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Selective attention--tuning into one stimulus while ignoring another--has been conceptualized as a core feature of executive function that facilitates learning and educational outcomes. Neuroscientific evidence shows that while adults tune out distractors at early processing stages, children process distracting information to a larger degree, a pattern most pronounced among those from lower socioeconomic status, and assumed to be a deficit. Here, we ask whether--instead of reflecting a deficit--children who process more distracting information also learn more from such information, without sacrificing learning from target information. METHODS 51 socioeconomically diverse children 4-7y (M=6.15y) completed a preregistered study. Children were asked to listen to one story coming out of a speaker on one side of them (attended story) and ignore another story simultaneously coming out of the other speaker on the other side of them (ignored story). While they listened, an eyetracker recorded their pupil dilation after randomly embedded probes in each story, capturing children's neural processing of each story. RESULTS Children showed greater pupil dilation in response to the attended story, $p<.001$, suggesting preferential attention at a neural level. However, children with higher pupillary responses to the ignored story relative to the attended story also showed more learning from the ignored relative to the attended story, $p=.027$. Importantly, we found that learning from the ignored story did not impede children's learning from the attended story; if anything, children who learned more from the ignored story also learned more from the attended story, $p=.061$. DISCUSSION Our results suggest that broad attention styles--more common in children from disadvantaged backgrounds--can be advantageous, such that they facilitate rather than impede learning. We speculate it may be adaptive for some children to be receptive to information outside of their focus of attention.

2-C-279 EEG Frequency Tagging of Concurrently Presented Faces and Objects in Adults and Infants

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This investigation examined the extent to which infants and adults show selective cortical amplification to faces versus novel objects. Six-, nine-, and twelve-month-old infants (n=92) and adults (n=47) viewed concurrent presentations of unfamiliar female faces with a happy expression superimposed on novel computer-generated objects while EEG was recorded. The faces and objects were modulated in contrast against a Brownian noise background at a rate of 5Hz and 6Hz (object/face presentation frequency counterbalanced across participants). Baseline corrected ssVEP amplitude at the driving frequencies was analyzed over occipital temporal brain regions. Adults showed evidence of cortical prioritization for novel objects relative to faces and the response to faces, but not objects, was right lateralized. In 12-month-old infants, cortical amplification was prioritized for faces relative to the novel objects. Finally, although both 6- and 9-month-old infants showed significant cortical amplification at the stimulation frequencies there were no significant differences between faces and objects. For all infants, the response to both faces and objects was greatest over the medial occipital area suggesting continued

cortical specialization across the first year of life. Evidence of rhythmic, alternating, selection of objects and faces was found for all ages, however rhythmic sampling of faces and objects differed between infants and adults.

2-C-281 Neural correlates of predictive processes in the infant brain

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The infant brain is an exceptionally efficient learning machinery, able to extract complex knowledge by mere exposure to a noisy and ambiguous environment, typically devoid of any explicit feedback. Over the last few years, a new vision of cognitive development has emerged to account for these early accomplishments, postulating that infants actively generate predictions about their environment, and revise these predictions in the light of sensory input to derive knowledge. Despite a wealth of literature supporting this perspective at the behavioral level, it remains unclear whether and how this strategy is implemented at the neural level. To address this question, we present 36 4-month-old infants with a cross-modal cueing paradigm in which auditory cues acted as predictive signals about upcoming visual events. Combining the respective advantages of mismatch and omission protocols, we recorded electroencephalographic responses to predictive and non-predictive sounds, expected and unexpected images, as well as expected and unexpected visual omissions. Event-related analyses indicate the presence of mismatch responses to unexpected images, as well as anticipatory signals preceding expected images. These preliminary results provide evidence that predictive processes are already functional in the maturing infant brain.

2-C-282 Brain representations of symbolic and non-symbolic quantity become estranged with education: Evidence from between-format and between-age decoding

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A large body of evidence shows that animals and humans share an approximate number system (ANS) that allows for the manipulation of quantities without symbols (Feigenson et al., 2013). However, whether the ANS scaffolds the emergence of symbolic mathematics in children remains heavily disputed (Wilkey & Ansari, 2020). Here we measured fMRI adaptation to the repetition of dot arrays and Arabic numerals in 5-year-old (n=43) and 8-year-old (n=46) children. This allowed us to assess the relations between the neural representations of non-symbolic and symbolic quantity over development. To investigate representational differences in brain activation patterns, a searchlight decoding technique (Kriegeskorte et al., 2006) was applied with both intra-format (i.e., training and test stimuli were in the same format) and cross-format analyses (i.e., training and test stimuli were in different formats). For both age groups, robust intra-format decoding was found in a widespread brain system including the frontal, parietal, and occipital cortices. However, although we found significant cross-format decoding in the right inferiorparietal lobule (IPL) and dorsolateral prefrontal cortex (DLPFC) of 5-year-olds, such cross-format decoding was absent in 8-year-olds. Between-age searchlight decoding further revealed that brain representations were stable across the two age groups for non-symbolic quantity in the right IPL and bilateral DLPFC, but this was not the case for representations of symbolic quantity. These results

indicate that the brain representations of symbolic and non-symbolic quantity may overlap in young children but become estranged with development. This is consistent with the so-called symbolic estrangement hypothesis, suggesting that repeated exposure to symbolic numbers may allow children to manipulate symbols without referring to the quantity (Lyons et al., 2012).

2-C-283 Alterations in brain connectivity during letter-speech sound learning in poorly and typically reading children

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Objectives Learning of letter-speech sound associations (LSS) is crucial for learning to read. Individuals suffering from developmental dyslexia often show impaired LSS integration and deviant brain activation. Here we aim to characterize behavioral and neural differences between typically and poorly reading children during LSS learning. Methods 80 children (6-11yrs) with varying reading skills participated in the study and conducted an associative false font-speech sound (FF-SS) learning task during fMRI. We applied a reinforcement-learning drift-diffusion model to analyse behavioral learning parameters such as associative strength (AS) and prediction error (PE) and their modulation of brain activation and effective connectivity using dynamic causal modeling (DCM). Results Children were able to learn FF-SS independently of their reading status with high accuracy. However, the poorer the childrens' reading skills, the longer were their response times. Model-based fMRI analyses yielded insights into the relationship between learning and decision-making parameters and the activation of networks involved in reading and reinforcement processing during FF-SS learning. DCM revealed reduced connectivity from the ventral occipito-temporal (vOT) to the auditory cortex (AUC), from the AUC to the superior temporal cortex (STC) and weaker striatal modulation of the vOT-STC connection during the learning task in poorly reading children. Conclusion Despite a general high accuracy in associative learning, poor reading skills were associated with slower decisions and decreased connectivity among regions of the audio-visual learning network. Importantly the modulatory influence of AS by the putamen on the feedforward vOT-STC connectivity was reduced in poor readers suggesting aberrant connectivity during the formation of new audiovisual letter representations. To summarize, our study provides novel insights on the mechanisms of learning novel FF-SS associations in children.

2-C-284 Giving support or not? Relations between parental verbal and nonverbal support strategies and neural synchrony during parent-child spatial problem-solving.

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Synchronous interactions between parent and child are fundamental for children's cognitive and neural development. However, previous research primarily focused on the influence on child social or emotional outcomes (Nguyen et al, 2020). The role of diverse, proximal, dynamic parenting strategies on children's cognitive outcomes remains unclear. Here, we are going to explore how different verbal and nonverbal parental cognitive strategies bring different effects on neural synchrony patterns during interactions using dual-functional near-infrared spectroscopy (fNIRS) covering the bilateral prefrontal

cortex and temporo-parietal areas. Parents and children join in two conditions: individual problem-solving condition and cooperation condition. In cooperation conditions, the dyad is asked to solve a tangram puzzle together; in individual conditions, they are given the same task but asked to do it alone with an opaque screen between them. We categorize task-relevant parental strategies into three categories: verbal support (e.g., saying "turn it in the opposite way"), gesture support (e.g., pointing to a corner of the piece), and action support (e.g., moving pieces into the right place). We are planning to use wavelet transform coherence (WTC) to access two fNIRS time series from the dyad (Grinsted et al, 2004; Santosa et al, 2018). The neural synchrony patterns underlying three support strategies will be compared. Furthermore, we will link these synchrony patterns to the dyad's success in problem-solving tasks (number of tangram puzzles solved). We expect to see differential relations - prefrontal synchrony relates to nonverbal support, parietal synchrony to verbal support. These will improve our understanding of how different parental support strategies influence children's neurocognitive development.

2-C-285 Social search strategies during adolescence: when and who to observe

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Adolescents face many (social) decisions, including those that involve risk for health and well-being. Previous research has outsized the impact of peers on adolescents decision-making, but mainly focused on the adolescent as passive receiver of social information. From a social learning perspective, adolescents play an active role in gaining information about others' behaviour (i.e. social information-seeking behaviour) to guide social or uncertain decisions. Knowledge about the social search strategies of adolescents, including when and whom to learn from will help to understand, and foster the adaptive nature of social influence across adolescence. However, to date little is known about the type of peer that adolescents consult prior to decision-making. Method: Our studies investigated this information-seeking behaviour in the context of adolescents' social network at school. We combined the assessment of peer relationships with two novel social search paradigms, to address the characteristics of the consulted peers. Study 1 investigated the selected informants during a risky decision-making task, whereas study 2 investigated the selected informants for hypothetical scenario's including different behavioural domains (i.e., academic-, risk, prosocial-related and trend-following behaviours). Results: Study 1 showed that adolescents consulted friends and peers who were highly trusted and/or seen as smart. Popularity did not seem to increase one's probability to be selected as an informant. These results were partially replicated in study 2, which showed differences in social information-seeking behaviour per decision domain. Significance: this work will demonstrate the importance of viewing the adolescent as an active agent and sheds light on the characteristics of powerful peers, which will lead to a better understanding of how peers impact adolescents' decisions, and eventually will help adolescents to become more socially smart.

2-D-212 Heterogeneity in Early Adolescent Reward Networks and Associations with Behavioral Outcomes

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Background: Differences in connectivity networks are often examined by comparing average network characteristics between two known groups. This approach presumes that a single network structure reflects the population; however, there may be multiple, qualitatively distinct networks within a population. Here, we compared several approaches to modeling directed effective connectivity reward networks in early adolescents that differ in the extent to which they reflect heterogeneity in connectivity patterns. We also examined validity of network differences against behavioral outcomes. Methods: We extracted timeseries for 15 regions during a reward task in 103 adolescents after preprocessing with fmriprep. We then estimated idiographic networks and an aggregate network across all participants. Additionally, Group Iterative Multiple Model Estimation (GIMME) was used to create a group level network that accounts for heterogeneity, subgroup models of homogenous sets of networks, and individual networks building from the group model. Adaptive LASSO was used to estimate associations between network characteristics and discounting rate, reward drive, inhibitory control, and depression. Results: The aggregate network contained 24 directed paths, but idiographic networks typically contained fewer than 10 of these paths. GIMME identified 3 subgroups, but they had low modularity. GIMME also identified 19 group-level paths, and multiple paths that were only present for some individuals. Specific group- and individual-level paths were associated with multiple reward-related outcomes. Conclusions: The aggregate model poorly represented reward network for individuals, suggesting that group-average networks fail to reflect heterogeneity in network functioning. GIMME models that account for heterogeneity may better separate qualitatively distinct models of network functioning to increase validity for testing associations with behavioral and clinical outcomes.

2-D-286 Selective and reflective: Adolescents use context to adjust visual exploration

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Adolescence is a period of enhanced exploration, which is a critical component of learning from experience. Yet, little is known about how context modulates when and how adolescents explore new information. To test this, we designed a novel task indexing visual exploration of art images to examine how exploration changes with age. 54 participants ages 10-28 completed the "Reveal Task," in which subjects are shown completely occluded paintings and 'reveal' the image piece by piece by fixating on a location. Our stimuli included three different categories of paintings, which varied in level of abstraction: representational paintings, which depict familiar objects/scenes, indeterminate paintings, which depict recognizable, yet distorted objects, and abstract paintings, which depict no recognizable objects. Our results demonstrate that adolescents explore more selectively than adults do. This selectivity is evidenced by differences in spatio-temporal patterns and sensitivity to the amount of information in the image. We find that adolescents reveal fewer squares than adults, dwell longer on each square, and reveal squares that are farther apart in space. We also find that adolescents are more likely to modulate their viewing by the type of image and information content of the individual squares. Unlike adults, who reveal a high number of squares consistently across art types, adolescents reveal fewer squares for indeterminate art (compared to abstract and concrete art). Adolescents are also more likely to modulate their viewing pattern based on the amount of information (entropy) present in the current square. Compared to adults, adolescents exploit squares that are proximal to high-entropy squares, and explore

new locations quickly after encountering a low entropy square. Overall, these findings reveal how adolescents use cues from the environment and their immediate experiences to modulate visual exploration.

2-D-287 Memory-guided decision-making develops alongside model-based planning

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OBJECTIVE: We draw on the past to predict how our choices will unfold in the future. While prior work has shown that adults' choices are biased by past rewards retrieved and integrated from memory (Bornstein & Norman, 2017), it remains unclear how their influence changes across development. Episodic memory shares common neural substrates with model-based decision-making (Vikhbladh et al 2019; Vikhbladh et al 2017), which strengthens over development (Decker et al 2016). Therefore, we asked: (1) How does memory-guided decision-making change with age? and (2) Do age-related changes in memory-guided decision-making correspond to changes in model-based planning? METHODS: Participants (N=47, ages 8-25 years old, data collection ongoing) completed two tasks -- a two-day version of a decision-making task optimized to distinguish the influence of recent rewards versus memories of past rewards (Bornstein & Norman, 2017) and a reinforcement learning task designed to differentiate between incremental learning versus forward planning over a model of the environment (Daw et al 2011; Decker et al 2016). Neither memory nor model-based strategy use were incentivized. RESULTS: The influence of memories on choice and model-based planning both increased with age (memory - $r\tau$=0.20,p=0.051; model-based - $r\tau$=0.24,p=0.016) and were related to one another ($r\tau$=0.48,p<0.001). CONCLUSIONS: Our results provide evidence that memory-guided and model-based decision-making jointly emerge with age. Potentially, the ability to plan using internal models of the environment and the ability to sample and integrate experiences from memory mutually support one another across development.

2-D-288 Where and how are salient early-life experiences encoded? novel role of the thalamic paraventricular nucleus

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Memories contribute critically to how we perceive the world and how we behave in daily life as well as in challenging situations. Experiences encountered early in life play an outsize role in determining our reactions and spontaneous behaviors, likely by influencing the maturation of important high-order networks. Whereas much is known about the networks involved in encoding spatial and episodic memories, there are gaps in our understanding how salient emotional experiences are encoded in the infant and child's brain to influence future behaviors. In a transgenic mouse engineered to enable permanent labeling of neurons activated at a specific time-point (TRAP mice), we mapped brain regions activated by adverse or typical early-life experiences. Surprisingly, permanently tagged neurons resided robustly and almost exclusively in the thalamic paraventricular nucleus (PVT). Quantitative analyses showed that PVT was the only analyzed region that distinguished adverse from typical early-life experiences. Remarkably, PVT cells activated by early-life experiences contributed to aberrant reward

behaviors later in life, as silencing them using chemogenetic technology normalized the aberrant adult behavioral phenotype. Collaborative studies are now mapping the functional connectivity of the PVT in both humans and rodents and delineating the trajectory of PVT-network development from childhood to the adult. In conclusion, in experimental models, the PVT is a novel key node for encoding salient early-life emotional memories, and their influence on future behaviors. These discoveries provide strong impetus for studying the human PVT and its interconnected circuitry.

2-D-289 Population Patterns Linking Adolescent Risk-Taking and Substance Use

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Neurodevelopmental theories suggest adolescent substance use is driven by lifespan peaks in risk-taking during this period. However, the generalizability of risk-taking-substance use linkages across the varied sociodemographic and health factors associated with real-world substance use, remains unknown. To inform the potential translation of adolescent risk-taking to large-scale, generalizable screening, prevention, and/or substance use intervention efforts, we examined linkages between adolescent risk-taking propensity and substance use across twenty-three sociodemographic, psychiatric, and health subgroups (spanning sex, race, socioeconomic status, population density, religious affiliation, and mental/physical health strata) in a nationally representative sample. National Survey of Drug Use and Health 2002-2019 data (N=1,005,421; 12-65-years-old) were used to fit non-linear lifespan trajectories of self-reported risk-taking. Self-reported risk-taking displayed a non-linear lifespan trajectory, with a robust peak during mid-adolescence (16.25 years-old) matching neurodevelopmental predictions. While substantial average-level differences on risk-taking were observed (e.g., males vs. females: Cohen's d = 1.22; low vs. high religious affiliation: d = 1.10), all twenty-three population subgroups displayed highly consistent peaks in risk-taking during mid to late adolescence (range across strata: 15.0 to 19.3-years-old). Risk-taking also consistently disambiguated daily adolescent cannabis users (range across strata: d's = 0.57 to 1.13) and alcohol users (range across strata: d's = 0.41 to 0.57) from non-users. Results support neurodevelopmental predictions of adolescence as a period of heightened risk-taking that confers vulnerability to substance use. The consistency of adolescent peaks in risk-taking and links to substance use across population subgroups suggests risk-taking measures may be useful in large-scale screening and prevention efforts for adolescents.

2-D-290 Multidimensional phenotyping of youth with high positive alcohol expectancies: a preregistered study

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BACKGROUND: Positive alcohol expectancies (PAEs), one's beliefs regarding the positive consequences of alcohol use, are known predictors of drinking behaviors in adolescents. Prior small cohort studies have identified environmental (e.g. parental attitudes towards alcohol, peer drinking behavior), clinical (e.g. behavioral problems, comorbid psychopathological diagnoses, impulsivity), and neurobiological (e.g. regional activation of brain and behavioral measures) factors associated with high PAEs. However, current knowledge regarding the interplay of, or interactions, between these multifaceted

biopsychosocial factors is limited and requires assessments with large and generalizable samples of adolescents using cutting-edge data science approaches. METHODS: This study will apply the Generalized Kernel Machine (GKM) method, a multivariate data integration approach, to identify higher-order composite interaction across multiple data types (i.e., environmental, clinical, and brain/behavioral variables) at baseline for comprehensive identification of factors, and their interaction, contributing to elevated PAEs, one-year later using the Adolescent Brain Cognitive Development (ABCD) data (n = 6,880, ages 9-12). Three main objectives of this study are to 1) identify triplets (combination of 3 variables, one variable from each of the three data types) that most significantly define PAEs using the GKM approach, 2) examine the specific association between the variables in each identified triplet with respect to PAEs, using linear regressions, and 3) identify prediction accuracy of the identified triplets using a support vector machine (SVM). CONCLUSION: Although PAEs have been shown to predict drinking behaviors in adolescents, this study will be the first to comprehensively examine factors associated with PAEs, and their interactions that most significantly predict PAEs. Such information can be used to identify specific targets for early interventions for at-risk youth.

2-D-291 Prevention of adolescent risk-taking behavior through early identification

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Adolescents show more risk-taking behavior than children and adults. Most adolescents do not experience adverse consequences of increased risk-taking behavior. However, excessive risk taking can result in long term adverse consequences. To better target prevention efforts at adolescents who are at risk for excessive risk taking, these adolescents should be identified early. Early identification requires accurate prediction of future risk-taking behavior. Here we first test which statistical approach is best suited for prediction of risk-taking behavior. We compare out-of-sample prediction performance of three different forms of Ordinary Least Squares (OLS) regression models and a Least Absolute Shrinkage and Selection (LASSO) model. We use data from a large, three wave longitudinal sample with 298 participants between the ages of 8-25 at the first measurement. Participants were measured a total of three times, with a two year interval. Results show that the LASSO model outperforms all three OLS regression models on out-of-sample prediction for prediction of risk taking two years later. None of the models performs well for prediction of behavior four years later. We then use the LASSO model to determine a criterion value of who is at risk for excessive risk-taking behavior in two years. This criterion value can be used for early identification of individuals at risk and can provide guidance on decisions about prevention efforts.

2-D-422 Neural reaction during reward and effort anticipation in first year secondary school students

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During adolescence, students are more prone towards rewards compared to children and adults. The value of a potential reward is estimated in relation to the amount of effort that is needed to gain this

reward. Additionally, students' mindset might play an important role in reward and effort anticipation, since students with a growth mindset might value high effort as less threatening for a potential reward compared to students with a fixed mindset. The goal was to test for the motivational effect of reward and effort anticipation in secondary school students. Previous adult studies showed that the Cognitive Control Network (CCN) and the striatum are related to both reward and effort anticipation. We used functional Magnetic Resonance Imaging (fMRI) to examen which brain regions are involved in effort and reward anticipation in first year secondary school students (N = 62; Mage = 12.97 years; SDage = 0.35 years; female = 40.30%) when doing an arithmetic task. Additionally, we asked the same students to do an arithmetic task in a more ecological valid setting, at school (Math Effort Task; MET). Students' answers to this task were linked to mindset related variables in order to group students with similar motivational strategies when doing the arithmetic task (one growth mindset group (n = 28) and one fixed mindset oriented (n = 23)). Possible differences in neural responses between these groups were then examined. Preliminary results suggest that the CCN and striatum are involved during reward anticipation, but not during effort anticipation. Possible neural differences between groups will be analyzed. We expect that the CCN and the striatum is only involved during effort anticipation in students oriented towards a fixed mindset compared to students oriented towards a growth mindset. This study might shed light on nuances in students' strategies when anticipating on doing an arithmetic task.

2-E-292 Does math intervention modify the neural correlates of numerical magnitude processing in children?

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Numerical magnitude processing plays an important role in successful math achievement (Vanbinst et al., 2016). Those with math disability (MD or developmental dyscalculia) show weaker magnitude processing performance than their peers (Mussolin et al., 2010). Magnitude processing activates bilateral parietal and frontal regions (Sokolowski et al., 2017), and this differs in those with MD relative to controls (Kaufmann et al., 2011). Poor magnitude processing is thought to be causally related to MD, but it is not known if the brain-bases of magnitude processing are malleable and change following successful math intervention. To test this question, we for the first time investigated brain activity during a magnitude processing task before and after 6 weeks of tutoring (90h total) in 51 children/adolescents (age 8-12) with low math ability (scores <92 on either Calculation or Math Fluency tests of the Woodcock Johnson (Woodcock et al., 2001)). On average, the group made significant gains in math performance following the intervention. We will use both a region-of-interest (regions determined a priori), as well as a whole-brain analysis approach to test whether: (a) activity during magnitude processing changes following the intervention; and (b) changes in magnitude processing activity following the intervention correlate with changes in math performance (for a range of measures, including both calculation-based and retrieval-based arithmetic). We expect to see activation changes (specifically, decreases) in frontoparietal regions following the math intervention; and that the degree of change here will correlate with changes in individual math scores, indicating the concurrent refinement of magnitude representations at the level of the brain and for math performance. This study will shed

further light on the role of magnitude processing in math learning and characterize the specific functional changes during magnitude processing following successful math intervention.

2-E-293 The overlap between precursors of reading and arithmetic in preschoolers correlates with the white matter organization of the inferior fronto-occipital fasciculus.

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Learning to read and count constitute important milestones of children's academic development. To date, most research has focused on either reading or arithmetic development, resulting in separately identified brain networks and cognitive precursors. This seems counterintuitive as both abilities are highly correlated and disabilities in reading and arithmetic often co-occur. To fill this gap, we examined the association between precursors of reading and arithmetic at the level of brain networks. Specifically, we analyzed fractional anisotropy (FA) of multiple white matter tracts in a sample of 5-year-old preschoolers (n = 56). Applying both averaged and along-the-tract analyses of white matter organization, our results indicated that the FA in the Inferior Fronto-Occipital Fasciculus (IFOF) was strongly correlated with precursors of both reading (phonological awareness, letter knowledge) and arithmetic (numerical ordering, numerical knowledge), even after controlling for age, motion, verbal- and spatial reasoning. Regression analyses showed that phonological awareness and numerical ordering were the strongest unique predictors of the white matter organization of the IFOF. However, neither of these remained a significant predictor when both were simultaneously added into a model, indicating that their associations with the IFOF reflected overlapping processes between the two. Our results emphasize that there exists great overlap between reading and arithmetic, even before children attend formal education. This is observed both at the level of their cognitive precursors as well as at the level of their underlying white matter networks.

2-E-294 Visual training of executive functions in dyslexia: fMRI evidence for neural plasticity in the dorsal attention and cingulo-opercular networks

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Developmental dyslexia is a learning disability characterized by slow and inaccurate reading. Interventions for dyslexia have been traditionally focused on phonological skills. The aim of this study was to determine the effect of a reading training targeting executive functions (EF) on neural circuits supporting higher-order cognitive abilities. Eighty children (mean age = 9.6±1.45) participated in the study: 44 children with dyslexia and 36 typical readers. All participants were randomly divided into two intervention groups: EF-based reading training and control training (math). Both interventions had a duration of 8 weeks. Functional MRI data and a cognitive test battery were administered before and after the intervention. After the reading intervention, children with dyslexia improved in reading comprehension, visual attention and inhibition. In typical readers, only a gain in visual attention was observable. Neurobiologically, a seed-to-voxel analysis (with the dorsal attention network as a seed) showed increased functional connectivity with the left inferior frontal gyrus in typical readers. Functional connectivity was correlated with working memory and speed of processing. Children with

dyslexia displayed an increase in functional connectivity after the reading intervention between the cingulo-opercular network and occipital regions. Functional connectivity was correlated with visual attention and speed of processing. In conclusion, reading improvement following EF-based reading intervention involves neuroplastic connectivity changes between visual attention-related neural circuits and multimodal neural hubs in children with dyslexia. In typical readers, the mechanism was higher integration of EF-related regions and visual areas. The results suggest the need for training basic cognitive abilities other than phonological awareness (such as EF and visual attention) in order to improve reading in dyslexia.

2-F-295 Retrieving item and feature information from episodic memory following deep or shallow encoding: Complementary oscillatory and ERP evidence from young and older children as compared to young adults

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Episodic memory retrieval is achieved via recollection and familiarity, but the developmental trajectory of familiarity in particular remains unclear. Here, we assessed young (7-8 years) and older children (10-11 years) and young adults using both neural oscillations and event-related potentials (ERPs). Participants classified pictures as identical or changed exemplars of every-day objects encoded previously in a perceptual or a semantic encoding task. Retrieval was more accurate for identical relative to changed items, and for the two older age groups. Semantic (vs. perceptual) encoding was beneficial in particular for adults, in line with the ongoing maturation of the semantic memory system. Oscillatory activity provided evidence for strong increases in delta and theta activity during episodic memory retrieval for all age groups. In young children and adults, a sustained increase in posterior slow theta (4 Hz) - previously associated with recollection - predicted correct feature retrieval for deeply encoded items and was only observed after the response for incorrectly retrieved features; correct retrieval for items encoded during the perceptual task was associated with an early burst in upper theta (8 Hz), which occurred later for children. Similarities between age groups for EEG oscillations contrasts developmental differences evident in ERPs: Sustained parietal ERP correlates of recollection were evident in children across conditions, but restricted to the left hemisphere for incorrect retrieval of perceptual details, suggesting (partial) recollection of verbal labels but insufficient perceptual details. By contrast, in adults an early fronto-central positivity indicated familiarity-based retrieval; a brief centrally distributed correlate of recollection was followed by a sustained parietal negativity. Together, these results suggest qualitative rather than quantitative changes in the cognitive processes supporting episodic retrieval of item and feature memory.

2-F-296 Effects of semantic prediction error on episodic memory: a lifespan comparison

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Predictive processing and learning accounts assume that internal models are being updated following prediction errors (PEs). Extending to memory domain, both weak and strong PEs are hypothesized to upregulate episodic encoding through different mechanisms. The dissociation of the two ends of PE can

be explored by taking a lifespan perspective. We hypothesized that, while weak PE events (i.e., predicted events) and strong PE events (i.e., unpredicted events) are remembered equally well in young adults, the importance of these events are likely to change across the lifespan. Specifically, children are expected to encode strong PE events more, whereas older adults would encode weak PE events more. In this study, we examined to what extent episodes depicting actions that match or violate expectations affect the memories of those episodes in the context of a visual narrative paradigm across three age groups (children 8-10 years, younger adults 18-25 years, older adults 65-70 years, targeted sample size 64 per group). Participants are presented with comic strips depicting two characters engaged in an action. Critically, the end of the narratives is manipulated to create three ending conditions: expected ending, unexpected ending, and unfinished action. During the retrieval phase, memory for the presented comic strips is measured across four different memory tasks. We expected children to display a more pronounced encoding advantage for strong PE events than younger adults, whereas older adults would show memory benefit for weak PE events. These results can potentially provide important insights into the relationship between prediction, memory and development.

2-F-297 The impact of mnemonic prediction error on memory over the lifespan: electrophysiological and behavioral evidence

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Statistical regularities from the environment are internalized to make predictions which are subsequently contrasted with incoming sensory evidence. Mismatching evidence gives rise to a prediction error (PE) which presumably enhances encoding, leading to better memory of violating than non-violating episodes. Our study goals were to compare the effects of mnemonic prediction error on episodic memory among children, young adults, and older adults, and to investigate their electrophysiological correlates in young adults. In an online study, 40 participants of each age group implicitly learned associations between pairs of visual objects over two days. On the third day, new objects were shown among the learned pairs, either after the first item of a pair (violating items), i.e., when participants would expect the second item of a pair, or between pairs (non-violating items). In young adults, a recognition test revealed better memory for violating than non-violating items, which was not observed in children and older adults. In an associative memory test on the original pairs, older adults were outperformed by children and young adults. In a structurally similar EEG study with young adults only, electrophysiological correlates of PE also suggest that the original pairs were well learned in this age group. We conclude that older adults' poorer associative memory contributes to weaker priors and, consequently, also to weaker PE than in the other age groups. On the other extreme of the lifespan, children internalize statistical regularities very well, but, in contrast to young adults, PE does not have an enhancing effect on encoding.

2-F-298 Age differences in generalization, memory specificity and their overnight fate in childhood

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Adaptive memories are formed in the face of a fundamental tension: extracting commonalities across experiences to generate novel inferences (i.e., generalization) while simultaneously forming separate representations of similar events (i.e., memory specificity). During childhood, this tension is further amplified through the uneven progression of generalization and memory specificity and the protracted development of underlying neural correlates. In particular, it is not well understood whether generalization relies on memories for specific, related episodes and how children manage to consolidate both generalized and specific memories. In this study, we examined age related differences in behavioral measures of generalization and specificity immediately after learning and after one night of sleep (ages 4-8 years, N=141) to investigate whether (i) age differentially relates to generalization and memory specificity abilities; (ii) generalization is contingent on memory specificity and (iii) the effect of a sleep-filled delay on these memory processes differs by age. We found that both, generalization and memory specificity showed robust age-related differences, with greater differences for generalization than for memory specificity. Unlike prior evidence in adults, children's generalization success was contingent on memory specificity for conceptual object properties and inter-object semantic proximity, but not on perceptual attributes or surrounding contexts. Further, across one night of sleep, older children were more likely to retain both generalized and specific memories than younger children. However, memory gains differed across processes: Compared to younger children, older children showed greater gains in generalized, but not in specific memories. In summary, the present results reveal aspects of past experiences upon which children draw when creating inferences and suggest that the overnight fate of generalization and memory specificity changes with age.

2-F-299 Functional Manipulation of Infant Memories in Mice

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Infantile amnesia, the developmental loss of memories formed in early childhood (prior to 2-4 years), affects all humans. Although behavioural neuroscientists have already demonstrated that rodents display infantile amnesia, little is known about the basic neurobiology of infantile amnesia and further its effect on memory engrams. We probe the question of how memories are stored in the brain throughout development by integrating engram labelling technology with mouse models of infantile amnesia. We show that infant mice demonstrate infantile amnesia for a range of behavioural paradigms including fear conditioning, novel object recognition and the Barnes maze. We successfully reactivated infant memories of various modalities in adult mice by optogenetically stimulating dentate gyrus engram cells that were labelled for a target experience during infancy. We used cell reactivation as a proxy of memory retrieval and demonstrate that the engram connectivity pattern survives infantile amnesia. Further, we were able to permanently reinstate lost infantile memories by artificially updating the memory engram and restoring natural access to the engram. Finally, we demonstrate that male, but not female, offspring from maternal immune activation (MIA) models do not experience infantile amnesia.

2-F-300 Developmental change in hippocampal and prefrontal engagement during preparatory retrieval cues

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Investigations into the brain basis of memory retrieval over development have shown that marked changes to hippocampal and prefrontal engagement may support behavioural improvements in memory. Our own past fMRI decoding work has shown that developmental differences in neural state are most pronounced during retrieval of semantic, as compared to autobiographical or episodic, memories. Moreover, the nature of this difference might reflect discrepancies in cognitive approach to the task: adults and teens appeared to be differentially able to make use of pictures that cued the general topic of an upcoming question. Here, we leveraged the fact that image cues and specific retrieval questions appeared separately in time to characterize how prefrontal and hippocampal activation compared across trial phases (preparatory image cue vs. question) in three age groups (children, 10-12 years old; adolescents, 14-17; and young adults). We hypothesized that adults would show greater prefrontal and hippocampal engagement during preparatory image cues in contrast to younger age groups, who would instead activate these regions during the question period. We found that on average, hippocampus was more engaged during the image cue than question period of all tasks across age groups. However, developmental differences were most pronounced in the semantic task: children and adolescents engaged anterior hippocampus more overall in comparison to adults, who in contrast additionally engaged posterior hippocampus. Prefrontal cortex (PFC) engagement also differed by age group specifically in the semantic task: children and adolescents engaged medial PFC more during image cues, while adults engaged lateral PFC more during question periods. These results suggest there are age-related differences in how preparatory cues are used in service of answering questions that rely on semantic memory. This aligns with past work that shows expanding knowledge can refine memory retrieval processes.

2-F-301 Mechanisms of Engram Plasticity in Infantile Amnesia

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Infantile amnesia describes the inability to recall memories formed during infancy and early childhood. This phenomenon occurs during a critical window of brain developmental which includes the maturation and refinement of synaptic connections and brain circuits, however the biological mechanisms underlying infantile amnesia remain elusive. Microglia, the resident immune cells of the brain, are known to play an important role in synaptic refinement during postnatal development and we aim to investigate the role of microglia and synaptic modifications in the neurobiology of infantile amnesia. We trained infant mice at postnatal day 17 on a contextual fear conditioning task and inhibited microglial activation using the tetracycline antibiotic minocycline. We then investigated the effect of microglial inhibition on recall of this fear memory 1 day (pre-amnesia) and 8 days (post-amnesia) post-training. We found significantly elevated levels of freezing 8 days post-training in mice treated with minocycline compared to controls. Furthermore, using activity-dependent ensemble labelling, we labelled infant memory engram cells for the contextual fear memory and through histological analysis we explored the characteristics and changes in these cells pre- and post-amnesia. We found changes in the inhibitory post-synaptic element Akyrin-G on engram cells post amnesia. We are currently using histological tools

to characterise microglial activation in control and minocycline treated mice as well as evaluating microglial characteristics across this critical postnatal window. Overall, our current findings suggest that developmental processes such as maturation of inhibitory circuits and synaptic refinement through microglia based synaptic pruning may impact infant engram accessibility resulting in infantile amnesia.

2-F-302 Developmental differences in resolving memory competition during retrieval of specific and general memories

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Remembering our lives accurately often requires telling apart similar experiences. However, given prolonged prefrontal development, adolescents may not be able to use the same top-down, ventrolateral prefrontal cortex (vlPFC)-mediated, processes as adults to discriminate between such competing memories at recall. Here, we will address this question by having adolescents and adults learn to associate natural (A) objects from four categories with unique artifacts (B objects). Categories will either have high (apple, shell) or low (rock, leaf) intra-category similarity, yielding high or low expected competition between pairs. During retrieval scanned with functional magnetic resonance imaging (fMRI), participants will be shown B objects and prepared to either disambiguate the specific paired A item (e.g., apple 1 or apple 2) or general paired category ("apple" or "rock"). We will compare brain activity for high and low competition pairs during the retrieval period before both question types. We predict that when retrieving the specific object, only adults will recruit the vlPFC more for high versus low competition pairs, however, both age groups will show higher activation of the earlier developing posterior hippocampus for higher competition pairs. We also expect this to be reflected in behaviour such that adolescents are less successful than adults at recalling the specific item for high competition pairs (as found in pilot). Such results would suggest that adolescents are particularly disadvantaged at retrieval when top-down resolution of high memory competition is required, but not necessarily when memories have weaker similarity. In contrast to retrieval of specific objects, we expect no difference in vlPFC activation according to competition or age group when general category information is retrieved. The results of this study will offer insights into how the development of the PFC and hippocampus allows people to resolve memory competition at retrieval.

2-F-303 Hippocampal Neurite Density and Trace Eyeblink Conditioning in Four- to Six-Year-Olds

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Pavlovian eyeblink conditioning (EBC) has been proposed to be a proxy for the efficiency and efficacy of hippocampal development across different learning, memory, and spatial domains. EBC has a well-defined neural circuitry, which includes both the hippocampus and the cerebellum. As a first step to validate the use of EBC as a proxy for hippocampal development, the current study examined the relation between trace EBC (i.e., the conditioned offset/unconditioned onset are separated by a trace period) and hippocampal and cerebellar neurite density. A total of 30 children aged 4- to 6-years (M =

5.7, SD = .88) completed a: (1) T1-weight structural scan; (2) a T2-weighted structural scan; (3) a Diffusion Weighted Imaging (DWI) scan (3T; 102 diffusion directions); and (4) a 10-minute trace-EBC task. Two-dimensional surface renderings of each participant's T1- scans were constructed in FreeSurfer v6.0. Neurite orientation dispersion and density imaging (NODDI) reconstruction was accomplished using the T2- and diffusion scans. The NODDI model provides the neurite density index (NDI) metric, an indicator of neurite density. Average neurite density was calculated for bilateral hippocampus and cerebellar cortex. EBC training consisted of 80 tone-puff trials (i.e., presentation of a 750-ms tone CS, a 80 dB, 1000 Hz pure tone, followed by a 500-ms trace ISI, followed by a 100-ms airpuff US, ~10 lb/in2), 10 tone-alone trials, 10 puff-alone trials. Conditioned Response (CR) onset latency was computed across all 80 trials. We found that greater neurite density of the bilateral hippocampus predicted higher CR onset latency ($p < .0007$ for left, $p < .007$ for right). Neither left nor right cerebellum predicted CR onset latency (lowest $p = .27$). These results suggest that pruning hippocampal synaptic connections, through maturation and/or experiential processes, may engender resource-efficient differentiation of signal from noise in learned associations.

2-G-304 Adversity and the timing of childhood tooth eruption

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Accelerated biological aging is a mechanism by which early adversity may confer risk for physical and mental health problems later in life. Recently, the timing of the eruption/emergence of permanent molar teeth has been identified as a measure of adversity-associated accelerated biological aging. Specifically, lower family income and greater exposure to childhood adversity has been correlated with earlier permanent molar eruption timing (cross-sectionally; McDermott et al., 2021). We aim to replicate and extend this prior work using data from the Avon Longitudinal Study of Parents and Children, a sizeable longitudinal cohort study. We hypothesize that greater exposure to early life adversity will be associated with earlier eruption of first permanent molars (assessed by a dental observer at age 5 in >1,400 participants), as well as earlier age at first tooth emergence (reported by caregivers at age 15 months in >11,000 participants). Adversity measures include prospective assessments of income and caregiver abuse from 20 weeks gestational age through 5 years of age, and central hypotheses will be evaluated using linear regression. Additional exploratory analyses will examine effects of adversity timing using Structured Life Course Modeling Analyses, an analytic approach that allows researchers to model complex life-course hypotheses, including sensitive periods. The timing of tooth eruption may be a non-invasive and inexpensive way to predict the impact of adversity on neurocognitive changes associated with accelerated maturation. Extending prior research to additionally examine first tooth emergence timing is important because this measure may be an especially early indicator. Characterizing the association between adversity and tooth eruption timing is a first step in understanding the degree to which easily observed aspects of tooth development might reveal the impacts of adversity on neurodevelopment.

2-G-305 Chronic home radon exposure differentially impacts gray matter and white matter development in healthy youth

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OBJECTIVE: Radon is a highly prevalent, gaseous toxin with key roles in lung cancer. Beyond oncology, studies of air pollution have associated long-term exposure with deleterious changes in brain morphology, though these studies have generally focused on adults and excluded radon. The current study examined the impact of chronic home radon exposure on total gray matter volume (GMV) and white matter volume (WMV) in typically-developing youth. METHODS: A total of 53 youths (6-14yrs, M=10.52yrs) and their parents completed the study, including a home radon test and radon questionnaire which were used to create a radon exposure index (REI). Children underwent structural T1-weighted MR imaging where GMV, WMV, and total intracranial volume (TIV) were extracted via voxel-based morphometry. We used multivariate analysis of covariance to assess the degree to which the REI, age, and their interaction were predictive of variability in GMV and WMV, controlling for confounders (body-mass index, socioeconomic status, pubertal development). RESULTS: Radon and its interaction with age revealed nuanced associations with total volume. Univariate analysis revealed a main effect of REI on GMV, such that youths with greater exposure had smaller total GMV (F = 4.36, p</> = .043, ηp2= .09). Interestingly, we saw an REIxAge interaction on WMV (F = 4.12, p =.049, ηp2= .09). Simple slopes analysis revealed expected increases in WMV with age in youths with moderate-to-low radon exposure. Contrastingly, total WMV decreased as a function of age in youth with greater exposure, suggesting harmful effects of radon on WMV development. CONCLUSIONS: Radon exposure is associated with atypical neural tissue volumes, as seen in GMV reductions and reversal of WMV growth trends. These dynamic structural changes are likely to continue with exposure, possibly affecting cognition.

2-G-306 Within Arms' Length: Caregiving and Cognition in 8-Month-Old Infants

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The cognitive abilities developed in infancy are the foundation for the complex ones required throughout life. Yet, it is unclear how environmental factors influence the development of such abilities. Literature suggests that caregiving is associated with cognition. Traditionally, research on the topic has divided caregiving behaviour into two categories, emotional and cognitive, and investigated them separately. However, a recent theoretical framework proposes that children require both emotional and cognitive input from caregivers for healthy cognitive development. Additionally, previous studies on the topic relied on behavioural methods that cannot precisely assess cognitive factors separately, such as scales and indices. The current study aims to investigate the associations between caregiving and cognition in 8-month-old infants. Mother-infant interaction observations will be used to assess the emotional and cognitive aspects of caregiving. A Bayesian cognitive model informed by eye-tracking data will be used to assess several indices of infant cognition, such as their processing speed, curiosity, reaction time, learning efficacy, and baseline attention. It is hypothesized that more enriched caregiving environments (e.g., higher emotional and cognitive input) are associated with higher cognitive performance. Bayesian linear regressions will test the main effects and the interaction of the emotional and cognitive aspects of caregiving on different infant cognitive factors. This study's objective,

hypothesis and methods have been pre-registered at Open Science Framework. The results of this study can elucidate the role of environmental factors in cognitive development and can orient parent behaviour and the development of interventions.

2-G-307 The Co-occurrence of Social Adversities in Youth and their Relationship to Cognitive Outcomes

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A large body of research has shown that experiencing adversity during early childhood is associated with a range of detrimental effects on long-term mental and cognitive health. Relatively little is known, however, about the impact of experiencing adversity in later periods of life - particularly, adolescence. Given the heightened importance of the social environment at this life stage, this neglect has slowed progress in understanding and addressing key areas of social vulnerability among adolescents, such as experiencing bullying or peer relationship problems. Due to a focus on univariate approaches, treating adversities as occurring in isolation from one another, there is also little understanding of how adolescent adversities co-occur, and how they jointly shape important outcomes such as cognition. To address this gap in the literature, we will conduct a preregistered Latent Profile Analysis, using data from the Understanding Society cohort (N ~ 800), to investigate the interactions between social adversities reported in adolescents aged 14. We will then conduct multiple regression models to determine how our derived latent social adversity profiles predict cognitive outcomes, including working memory, fluid reasoning and numerical ability, in those same individuals at age 16. We hypothesise that, (1) There will be distinct profiles of social adversity which emerge among adolescents at age 14, and (2) These profiles will differentially predict working memory, fluid reasoning and numerical ability at age 16. This research will not only inform theories of adversity in adolescence, but by demonstrating what types of adversities impact cognitive outcomes, we hope the research will also inform applied work. Given the importance of cognitive domains for education, our findings provide guidance for interventional policy and practice to specifically target cognitive change in individuals who have experienced different types of social adversity.

2-G-308 Associations Between Expectant Fathers? Early Family Risk and White Matter Integrity

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OBJECTIVE: Being raised in a risky family environment has been found to affect adjustment to parenthood, and neural mechanisms may help to explain this relationship. Prior studies suggest that early family risk may compromise the white matter microstructural (WMM) integrity of the brain in adulthood. WMM integrity reflects the orientation and direction of white matter tracts in the brain. The present study will examine whether early family risk predicts WMM integrity in men expecting their first child. METHODS: We collected diffusion-weighted imaging (DWI) scans on a sample of fathers (n = 38) when their female partners were roughly six months pregnant. Fathers also answered a questionnaire on the degree to which their early environment was harsh, cold, chaotic, and neglectful. HYPOTHESIS:

We hypothesize that expectant fathers reporting more adverse early family environments will exhibit lower WMM integrity as measured by fractional anisotropy (FA). ANALYSIS: We will utilize diffusion MRI connectometry in DSI Studio to derive correlational tractography of regions associated with the family environment measure. Given the limited research on this topic, we will conduct a whole-brain analysis. IMPLICATIONS: Identifying neurobiological markers of adverse family environments in individuals transitioning to parenthood may provide insight into the intergenerational transmission of early family risk. Additionally, this study will add to the paternal brain neuroscience literature and potentially guide future interventions in identifying fathers at higher risk for struggling with the transition to parenthood.

2-G-309 Predicting emotion regulation in typically developing toddlers: common and independent effects of preceding chaos in the home, maternal sensitivity, and attachment security.

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Background: The capacity for emotion regulation (ER) is a source of risk and resilience for the development of psychopathology. Thus, there is a clear need to better understand the mechanisms behind typically developing ER in early childhood. Potential mechanisms underlying ER-capacity may be different aspects of the early rearing environment, such as maternal psychological and social resources, level of maternal sensitivity, and child attachment security. Yet, no study to date has investigated their common and independent contributions to child ER in toddlerhood. This longitudinal study investigates these potential predictors in relation to ER-capacity in typically developing toddlers. The results can guide future research in the search for core predictors of ER development. Method: We followed typically developing children and their caregivers (N =124, n = 58 girls) with predominantly high SES at three time-points (child ages 10, 12 and 18 months). At 10 months, mothers reported on the degree of CHAOS in the home, social support and parental stress, and maternal sensitivity was obtained through observation based on Ainworth's Maternal Sensitivity Scales. At 12 months, child-attachment quality to the mother was classified using Ainsworth's Strange Situation Procedure. Finally, at 18 months child ER was assessed with the Lab-TAB frustration task. Results: CHAOS, maternal sensitivity and attachment security were positively correlated with child ER. Multiple regression analyses further showed independent effects of level of CHAOS and maternal sensitivity on child ER. Conclusions: Our results suggest that ER is a partially malleable capacity, and that different aspects of the early rearing environment as well as child-attachment quality play a role in its development in toddlerhood. The results have practical implications for early prevention and treatment methods that foster child mental health, which should be investigated in future replication studies.

2-G-310 Individual Differences in Trajectories of Postpartum Depression: The Roles of Delivery Method and Subjective Birth Stress

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Objective: Childbirth is a transformative life event with implications for the biopsychosocial health of the entire family. This study examined how individuals' and couples' subjective birth stress interacts with

delivery method (c-section vs. vaginal delivery) to impact the trajectory of postpartum depressive (PPD) symptoms in first-time parents across the year following birth. Methods: As part of a longitudinal study investigating the neural and behavioral changes across the transition to parenthood, 176 new parents completed the Birth Experiences Questionnaire, a 10-item measure of subjective birth stress, approximately 3 days (SD = 8.42) after their baby's birth. At 3-, 6-, and 12-months postpartum, parents reported on their PPD symptoms using the Beck Depression Inventory-II. We used a 3-level multilevel model, wherein time series values were nested within parents, which were nested into couples, to analyze person- and couple-level effects on PPD trajectories. Results: We found that 1) c-section and shared subjective birthing stress at the couple level predicted increased PPD for both partners, and 2) that delivery method moderated the influence of couple-level subjective birthing stress on PPD, such that couples who subjectively experienced c-section delivery to be more stressful were less depressed at each time point, whereas those who found their vaginal birth experiences to be more stressful were more depressed at each time point. Implications: This is the first study to examine both parents' responses to birth stress longitudinally, across the postpartum period. Previous research indicates that stressful experiences may disrupt adaptive changes in maternal brain structures and connectivity related to stress regulation and parenting behaviors. This study suggests that future research should investigate stressful birthing experiences as a risk factor for both mothers and fathers and explore its impact on the neural correlates of adjustment to parenthood

2-G-311 Early childhood adversity and alternations in cortical thickness and surface areas in female adolescents

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Early adversity, including threat and deprivation, is associated with negative outcomes in youth. Prior work using the dimensional model of adversity and psychopathology (DMAP) demonstrates that exposure to threat (interpersonal violence) in childhood is associated with emotion dysregulation and fear learning, whereas exposure to deprivation (lack of enriched cognitive and social inputs) is associated with impaired executive and cognitive function. This study examined whether exposure of threat or deprivation predicts neural structure (altered cortical surface area and thickness) and psychopathology in 135 adolescent girls (age 9-17). Associations between one dimension of adversity and cortical surface area and thickness were examined after controlling for the other adversity using the FreeSurfer structural analysis suite (https://surfer.nmr.mgh.harvard.edu/). Given rapid changes in neural structure and risk for psychopathology across adolescence, moderation by age also was examined. A bifactor model was fitted to estimate "p" factor using a confirmatory factor analysis. Though we observed no main effects, interactions between both dimensions of adversity and age were significant. Threat and age interacted to predict surface area in left hemisphere (lh) inferior temporal cortex and right hemisphere (rh) cuneus cortex. Deprivation and age interacted to predict lh superior parietal, lateral orbitofrontal, and inferior temporal cortex surface area, and rh superior-frontal and precentral

cortex surface area. In all regions, for youth without adversity, age predicted decreased surface area across adolescence, consistent with normative data. Adversity attenuated these negative slopes. Main effects of deprivation, threat, and age on "p" factor were significant, whereby each predictor increased risk for psychopathology. Findings suggest atypical developmental trajectories in surface area, perhaps reflecting lower levels of synaptic pruning following adversity exposure.

2-G-312 Ethnic racial discrimination exposure is associated with reduced amygdala volume in Latina youth

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OBJECTIVE: Prior neuroimaging studies have shown the amygdala can be structurally altered by psychosocial stress, such that experiences of trauma are associated with reduced amygdala volume. Most of this work, however, has examined traumatic experiences, such as physical assault and abuse. Whether these associations extend to broader adverse sociocultural experiences, such as ethnic racial discrimination (ERD), is unknown. The current study seeks to address this gap by examining links between ERD exposure and amygdala volume in a sample of preadolescent Latina girls at varying levels of ERD exposure. METHODS: Thirty Latina girls (MAge=9.76, ±1.11 years, 100% Mexican) completed a T1-weighted structural MRI scan, from which bilateral amygdala volume measurements were extracted using Freesurfer 6.0.0. Participants reported on their experiences of ERD via an adapted version of the Perceptions of Racism in Children and Youth. Responses assessed the perceived prevalence (i.e., how often has this happened?) and severity (i.e., how much did this upset you?) of a range of discriminatory experiences. RESULTS: Controlling for total intracranial volume and annual household income, linear regression analyses revealed a significant effect of perceived severity of ERD exposure on amygdala volume, ΔR^2=.095, p=.047. Specifically, the degree to which children reported being upset by experiences of ERD was associated with reduced volume in the left amygdala, b=-26.77, p=.047. These effects were not observed when examining the perceived frequency of ERD exposure, p=.301. CONCLUSIONS: The current findings extend previous work demonstrating inverse associations between various forms of adversity exposure and amygdala volume to include experiences of ERD, and highlight the importance of assessing the perceived severity of these experiences, in addition to the frequency. Ongoing work examines these associations longitudinally and explores potential protective factors.

2-G-313 Social threat, fronto-cingulate-limbic morphometry, and symptom course in depressed adolescents: a longitudinal investigation

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Introduction: Psychosocial stressors characterized by social threat (ST), such as interpersonal loss and social rejection, are associated with depression in adolescents. Few studies, however, have examined how ST affects fronto-cingulate-limbic systems implicated in risk for adolescent depression. Methods: We assessed the severity of lifetime stressors across several domains using the Stress and Adversity Inventory (STRAIN) for Adolescents in 57 depressed adolescents (34 females, 16.15±1.32 years, and

examined whether the severity of ST and non-ST stressors was associated with gray matter volumes (GMVs) in the anterior cingulate cortex (ACC), amygdala, hippocampus, and nucleus accumbens (NAcc). We also examined how the severity of ST and GMVs in these regions related to depressive symptoms at baseline and over 9 months. Results: General stressor severity was related to greater depression severity at baseline and over 9 months. Moreover, greater severity of ST (but not non-ST) stressors was associated with smaller bilateral amygdala and NAcc GMVs, and smaller bilateral surface areas of caudal and rostral ACC (all pFDR ≤0.05). However, neither severity of ST nor non-ST stressors was related to hippocampal GMVs (all pFDR≥0.32). All fronto-cingulate-limbic structures that were associated with the severity of ST were also negatively associated with greater depression severity over 9 months (all pFDR≤0.025). Post-hoc analyses indicated that gray matter morphometry of bilateral amygdala, NAcc, and rostral and caudal ACC mediated the association between ST and depression severity in adolescents over 9 months (all pFDR<0.05). Conclusions: Social threat specifically affects fronto-cingulate-limbic pathways that contribute to the maintenance of depression in adolescents.

2-G-314 The independent and interactive roles of parent income, educational attainment, and neighborhood disadvantage in shaping brain structure in children: findings from the ABCD Study

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Background: Low socioeconomic status (SES) is associated with poor mental health and cognitive function in youth, in addition to alterations in brain structure. However, different aspects of the socioeconomic context may have differential and synergistic effects on child development. The goal of the present study was to examine the unique and interactive effects of parent educational attainment, income-to-needs, and neighborhood disadvantage on brain structure. Methods: This pre-registered study utilized data from the Adolescent Brain Cognitive Development (ABCD) Study. Using ten folds of within-sample split-half replication, we tested the unique and interactive effects of parent educational attainment, income-to-needs ratio, and neighborhood disadvantage on cortical thickness and surface area and subcortical volume in a sample of 8800 adolescents aged 9-10 years. Results: We found that neighborhood disadvantage was uniquely associated with the thickness of frontal, parietal, and occipital regions (η2 = 0.004-0.009), and that income-to-needs was uniquely associated with parahippocampal thickness (η2 = 0.004). Further, we found evidence for interactive effects, such that the association between low parent educational attainment, neighborhood disadvantage, and low cortical thickness was mitigated in the presence of high income-to-needs (η2 = 0.003-0.007). Conclusion: Our findings suggest that different SES indicators have distinct effects on children's brain structure, and that neighborhood disadvantage has robust associations with brain structure over and above household SES. Further, high income-to-needs plays a protective role in the context of low neighborhood SES and parental education. This highlights the importance of considering the separate and joint effects of different SES indicators in future work.

2-G-315 Genes, adversity, and connectomics: Testing the contribution of polygenic propensity and early life environment to structural brain organisation

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The organisation of the human brain develops over time. Starting prenatally, the brain is shaped by a multitude of internal and external influences, a process that continues across the lifespan. The impact of early life adversity on the development of the brain has been well-documented. Furthermore, some adversities, such as low socioeconomic status (SES), are associated with negative outcomes, encompassing cognitive development, education, wellbeing, and physical health. Early life adversity does not act in isolation, but likely reflects an interaction between internal factors, as well as factors in a child's proximal environment that are likely to have downstream consequences. Using a prospective longitudinal birth cohort, the Avon Longitudinal Study of Parents and Children (ALSPAC; n = 13,855), we aim to elucidate the ways in which early life adversity, genetic propensity, and neural connectivity interact to shape one another and thereby influence development. Our analysis incorporates measures of early SES when children are 8 months old (i.e., parental education, income, occupation, and levels of difficulty affording food and rent or mortgage), polygenic scores for key aspects of development (i.e., cognitive ability and educational attainment), and personalised connectomes mapping structural brain connectivity. Utilising a three-block partial least squares regression, we will be able to investigate the relationships between standard measures of SES, genetic propensity, brain connectivity, and child development.

2-G-316 Pandemic-related maternal stress and the association with fetal thalamic volumes

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Objective: The thalamus is a subcortical brain structure responsible for relaying sensory information to the rest of the brain. Both human neuroimaging and animal models have demonstrated its sensitivity to stress. Here, we examined whether maternal stress during the COVID-19 pandemic is associated with thalamic macrostructure in the third trimester human fetus. Methods: Participants were 19 women with singleton pregnancies, scanned longitudinally (December 2020-March 2022) at least 2 weeks apart. Second time-point data were available for 15 women, for a total of 34 scans. The Perceived Stress Scale (PSS) was used to assess maternal stress. Three single shot fast spin echo images were acquired using a 3T GE Discovery scanner at Western University, and reconstructed into a single 3D volume using NiftyMic. Right and left thalamus volumes were manually segmented. PSS responses were submitted to principal components analysis (PCA), and the largest component was then used to predict right and left thalamus volumes using linear mixed effects modelling while controlling for gestational age and total cerebral volume. Results: PCA revealed that the first component (PC1) explained 48% of the variance in PSS scores. Questions on the PSS that PC1 encompassed pertained to coping with stress, and individuals who felt more able to cope had higher PC1 values. When examining whether PC1 predicted thalamus volume, linear mixed effects modelling revealed a significant interaction between PC1 and hemisphere ($t¬(1.5) = 2.62$, $p = .019$). Post-hoc estimated marginal means of the linear trends indicated that there was a positive relationship between PC1 and volume in the right thalamus. Conclusions: Better prenatal maternal coping abilities predicted larger right thalamus volumes in third trimester fetuses. The

relationship between prenatal stress and fetal brain volumes suggests that helping people manage stress during pregnancy may be a modifiable factor affecting brain development.

2-G-317 Neighborhood Influences on Adolescent Brain Development

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The features of a child's neighborhood environment-from green space to social cohesion to air quality-have measurable effects on their life outcomes (Roux & Mair, 2010; Anglin et al., 2021). In a follow-up report to the US Department of Housing and Urban Development's Moving to Opportunity (MTO) experiment, Chetty and colleagues (2016) demonstrate that kids who move from more to less impoverished neighborhoods experience significantly better life outcomes, as measured by college attendance, earnings, and rates of single parenthood, than their peers who remained in under-resourced settings. At the neural level, we know, for example, that early life adversity (VanTieghem et al., 2021) and socioeconomic status (Brito & Noble, 2014) are significantly associated with brain development. However, there is little research on how "moving to opportunity" relates to brain structure. The present work draws on data from four waves of the Transitions in Adolescent Girls study (N=174; ages 10-13 at time of recruitment; Barendse et al., 2020). First, using whole brain analysis, we will look at how neighborhood quality at wave 1 predicts trajectories of cortical thickness across waves. To address the questions introduced in the MTO study, we will then explore whether change in neighborhood quality across waves moderates that association. As in the original MTO study, we will operationalize the neighborhood by census tract as defined by the American Community Surveys (the participants in our sample reside in 66 different tracts). A guiding motivation of the present project is to establish testable hypotheses that we can bring to larger data sets like the Adolescent Brain Cognitive Development study in order to assess generalizability. Leveraging our longitudinal design, with MRI data collected at up to five time points at roughly 18 month intervals, we have the opportunity to examine how features of a child's neighborhood relate to how their brains develop across adolescence.

2-G-318 Can cortical thinning predict mental health response to the COVID-19 pandemic? Evidence from the ABCD® Study

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Objectives: The COVID pandemic led to a myriad of stress and mental health issues in adolescents. While everyone was affected, the U.S. Surgeon General reported an urgent mental health crisis among youth. The strain of the pandemic affected all youth, but the response and severity varied among individuals. We propose to evaluate differences in mental health responses during the pandemic by examining associations between pre-pandemic neurological development and mental health outcomes. Because cortical thinning in prefrontal regions has been associated with improved emotion regulation, we hypothesize that prefrontal cortical thinning may be a protective factor against adolescent mental health problems during the pandemic. Hypotheses: We predict that greater cortical thinning in the prefrontal cortex measured prior to the COVID-19 pandemic will protect against increasing mental health issues and elevated stress associated with the pandemic. Analysis Plan: The Adolescent Brain

Cognitive DevelopmentSM Study provides both a large neuroimaging dataset collected prior to the COVID-19 pandemic and youth self-reported responses to the pandemic. Cortical thinning will be measured developmentally as the difference in cortical thickness from Baseline (ages 9-10) to Year 2 (ages 11-12, prior to the pandemic last data collection March 2020). Utilizing Linear Mixed-Effects Modeling, we will use pre-pandemic cortical thinning to predict youth self-reported mental health and perceived stress in May/June 2020 and May/June 2021. Significance: Few datasets exist providing both pre-COVID neurobiological measures and post-covid mental health outcomes in adolescents. The ABCD dataset provides a rare opportunity to evaluate how individual differences in rate of brain maturation interacts with youth mental and emotional development during a period of significant personal and public-health crisis.

2-G-319 Associations between structural inequality in neighborhood environments and neurocognitive development in youth

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Does structural inequality in neighborhood environments relate to neurocognitive development in youth? Using the Adolescent Brain Cognitive Development (ABCD) Study, we aimed to characterize individual neighborhood profiles (NP) based on four risk factors: a) Area Deprivation Index (ADI), b) fine particulate air pollution (PM2.5), c) lead risk exposure, and d) community violence, to capture the multifaceted ecological contexts in which youth reside. Second, we examined whether demographic factors predict the likelihood of residing in different NP. Third, we examined how NP (i.e., high versus low risk) relate to subcortical volumes, subcortical resting-state functional connectivity (rsFC), and cognitive functions among youth. Method: 11,877 youth (52% male; 52% White, 15% Black, 20% Latinx, 2% Asian, 11% others) were included from the ABCD Study at baseline. Results: Using a person-centered latent profile analysis, we identified five NP: two high-risk profiles (1% and 15%) with the highest levels of ADI, PM2.5, lead risk, and community violence; a lead risk profile (19%) with high lead risk exposure; and two low-risk profiles (23% and 42%) with lower levels of all risk factors. While lower parental education was associated with ~1.5x the likelihood of being in the high-risk profile, Black and Latinx youth were far more likely (~8.1 and ~1.6x respectively) to be in the high- (vs low) risk NP, contextualizing structural racism. Youth living in high- (vs low) risk NP displayed smaller subcortical volumes (i.e., amygdala, hippocampus, nucleus accumbens, total), stronger negative subcortical rsFC, and lower cognitive functions (i.e., flexibility, attention, vocabulary, processing speed), even after controlling for household income, education, puberty, and sex. Findings highlight the need to address effects of structural racism and inequality in neighborhood environments on neurocognitive development, beyond socioeconomic status and interpersonal-level adversity.

2-G-320 Trajectories of gray matter volume development in children aged 2-8 years relate to maternal education

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Introduction: Socioeconomic status (SES) relates to gray matter structure in children. However, the influence of SES on gray matter development over time in young children is unclear. We used longitudinal MRI to determine how regional gray matter volume development from 2-8 years relates to maternal education as a proxy for SES. Methods: 122 typically developing 2-8 year old children provided high-quality T1-weighted MRI (51% male, 3T GE MR750w scanner, 393 scans, ~3.2 scans/subject). We measured volume in 116 gray matter regions with MaCRUISE and fit linear and quadratic development trajectories (R package lme4) with regional volume normalized by intracranial volume. In the 72 regions with significant (q<.05) age effects, we tested main and interaction effects of maternal education (finished high school/some post-secondary, trade/technical diploma, undergraduate degree, or some postgraduate/postgraduate degree) on gray matter volume, controlling for sex. Results: We found no significant main effects of maternal education, though 12 (of 72) regions had significant interactions with age. 10 regions had significant linear age-education interactions (right caudate, middle cingulate gyrus, fusiform gyrus, anterior insula, putamen, supramarginal gyrus, pars triangularis; left middle temporal gyrus, accumbens, middle cingulate gyrus) and 2 regions had significant quadratic age-education interactions (right pars triangularis, left middle temporal gyrus). Generally, the lowest education group had steeper regional volume changes while the highest education group had more moderate changes. Conclusion: Our study suggests that maternal education may influence gray matter development over time. Regions with significant age interactions have been implicated in language and memory, emotion, sensory integration, and motor control. SES may impact the development of brain regions with widespread cognitive and sensory functions, potentially underlying behavioral differences.

2-G-321 Multivariate associations between dimensions of early-life stress and white matter microstructure

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Microstructural remodeling of white matter pathways represents one potential mechanism linking childhood stress exposure with mental health across development. However, the degree to which specific aspects of stress exposure--such as the type or developmental timing of a stressor--may uniquely impact developing white matter has yet to be elucidated. Delineating links between early-life stress, neurobiology, and psychopathology is critical to identifying trajectories of risk following stress exposure. N=107 adults (ages 18-30) underwent a diffusion-weighted imaging scan and completed a modified version of the UCLA PTSD Reaction Index designed to examine key dimensions of lifetime stress exposure. We examined associations between stress exposure and 43 white matter tracts using regularized canonical correlation analysis. We identified 11 canonical modes that differed significantly from chance (Bonferroni corrected; p<.01). Several meaningful modes emerged. One mode predominantly indexed deprivation experienced across childhood and adolescence and alterations in the optic radiation tracts. Another mode predominantly indexed predictable and controllable stress experienced in adolescence and alterations in the cingulum cingulate. Further, the canonical mode characterized by deprivation was associated with internalizing symptoms in adulthood (p=.01). This

study indicates widespread alterations in white matter tract integrity in association with specific dimensions and timing of stress exposure. Our findings suggest that sensory processing tracts may be most affected by experiences of deprivation, while frontolimbic and frontostriatal tracts may be sensitive to experiences characterized by controllability and predictability. These results highlight the utility of multivariate approaches for parsing heterogeneity related to early-life stress and indicate that such techniques may yield clinically meaningful information.

2-G-322 Hippocampal subfield volumes are differentially susceptible to socioeconomic status during development

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The hippocampus is composed of cytoarchitecturally-distinct subfields that support specific memory functions. Variations in total hippocampal volume across development have been linked to socioeconomic status (SES), a proxy for access to material resources, medical care, and quality education. Low childhood household SES is associated with worse cognitive abilities in adulthood. Currently, it is not known whether household SES differentially impacts specific hippocampal subfields. Differential vulnerability of subfields to variations in household SES across development was assessed in 157 (78 females) typically developing 5- to 25-year-olds. Bilateral Subiculum, CA1-2, and DG/CA3 volumes were derived manually. Raw volumes were adjusted for intracranial volume and age via analysis of covariance. Principal Component Analysis with Varimax rotation was used to estimate a composite household SES measure (paternal education, maternal education, and income-to-needs ratio). Across participants, household SES was associated with CA1-2 (b=-22.59, p<.01) and DG/CA3 (b=-19.16, p=.02) volumes, accounting for age. Household SES did not predict individual differences in Subiculum volumes (p=.20). In a set of exploratory analyses, we further examined specificity of these effects in subgroups of children (n= 68, 5-12 years), adolescents (n=60, 13-17 years), and adults (n=29). Household SES was associated with DG/CA3 volume in children (b=-29.26, p<.05), whereas in adolescents household SES was associated with volumes of both CA1-2 (b=-23.25, p=.04) and DG/CA3 (b=-29.20, p=.03). Household SES was not associated with subfield volumes in adults (ps>.40). Planned analyses will assess the effect of neighborhood SES on subfield volumes in a large integrated sample. These data support the notion that hippocampal subfields show unique sensitivity to the effects of socioeconomic disparities over development, with potential implications for individual differences in cognitive functions.

2-G-323 Maternal Caregiving Moderates the Association of Maternal Stress with Infant White Matter Cingulum Microstructure

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Quality of maternal caregiving and maternal stress have been implicated in the development of the infant cingulum bundle, a tract that supports cognitive and affective processing. Few studies, however, have looked at the combined effects of these maternal characteristics. Based on previous literature, we hypothesized that caregiving quality would moderate the relation between maternal stress and white

matter microstructure of the infant cingulum bundle. Self-report data were obtained from 36 mothers (M=32.59, SD=1.29) during pregnancy and at six months postpartum. Mothers reported on lifetime stress exposure using the Lifetime Stressor Checklist-Revised, and on caregiver quality using the Baby Care Questionnaire. Diffusion-weighted MRI were acquired from 36 6-month-old infants (18F) born full-term, and deterministic tractography was performed to segment the cingulum bundles. We used hierarchical multiple regression to test whether caregiving quality moderates the association of maternal lifetime stress with infant cingulum bundle fractional anisotropy (FA), covarying for maternal age and education level, infant gestational age at birth, and family income-to-needs ratio. Caregiving quality moderated the association of lifetime stress with infant cingulum FA (β=.002, 95% CI [.0004, .0026], p=.003). Simple slopes revealed that mothers who reported higher lifetime stress and poorer parenting characteristics had infants with lower FA in the cingulum bundles (β=.-.0004, 95% CI [-.0007, -.0002], p=<.001). Our finding that maternal caregiving quality moderates the relation between maternal lifetime stress and white matter microstructure of the infant cingulum bundle highlights the importance of environmental input during sensitive developmental periods. These novel associations have important public health implications for the use of caregiving interventions to mitigate the maladaptive effects of maternal life stress on infant outcomes.

2-G-324 Do structural changes in brain development mediate the relationship between parenting factors and adolescent psychopathology? Evidence from the ABCD® Study

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Objectives: Parenting characteristics (e.g., psychopathology, warmth, acceptance) are key factors in adolescent mental health (MH) outcomes. MH disorders are also associated with developmental differences in brain structure. The present study aims to determine whether cortical thickness and white matter volume mediate the relationship between parental factors and adolescent psychopathology. Hypotheses: We predict that the relationship between parenting factors and adolescent psychopathology is mediated by volumetric brain development. More specifically, we hypothesize that greater parental psychopathology and lesser parental warmth and acceptance will lead to reduced cortical thinning and white matter volume, which in turn leads to heightened MH symptoms in adolescents. Analysis Plan: Leveraging the longitudinal nature of the Adolescent Brain Cognitive DevelopmentSM Study dataset, we will predict adolescent MH outcomes from parental factors with structural brain changes as a mediator using Linear Mixed-Effects Modeling. The Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS) will be used to obtain adolescent MH symptoms at Year 3 (ages 12-13), while the Adult Self-Report (ASR) will be used to characterize parent psychopathology for internalizing and externalizing problems. The Children's Report of Parental Behavior Inventory (CRPBI) warmth and acceptance subscales will evaluate parenting factors. Finally, we will calculate changes in global and prefrontal cortical thickness and global white matter volume via fractional anisotropy from Baseline (ages 9-10) to Year 2 (ages 11-12). Significance: While bivariate relationships between parenting factors, brain development, and psychopathology have previously been found, research on whether parenting factors influence brain structure as a potential mechanism that predisposes adolescents to psychopathology has not yet been examined.

2-G-325 Unpredictability is associated with accelerated fronto-limbic white matter maturation in childhood

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Children have an expectation of a stable environment and consistent caregiving. Deviations in the expectable environment can have negative consequences for child development. More specifically, unpredictability is thought to impact stress-sensitive brain systems, including those that are important for learning and memory. In a pre-registered analysis, we examined how unpredictability relates to white matter microstructure (mean diffusivity, fractional anisotropy) of fronto-limbic tracts: the bilateral uncinate fasciculus, the cingulum bundle, and the fornix. Children (n = 96, ages 4-10 years old) took part in a diffusion-weighted scan and parents completed the Family Unpredictability Scale (FUS), which provided an index of inconsistent resources and caregiving. Age interacted with unpredictability to predict mean diffusivity of the uncinate fasciculus. Children exposed to high levels of unpredictability showed a greater negative slope between age and mean diffusivity than children who were not exposed to unpredictability (b = .176, SE = .076, p=.021). This association held when controlling for socioeconomic status. Follow-up analyses assessing subscales of the FUS (i.e., nurturance, discipline, money, meals) indicated that the association was driven by unpredictability in nurturance (b = .103, SE = .046, p=.028). No significant associations were observed for the cingulum bundle or fornix (ps>.05). Our results are consistent with the theory that unpredictability in caregiving leads to accelerated maturation of learning and memory tracts. However, given that significant associations were only found for the uncinate fasciculus, a tract that includes connections between medial prefrontal cortex and amygdala, these findings also align with the theory that early adversity is associated with a more mature emotion regulation system in the brain.

2-G-326 Effects of the socioeconomic status on the neuroplasticity of the prefrontal cortex during cognitive training in children and adolescents

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Learning and development are complex and interrelated mechanisms involving a variety of factors, including environmental factors, such as socioeconomic status (SES), and neurobiological factors, such as brain plasticity. Brain imaging studies have revealed that SES influences behavior and cognition, modulated by the effect of SES on brain anatomy, especially in the prefrontal cortex (PFC). Very recent studies suggest that SES may also influence brain development via its effect on neuroplasticity. In this context, the aim of the present study was to examine whether the putative effect of SES on neuroplasticity may also drive the effect of SES on learning. Sixty-four children and 59 adolescents were recruited and randomly assigned to a cognitive training targeting inhibitory control (IC) or an active control (AC) group. We acquired anatomical resonance images (MRI) before and after the 5-week computerized training and measured the individual volumes of Regions of Interests (ROI) in the PFC using CAT12 toolbox and the Neuromorphometric Atlas. To assess the training-related neuroplasticity of

each ROI, we used structural equation models (SEM) including a latent change score (LCS) capturing the brain volume changes between pre- and post-training. We a priori hypothesized direct effects of 1) baseline ROI volume on neuroplasticity and 2) SES on baseline ROI volume and on neuroplasticity. Our results revealed an effect of SES level on the neuroplasticity of several frontal regions, including the anterior and posterior insula, the left medial forebrain, and the right middle operculum. Of note, this effect was specific to adolescents and to IC training. Our findings support an effect of SES on neuroplasticity involved during learning. The lack of effect in children might be interpreted in terms of higher load of environmental factors on PFC in adolescents.

2-G-327 Examining associations between exposure to deprivation and threat, neural structure, and psychopathology in early childhood

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Substantial research demonstrates that adversity confers risk for a range of negative health and wellbeing outcomes, including psychopathology. Few studies have explored the associations between adversity, psychopathology, and neural architecture in early childhood, a period of rapid brain development in which exposure to adversity is especially impactful. We use a dimensional approach to adversity to explore the unique associations between experiences of deprivation and threat, neural structure, and psychopathology. Seventy-one children ages 5-10 completed at least one neuroimaging T1 scan. Using the FreeSurfer structural analysis suite, we examined longitudinal associations between threat and deprivation (measured when children were between 2-5 years old) with cortical surface area and thickness in mutually controlled models (see Machlin, et al., under review). Utilizing cortical thickness and surface area within significant regions, we explored whether neural structure mediated the longitudinal association between adversity and psychopathology. We observe an indirect effect where the association between deprivation and the number of total diagnoses, d=-.293, 95% CI [-0.601, -0.036], and deprivation and the number of total symptoms d= -.217, 95% CI, [-0.433, -0.042] is mediated by thickness in the left superior temporal gyrus. Previously we have observed that experiences of deprivation and threat are uniquely associated to changes in cortical structure in childhood. Here we show that for deprivation, these structural associations mediate the association between adversity and psychopathology. The superior temporal gyrus has previously been implicated in language, auditory, and social cognition processes; subsequent analyses will explore the degree to which changes in cognition account for adversity related change in neural structure in this sample.

2-H-209 Transdiagnostic Neural Pathways to Inattention and Hyperactivity

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Inattention and hyperactivity are regarded as the cardinal symptoms of Attention Deficit Hyperactivity Disorder. These features have also been observed across a range of other neurodevelopmental conditions, such as autism and dyspraxia, suggesting that they might best be studied across--or

regardless of--diagnostic categories. Here, we evaluated how inattention and hyperactivity behaviours are associated with features of the structural and functional brain network (connectome) in a large transdiagnostic sample of children (Centre for Attention, Learning, and Memory; n = 384). We began by conducting an exploratory factor analysis on data from several behavioural questionnaires, which revealed that variations in inattention and hyperactivity are best represented by one latent factor, rather than two. Then, we conducted several analyses comparing inattention/hyperactivity factor scores to the properties of 100-node connectomes derived from DTI and resting-state fMRI data. Hierarchical clusatering analyses on the structural connectomes of children with extreme inattention and hyperactivity profiles revealed that three distinct structural 'neurotypes' generate the same behavioural phenotype. We then applied an inter-network functional connectivity analysis to resting-state connectomes across these subgroups in order to test whether integration and segregation in Intrinsic Connectivity Networks differed between neural subgroups of heightened inattention and hyperactivity. We conclude that there may exist multiple neural 'paths' that lead children to express high levels of inattention and hyperactivity, which is reflected by the organisation of structural and functional brain networks.

2-H-328 Relationships between brainAGE and maturational metrics in early adolescence

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The Brain-Age Gap Estimation (BrainAGE), defined as the difference between chronological age as predicted by a machine learning trained on a structural MRI data and a participant's actual chronological age, has been used as a metric of brain "maturity". A positive BrainAGE has been said to indicate a more mature brain, while a negative BrainAGE is said to indicate a less mature brain. Previously, BrainAGE has been related to numerous risk factors and outcomes in adolescents, including exposure to adversity, depression, and functional impairment (Drobinin et al., 2021). However, no studies to date have tested the relationship between BrainAGE and other metrics of maturity, such as pubertal stage. The present study aims to test the measurement validity of BrainAGE by relating BrainAGE to physical and cognitive metrics of maturity. Using data from the ABCD study, we tested an existing validated BrainAGE model on two matched samples of 5,808 early adolescents (9.9 ± .625 years old). BrainAGE scores were then related to both youth- and parent-report pubertal development questionnaires, as well as age-normed NIH Toolbox cognition scores. A more positive BrainAGE was significantly related to more advanced youth-report pubertal development ($p<.05$ in both samples, $\beta = .17, .31$) and parent-report pubertal development ($p<.001$ in both samples, $\beta = .18, .32$). A more positive BrainAGE was also significantly related to lower age-normed composite cognition scores ($p<.05$ in both samples, $\beta = -.003$ in both samples). For both samples, the directions of the effects were the same, and the magnitude was similar. Our results provide initial evidence that a higher BrainAGE is related to more advanced pubertal development, and therefore provides some index of maturation. However, the relationship between a higher BrainAGE and lower age-normed cognition scores provides some conflicting evidence that BrainAGE might be representing additional processes other than maturation.

2-H-329 Partitioning variation in brain structure into genetic, environmental, and subject-specific components

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Objective: Previous brain imaging analyses lack the computational efficiency to model complex random effects across the whole brain. The recently developed Fast Efficient Mixed-effects Analysis (FEMA) allows complex mixed effects models to be fit across high-dimensional brain imaging data and the distribution of random effects to be viewed at the vertex and voxel level. Methods: Using data from the ABCD study release 4.0, we used linear mixed effects models to partition the variance of vertex-wise cortical variables (9,416 participants, 14,713 observations) and voxel-wise diffusion MRI (9,379 participants, 14,631 observations) into components corresponding to shared family effects (F), additive genetic effects (A), individual subject-level effects (S), and an error term (E). Statistical analyses used the publicly available FEMA package, which incorporates pairwise genetic similarity between all individuals within families rather than only using twin data. Results: Vertex-wise analysis of cortical thickness and surface area found that A and S accounted for large proportions of variance with F exhibiting only a minimal contribution. Sulcal depth showed the highest proportion of S with lower values for A compared to other vertex-wise measures. In voxel-wise analysis of diffusion phenotypes, F accounted for a negligible amount of the variance. A tended to explain the highest proportion of variance in subcortical regions corresponding to white matter tracts, whereas S explained the highest proportion of variance in the cortex. Conclusions: Subject-level effects accounted for a high proportion of variance in sulcal depth and cortical diffusion parameters, reflecting a cortical "fingerprint" that is stable within individuals. In contrast, genetic effects accounted for the most variance in cortical thickness, cortical surface area, and subcortical structures, which may relate to developmental or maturational processes that are known to take place during adolescence.

2-H-330 Understanding vulnerability through variability: a longitudinal study on heterogeneous brain development in relation to symptoms of ASD and ADHD

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There is evidence that sex related factors may contribute to vulnerability, as is shown by higher prevalence, severity and early onset of male biased developmental disorders, including ADHD and ASD. Most of these studies have focused on studying mean group differences, where within group variation is typically ignored. Recently it was observed that males have greater variability in brain structure and development than females. This provides a novel lead in understanding underlying mechanisms involved in male vulnerability in developmental disorders. Hence, the present paper tests the hypothesis that greater male variability is related to greater male vulnerability, where extreme brain patterns are hypothesized to be linked to greater behavioral problems. We test this in a large longitudinal sample of typically developing children from the Leiden Consortium on Individual Development. This approach moves beyond studying mean differences, which is a pivotal step in identifying biological markers that are crucial for the diagnosis and treatment of developmental disorders.

2-H-331 Compared brain structure underpinnings of deficits in empathy processes in children and adolescents with CD and ASD

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Background: Reduced empathy is described both in patients with conduct disorder (CD) and in those with autism spectrum disorder (ASD). However, CD has most consistently been associated with reduced affective empathy, whereas individuals with ASD show deficits in cognitive empathy. Few studies have investigated the association between disorder-specific empathy deficits and brain structure in youths with ASD and CD, however, the evidence lacks consensus. This study investigates the compared affective and cognitive empathy deficits in youths with CD and ASD and underlying differences in brain structure. Hypotheses: We expect youths with CD to show disorder-specific reductions in affective empathy relative to the typically developing (TD) and ASD groups, whereas ASD youths will show disorder-specific deficits in cognitive empathy. We expect an inverse association between a) cognitive empathy scores and measures of brain structure (cortical volumes and thickness) in the ventromedial prefrontal cortex (vmPFC) and precuneus; b) affective empathy scores and measures of brain structure on the insula, temporo-parietal junction (TPJ) as well as in the amygdala and hippocampus. Methods: T1-weighted structural MRI data will be obtained for 120 youths (40 CD, 40 ASD, 40 TD, age range 10-18 years). Cognitive and affective empathy scores will be obtained using the parent-rated Griffith Empathy Measure and the self-reported Basic Empathy Scale. Customised templates for each group will be created using the COM toolbox, followed by standard segmentation procedures using the Cat12 toolbox in SPM12. Between group ANOVA comparisons will be conducted with Threshold-Free Cluster Enhancement and Affective and Cognitive empathy scores as regressors of interest. Implications: This study will help clarify the disorder-specific character of the structural brain alterations in youths with CD and ASD in association with deficits in cognitive and affective empathy processing.

2-H-332 Retrospective analysis of growth curves for brain structure derived from clinically-acquired pediatric MRIs from age 0-22 years

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Introduction: Though usually siloed from developmental neuroimaging research, clinically-acquired brain MRIs without gross pathology are a valuable scientific resource. Children's Hospital of Philadelphia has used a harmonized ~1mm isotropic MPRAGE T1w sequence for routine 3T scans since 2008. We report initial results for a study designed to extend brain charts derived from research datasets (Bethlehem, Seidlitz, White et al., in press) to retrospective analyses of these clinical MRIs. Methods: Pediatric MRIs without gross pathology were anonymized and curated into the standardized Brain Imaging Directory Structure (Covitz et al., 2022), inspected for image quality, and processed with FreeSurfer 7.1.1 or Infant FreeSurfer for patients <2 years (Zöllei et al., 2020). Generalized additive mixed models of imaging phenotypes were fit in R (Wood, 2007) using penalized splines for age; random effects for scan site; and fixed effects for sex, Euler number, and clinical indication for scan. Preliminary analyses included 449 patients. Results: The sample ranged from the first week of life to age 22 years

(mean age=9.3 years (sd=5.5); 52% female; 11 scan sites). No significant associations were found between imaging phenotypes and clinical indication for scan including headaches (n=189), eye/vision symptoms (n=40), or seizures (n=36) (all p>0.05). Growth curves for total and subcortical gray matter volume, white matter volume, CSF volume, total cortical surface area, and mean cortical thickness were similar to those of recently reported brain charts. Conclusions: Results support the utility of clinically-acquired brain MRIs for investigations of brain development. Growth curves were similar to those reported in research samples and do not appear heavily biased by the clinical indication for scan. Orders of magnitude more data are available for future investigations, which will include quantification of neuroanatomical deviation in understudied neurogenetic disorders.

2-H-333 THE RELATIONSHIP BETWEEN CORTICAL STRUCTURE AND FINE MANUAL DEXTERITY IN MOTOR DEVELOPMENT

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Objective: Fine manual dexterity (FMD) is a critical component for healthy development throughout childhood, yet up to 6% of children will present with motor difficulties within this domain. Despite the importance of FMD to childhood motor control and learning, little is known about the neural structural underpinnings contributing to individual differences in the development of FMD. Aim: This study is examining the relationship between the cortical structure (i.e., volume, thickness, and surface area) of brain regions thought to be important for motor ability (primary motor and premotor cortex, supplementary motor area, inferior parietal lobe, pars opercularis) and FMD in children with (Developmental Coordination Disorder [DCD]) and without motor difficulties. Method: Children aged 5-14 years with and without motor deficits completed the Pegboard task, and the fine manual control and manual coordination subtests of the Bruininks-Oseretsky test of motor proficiency (BOT-2) as a measure of FMD. Participants also received a magnetic resonance imaging scan to acquire T1 weighted images of their brain. Analysis Plan/Hypothesis: Linear Mixed Modelling analysis will be used to investigate the association between cortical structure and FMD on the two assessments in this sample. It is predicted that decreased cortical structure in the specified brain regions will be correlated with decreased performance on both the Pegboard task and subtests of the BOT-2 in children with motor deficits (i.e., DCD), relative to their age-matched peers. Implications: These findings may further our knowledge of the underlying neural constructs contributing to disparities in FMD among children. In doing so, this research may help inform the design of targeted movement therapies aimed at improving atypical motor skill/development in childhood.

2-H-334 Behavioral, cortical morphological and microstructural correlates of eating disorders in adolescence

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Eating disorder (ED) prevalence is on the rise and can have severe consequences for adolescent health. A better understanding of behavioral and neurobiological risk factors of EDs is needed to inform early intervention and clinical care programs. Data from the ABCD Study were used to identify participants who met youth-reported diagnostic criteria for an ED at the two-year timepoint (ages 11-14). First, we explored cognitive, mental and physical health variables collected two years prior and their association with a later ED, using a mixed effects logistic regression model (ED N=359, No ED N=1516). Second, we investigated vertex-wise cortical morphological (cortical thickness, surface area) and microstructural (restricted diffusion) differences between participants with MRI data at the two-year timepoint (ED N=259, No ED N=1416) using the Fast and Efficient Mixed-Effects Algorithm. Analyses were adjusted for age, sex, sociodemographics, race, ethnicity, and scanner/site, accounting for family relatedness. Higher scores reflecting greater internalizing, externalizing behaviors and inhibition, as well as lower scores on executive functioning and lower BMI at baseline were significant predictors of a later ED. Cortical surface area and restricted diffusion intracortically was reduced in ED relative to No ED, particularly within insula, fusiform and extrastriate cortex. Restricted diffusion findings were largely driven by reductions in isotropic restricted rather than directional diffusion, which may reflect cell body/glial differences. Broad mental health concerns and lower performance in executive functioning/fluid intelligence in late childhood significantly predicted an ED in adolescence. Cortical findings pointed to abnormalities in brain regions important for emotion regulation, interoception and body perception, mirroring the core behavioral features of EDs. Future work can help map developmental trajectories of these risk factors prior to ED onset.

2-H-335 Neuroanatomical profile of pediatric acute-onset neuropsychiatric syndrome: A voxel-based morphometry analysis on different stages of illness

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Pediatric Acute-onset Neuropsychiatric Syndrome (PANS) has been used to describe abrupt behavioral change along with abrupt-onset obsessive-compulsive disorder (OCD) in children with suspected infectious or inflammatory triggers when more typical psychiatric diagnoses do not fit (Swedo et al., 2012). While basal ganglia changes, similar to those found in OCD (Boedhoe et al., 2017), have been identified in PANS subjects, results have been mixed possibly due to the subject's disease state at the time of an MRI scan. In the current study, we will investigate neuroanatomical differences in PANS patients grouped by disease stage. We hypothesize that basal ganglia volume will be larger in early-stage (acute-onset) PANS patients than an age-matched comparison sample while a diminished basal ganglia volume will be found in patients with chronic PANS. Exploratory associations between psychiatric symptoms and MRI measures will also be examined. We will include MRI scans from 80 PANS patients (ages ranging from 4 to 20) recruited through the Stanford University PANS multidisciplinary clinic at varying disease stages (i.e., acute vs. flare on chronic). Disease stage will be assessed by completing a thorough chart review of the patient's disease course. OCD symptoms will be measured using the Children's Yale-Brown Obsessive Compulsive Scale. Whole-brain and regional voxel-based morphometretric analyses will be completed using standard procedures from the FMRIB Software Library. An ANCOVA will be used to compare volumes between participants in different disease stages

and to explore associations between age-adjusted brain volumes and clinical variables. Findings will contribute to PANS research by integrating neuroimaging and clinical data and noting the stage in the clinical course. This study is critical to better understanding and treating PANS by incorporating the phase of the illness.

2-H-336 The thalamus as a mediator of the relationship between sleep and psychosis

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Objectives: Whereas thalamic abnormalities have been identified in both sleep deprived adolescents and individuals with psychosis, we propose to assess the role of the thalamus as a mediator between these two variables. Our objective will be to determine whether sleep disruptions in early adolescence are related to volumetric differences in sub-thalamic nuclei in middle adolescent and whether those differences would in turn be related to an increase in psychotic-like experiences in late adolescence. We hypothesize that the magnitude of sleep disruptions and frequency of psychotic-like experiences will be associated with a reduced volume of the mediodorsal thalamus and of the pulvinar and thalamic reticular nucleus. Method: A total of 155 adolescents (aged 12 to 14 at study entry) were assessed at three time points over a five year period as part of a neuroimaging study. A structural volumetric analysis will be conducted using the Harvard-Oxford thalamus probabilistic atlas. Statistical analyses will be conducted using a multi-level model with a Bayesian estimator. This approach will allow us to isolate the between group, within person and lagged effects to better understand the relationship between our variables. Conclusion: Our results would highlight a putative mechanisms to explain the causal association between sleep and psychosis that is increasingly highlighted in the literature. It would further cement sleep remediation as an essential strategy to healthy neurodevelopment in populations at risk of psychosis.

2-H-338 Anxiety predicts mean kurtosis of right uncinate fasciculus in early adolescence

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Objective: Adolescence is a critical developmental period during which both neural plasticity is high and risk for the onset of anxiety pathology increases. Delayed maturation of key white matter tracts, particularly the uncinate fasciculus (UF), may contribute to the onset of such psychopathology during this time. Although prior work has related anxious pathology to UF structural integrity, this has work relied on conventional diffusion tensor imaging metrics, which index only the rate and coherence of diffusion. Diffusion kurtosis imaging, which quantifies non-Gaussian diffusion, reflects separate aspects of tissue microstructural complexity, and thus may provide unique insight into the white matter disturbances that lead to adolescent anxiety. Given that diffusion kurtosis has not been examined in the context of adolescent anxiety, we examined the relationship between UF mean kurtosis and anxiety in early adolescence. Methods: Early adolescents (n=105, 54.3% female, age: M=12.2, SD=.96) completed the Screen for Anxiety Related Emotional Disorders and a diffusion-weighted imaging scan. The relationship between anxiety and mean UF kurtosis was examined via tract-based spatial statistics. Higher kurtosis indicates restricted diffusion, which is expected in white matter, and thus lower kurtosis

reflects disturbances in this tissue. Thus, we hypothesized that higher anxiety would be associated with lower UF kurtosis. Results: We detected a significant inverse relationship between anxiety and mean kurtosis in an area of the right UF, reflecting a lack of barriers to diffusion and reduced cellular complexity. One potential interpretation of this finding is that this area of right UF is not well-myelinated in adolescents reporting higher levels of anxiety, given that myelination should lead to higher kurtosis. Conclusion: Our results provide support for mechanistic theories proposing that delayed myelination of the UF confers risk for the onset of anxiety in adolescence.

2-H-339 Comparing the Multivariate Relationships of Conceptual Adversity Models and Structural Brain Development in Adolescent Girls

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Adverse experiences throughout development confer risk for a multitude of negative long-term outcomes, but the processes via which these experiences are neurobiologically embedded are still unclear. Adolescence provides an opportunity to understand how these experiences impact the brain's rapidly changing structure. Two models are at the center of current adversity conceptualizations: a cumulative risk model, where all types of experiences are summed to represent accumulating stress, and a dimensional model, where certain features of experience (e.g., threat or deprivation) exert unique neurophysiological influence. We will extend upon previous research by using Representational Similarity Analysis to examine how the dimensional and cumulative risk model of adversity predict cortical thinning in frontoparietal and frontotemporal networks and volumetric changes in subcortical regions throughout adolescence. This work will extend our understanding of how models of adversity mechanistically impact the brain.

2-H-340 Maturation of pyramidal tracts supports the emergence of preferential attention to the eyes during infancy

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Objective: Preferential attention to the eyes of others is a foundational social behavior that emerges in the first 6 months of life and supports continued social-cognitive development. Known to be disrupted in neurodevelopmental disorders, early eye-looking holds critical import for both basic and transitional science, yet its associated neural systems are unknown. Here, we study the role of white matter maturation in the emergence of preferential eye-looking during early infancy. Methods: Longitudinal eye-tracking and DTI data were collected from 73 infants (30f, 43m) from 0-6 months, at up to 6 and 3 timepoints, respectively. 12 white matter tracts were delineated using atlas-based probabilistic tractography and fractional anisotropy indexed tract maturity. Percent fixation to eyes, mouth, and non-social stimuli measured social visual engagement. Trajectories of brain and behavior were computed using Functional Principal Components Analysis and Functional Linear Regression was used to test time-varying associations between these developmental trajectories. Results: In the first 6 months of life, maturation of the pyramidal tracts originating in the motor cortex (PT-M1) significantly predicted the

development of eye-looking (R2=.62, p<.004). Time-varying R2 values showed that maturation of PT-M1 before 80 days was most significantly predictive of eye-looking trajectories (R2=.75-.78, p<.05). Maturation of PT-M1 was associated with less mouth-looking (R2=.50, p<.05) and no associations were found between PT-M1 and non-social stimuli. Conclusions: These results provide key insight into the neural mechanisms underlying preferential attention to the eyes, a foundational social behavior that has important clinical relevance. Surprisingly, we find a robust association between eye-looking and pyramidal tracts, more classically known for their role in motor behavior. This intriguing finding reinforces the fundamental co-development of social and motor systems.

2-H-341 Combined effects of occipito-temporal and anterior cingulate sulcal patterns on reading and writing skills in children and adults

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Reading and writing are complex cultural skills that require years of practice to be mastered. Their acquisition is a key factor contributing to academic and professional success and to social integration. Previous functional magnetic resonance imaging (MRI) studies of reading and writing have evidenced the crucial implication of the left lateral occipito-temporal sulcus (OTS) hosting the visual word form area and of the dorsal anterior cingulate cortex (ACC), a key region of cognitive control. Here, we investigated whether and how reading and writing skills are influenced by the morphology of the OTS and ACC. Using structural MRI, we analyzed the sulcal patterns of the OTS and ACC of 38 children (8- 11 y.o.) and 23 adults (20- 40 y.o.). Standardized and age-normalized tests were used to evaluate reading and writing accuracy and speed. We used Structural Equation Modeling (SEM) to assess the relationships between the sulcal patterns and behavioral measures. The SEM fit the data well according to the classical metrics in both children and adults. SEM revealed significant effects of the ACC pattern on writing accuracy in children and adults along with effects of the left OTS pattern on reading and writing accuracy in children and on reading speed in adults. Of note, SEM also detected multiple correlations between behavioral tasks in children but not in adults. These results confirm previous findings on the influence of the OTS anatomy on reading skills and extend these findings to the writing domain. They further show that the constraints exerted by the OTS anatomy vary as a function of the development of literacy. They also contribute to emerging research on the importance of the ACC for writing acquisition. Because the sulcal patterns are determined in utero, our findings suggest that individual differences in reading and writing skills can be traced back to early stages of brain development in addition to the well-established educational and socioeconomic factors.

2-H-342 Causal interactions between the cortical structure of the fusiform gyrus and reading skills during primary school

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Literacy acquisition is associated with functional and anatomical changes throughout the brain. Among those, one crucial development is the functional specialization of a visual region of the left fusiform gyrus (FG) for processing letters and words. Conversely, the structure of this region before learning to read may predict the success of reading acquisition, suggesting complex bi-directional interactions between cortical structure and reading behavior across development. Here, we apply for the first time dual latent change score models to decipher causal influences between brain structure and reading behavior during reading acquisition. In 209 children followed longitudinally for up to 5 time points, from a median age of 6 to 11 years, we studied the interactions between word reading efficiency (TOWRE) and cortical structure of the FG. Surface area and cortical thickness, respectively reflecting more prenatal vs. postnatal influences, were derived using Freesurfer from the left FG - as our region of interest -, and from the right FG and whole cortex - serving as controls. Surface area of the left FG positively and significantly predicted future gains in word reading skills, while the reciprocal reading-to-brain influence was weak. The brain-to-reading coupling was weaker for the right than left FG surface area, and absent for the total cortical surface area. Similar but weaker trends were observed for cortical thickness of the left FG. Thus, the cortical structure of the left FG, especially surface area, appears as a strong leading indicator of changes in reading skills throughout primary school.

2-H-343 The contribution of familial risk for reading difficulties on early auditory predictors of literacy

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Objective. Acquiring reading skills is fundamental for academic and socio-emotional development. Reading outcome after a few years of schooling can be predicted by measures of auditory and phonological processing. Children who develop severe reading difficulties (i.e. dyslexia), show difficulties on these measures as early as in kindergarten. However, it is unknown how familial risk (FR) for dyslexia contributes to these predictive relationships. Some indirect evidence from brain imaging studies exists, reporting differences in auditory regions of the left temporal lobe related to FR rather than reading outcome. Here, we investigated the contribution of FR on auditory predictors (behavioral and neurostructural) of reading. Method. Behaviorally, we measured auditory processing of non-speech and speech stimuli in 162 kindergartners. In 129 of them, we also acquired structural MRI images at the end of kindergarten. We applied the Toolbox for Automated Segmentation of Heschl's gyrus (TASH) to delineate and quantify the bilateral Heschl's gyrus (HG), a temporal brain region associated with auditory processing. We performed mediation analyses to estimate the direct effect of auditory predictors on word reading outcome in third grade and the contribution of an indirect FR-effect (measured using parental questionnaires). Results. We found a significant effect of pre-reading speech-in-noise and auditory processing, left HG volume and right HG surface area on reading. Interestingly, this was partly mediated by the indirect FR-effect for the behavioral measures, but not for the neurostructural measures. Conclusion. Our results suggest that FR mediates at least part of the relationship between auditory processing and reading. Unexpectedly, we do not find this pattern at the

neurostructural level, in an auditory region that was previously linked to FR. Ultimately, understanding the contribution of FR during reading development will facilitate early diagnosis and intervention.

2-H-344 Are Differences in Cortical Thickness between Children with and without Reading Disability Affected by a Bilingual Experience?

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Reading disability (RD, or dyslexia) affects 5-12% of the population and negatively impacts academic and vocational success. Studies of cortical thickness (CT) have revealed less CT in children with RD, especially in posterior regions (Altarelli et al., 2013; Clark et al., 2014; Williams et al., 2018). In a separate line of work, it has been shown that there is less CT in bilingual versus monolingual children in widely distributed brain regions (Vaugh et al., 2021). As such, the question arises how the bilingual experience affects the CT differences observed in RD? Since there have been no studies of brain anatomy in bilingual children with RD, it is unknown if brain-based models developed in monolinguals with RD generalize to bilinguals with RD. All participants were drawn from the Adolescent Brain & Cognitive Development Study. We have selected a group of 25 Spanish-English Bilinguals with RD (Oral Reading Recognition Test (ORRT) score below 85; avg=78±5.2), 28 Spanish-English Bilingual Controls (ORRT score above 100; avg=116±10.3), a group of 25 English Monolinguals with RD (ORRT score below 85; avg=77±5.4) and 28 English Monolingual Controls (ORRT scores above 100; avg=116±10.1). Overall, participants were 12±0.7 years of age and the four groups were matched for age, sex and self-ratings of English ability. Structural magnetic resonance images will be analyzed in CAT12 using a factorial design and testing for the main effects of Reading Ability and Bilingual Language Background, as well their interaction ($p < .05$, FDR corrected). We will control for nonverbal reasoning skills and parental education. We expect to find main effects of RD and bilingualism on CT but are especially interested in any compounding effects (exponential) of bilingualism on RD in posterior regions (where RD and bilingualism have been associated with relatively less CT). Our findings will reveal if neuroanatomical models of RD developed in monolinguals applies to bilinguals with RD.

2-H-345 Development of visual white matter pathways relates to spontaneous electrophysiological activity

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Since 1920 electrophysiological studies in animals and humans have consistently reported a peak in alpha power (8-12 Hz) during resting state (Berger 1929). This fundamental rhythm of spontaneous brain activity can be easily observed in single individuals, with variations that depend on age and eye closure. Biophysical models describing electrophysiological characteristics of alpha rhythms depend on properties of specific white matter connections (Nunez 2011), with thalamocortical circuits being one of the major generating sources of alpha (Becker et al. 2015). Here we used the Healthy Brain Network Dataset (~2000 EEG/dMRI participants, age: 5-21y) to examine the link between developmental changes in alpha and fractional anisotropy (FA) of a thalamocortical pathway, the optic radiation (OR). A time

frequency analysis was conducted on resting state EEG and by-subject average power spectra were obtained for eyes open and eyes closed. Three alpha features were estimated using FOOOF (Donoghue et al. 2020): central frequency, bandwidth and adjusted power. The OR of the same participants were segmented using pyAFQ (Kruper et al. 2021) and by-subject FA measures were obtained by averaging left and right OR. The final sample of participants with available alpha and OR FA measures included 728 participants that passed a rigorous quality control. Results showed that high OR FA is associated with an increase in EC alpha power and central frequency after accounting for participants' age. Tract profiles comparisons showed that this structural-functional relationship is evident in the posterior part of the OR. These results 1) confirm the crucial role of thalamocortical connections in the emergence of alpha; 2) suggest that the OR FA is related to the coherence with which white matter fibers deliver neural signals. Overall, these findings suggest that spontaneous electrophysiological brain activity is related to structural properties of white matter pathways.

2-H-346 Individual variation in functional brain network area predicts individual differences in executive function

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Executive function (EF) is a broad domain of cognition that includes working memory, planning, and self-control. Individual differences in EF have meaningful functional outcomes in youth (e.g., academic achievement and risk-taking behavior). EF relies on spatially distributed brain regions spanning the frontal, parietal, and temporal cortices. Typically, these networks have been defined as a group average with the assumption that there is a stable correspondence between functional and structural anatomy across individuals. However, recent work shows that person specific functional networks exhibit unique topographical features. Yet, the possible behavioral relevance of such individual differences remains unclear. Here, we investigated whether individual variation in functional network size predicts individual differences in executive function. In ABCD sample (N = 2766), we delineated person-specific functional networks using a template matching procedure (Hermosillo et al., 2022) and calculated surface area for each individual's networks. Executive function and general cognitive ability scores were summarized from a previously published work (Thompson et al., 2019). Controlling for gender, parental education, and site, preliminary regression analyses showed that the surface area of DMN (pBonf <0.05) and CO (pBonf < 0.01) networks positively predicted EF scores. Furthermore, to examine if the contribution of topographic variability was specific to EF, we examined the relationship between network surface area and general cognitive ability. We found that the size of FP, DMN, DAN, CO, and Tpole positively predicted cognitive ability scores. We successfully replicated both findings in a matched ABCD sample (N = 2830). Our result emphasizes the relevance of individualized functional network topography in understanding behavioral variability and sets the stage to further examine how such brain-behavior relationships change over development.

2-H-347 Contributions of Age Related Changes in Intracortical Myelination to Gamma Band Activity During Working Memory

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The neural mechanisms supporting developmental improvements in working memory into adulthood are not well understood. Oscillatory gamma band activity, which supports inter-laminar and inter-regional communication, is known to support working memory maintenance and shows age related improvements. Age-related increases in intracortical myelination speeds neural signal transmission and signal fidelity, critical for integrating information processing. However, little is known about how the development of intracortical myelination may support gamma function supporting working memory. To test this, we acquired EEG during a memory guided saccade (MGS) task, as well as magnetization transfer MRI scans, a sensitive measure of myelination, at 7T in the same participants. After data quality exclusions, 119 participants were included (ages 10-30, 67 F). Intracortical magnetization transfer ratio (MTR) was calculated at 75% the depth from the pial surface to gray/white matter boundary. Gamma band spectral events (i.e., activity bursts) were calculated over 1 second epochs during the delay period of the MGS task. Whole brain MTR was positively correlated with whole brain gamma trial power ($p=0.003$) and variability ($p = 0.011$), after controlling for age and correcting for multiple comparisons. Follow up analyses tested whether regions that undergo significant age-related change in MTR are associated with whole brain gamma power and variability. After correcting for multiple comparisons, MTR in the anterior cingulate cortex (ACC) was significantly associated with trial power variability ($p=0.004$). These findings indicate that intracortical myelin throughout cortex and particularly in the ACC performance monitoring region, may underlie age related changes in gamma bursting activity supporting development of working memory,

2-H-348 Longitudinal and prospective assessment of prenatal maternal sleep quality and associations to newborn hippocampal and amygdala volume

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Introduction: The prenatal period is characterized by rapid fetal neuronal growth. Such growth can increase susceptibility to prenatal environmental signals (Barker, 1998). A process that may alter fetal brain structure is prenatal sleep health. Poor prenatal sleep is a public health concern affecting most (78%) pregnant individuals (Lucena et al., 2018). Sleep deprivation across gestation predicts offspring hippocampal neurogenesis in preclinical studies. In humans, poor sleep in other developmental stages predicts hippocampi and amygdala changes (Saghir et al., 2018). However, the relation between sleep quality across gestation and offspring brain structure remains unknown. The present study examined the associations between trajectories of prenatal sleep quality and newborn hippocampal and amygdala volume. Method: Pregnant individuals (N=94; Mage=30.5; SDage=5.3) reported sleep quality three times prenatally. Newborn (Mage(weeks)=5.1; SDage(weeks)=2.7) hippocampus and amygdala volumes were assessed during an unsedated sleep cycle using magnetic resonance imaging. Brain region segmentation was performed using a multi-atlas fusion algorithm that individually segmented regions jointly from T1- and T2-weighted high-resolution images (See neonate multi-atlas at

https://www.nitrc.org/projects/unc_brain_atlas/). Prenatal sleep quality trajectories and hippocampus and amygdala volume were examined using multilevel modeling. Results: Changes in prenatal sleep quality were associated with bilateral hippocampal volume (b=0.00004, p<.001; right hippocampus) such that poorer sleep quality predicted larger hippocampal volume. No significant associations were observed between prenatal sleep quality and amygdala volume (b=0.00001, p=.81; right amygdala). Conclusion: The current findings highlight the intergenerational implications of poor prenatal sleep health. Sleep health during pregnancy may be a robust point of intervention for promoting maternal and fetal development.

2-I-349 Longitudinal trajectories of functional brain network integration during the first two years of life and their relation to later working memory ability at 8-12 years

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The first two years of life are a period of rapid change in brain function thought to support cognitive development. Critically, network integration increases during this period, purportedly to allow for more complex cognition to emerge, such as working memory (WM). Additionally, functional brain network integration has been related to WM ability throughout childhood and adulthood. However, there is little known about how early trajectories of functional brain network integration support childhood WM ability. Here, we examined longitudinal trajectories of functional network integration from 0-2 years, and how these trajectories relate to childhood WM. We used a longitudinal neuroimaging dataset (N=44) with resting-state functional MRI (fMRI) data collected at up to 7 timepoints. We measured network integration as participation coefficient (PC), which quantifies how distributed connections are between a given node and nodes outside its own network. WM ability was assessed as accuracy on the 2-back condition of an n-back task in a subset of participants who returned at 8-12 years. A pipeline specific for infant fMRI data was used to appropriately preprocess, segment, and register images. The Automated Anatomical Atlas (90 regions) was deformed to subject space so functional timeseries could be extracted for network analysis. Linear multilevel modeling with random intercepts and random slopes revealed that mean PC averaged across all 90 regions increased linearly with age when controlling for sex assigned at birth, family income:needs ratio, and maternal education ($F(1,105)=6.62$, $p<0.05$). Intercepts and slopes did not correlate with 2-back accuracy. However, PC at 2 years demonstrated a trending positive correlation with 2-back accuracy at 8-12 years ($r=0.41$, $p=0.09$). These results provide preliminary evidence that network integration increases longitudinally during infancy, and that network integration early in life may support childhood WM ability.

2-I-350 Methylphenidate changes dynamic brain organization in stimulant medication naïve children with ADHD

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ADHD symptoms are thought to arise from rigid and persistent brain connectivity across time. Stimulants, such as methylphenidate, are a first-line treatment for pediatric ADHD, though not all children respond well to them. Understanding of the neural basis of stimulant action is critical to

predicting treatment outcomes. Dynamic brain organization, which characterizes brain function on the order of seconds, is one promising approach for understanding stimulant mechanisms of action. Here, we examine how stimulants change dynamic brain connectivity in pediatric ADHD. We scanned stimulant naïve children with ADHD (8-12y, N=34) on and off a single dose of methylphenidate. We estimated resting state dynamic functional connectivity across large-scale brain networks using the dynamic conditional correlation method to characterize brain organization at 150 different timepoints throughout the scan. A multilayer network approach was then used to model how the brain was organized into communities at each timepoint and how brain regions changed their community membership across timepoints. Flexibility, which measures the number of changes in community membership across time, was calculated per region and per large-scale network, and compared on and off methylphenidate. We found that across the whole brain, flexibility increased on methylphenidate, particularly for the default mode and visual networks. Further, a decrease in flexibility of the cingulo-opercular network on/off drug was related to higher parent-reported inattention symptoms, while a decrease in flexibility of the fronto-parietal network was related to more hyperactivity. These results suggest that methylphenidate increases dynamic reconfiguration of brain networks across time, particularly those that have been implicated as having rigid connectivity in ADHD such as the default mode network. The degree of change on drug was related to ADHD symptom severity, providing insight into varied treatment response.

2-I-352 Parsing the unique and shared structural connectomics of irritability, inattention, and hyperactivity in youth

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Irritability, attention deficits, and hyperactivity are frequently co-occurring symptoms in youth. During adolescence, a period when neural networks and their white matter connections mature, severity of these symptoms often decreases - suggesting a crucial role of structural connectivity in the underlying pathophysiology. Indeed, all three symptoms have been linked to aberrancies in white matter tracts, but the literature remains inconclusive regarding the specificity of these alterations for each phenotype. To address this question, we will use a bifactor approach to parse the unique and shared variances of the three phenotypes, then assess their relationships with white matter connectivity. Additionally, we will extend prior work on regional white matter alterations by analyzing whole-brain and circuit-level organization via a graph-theoretical approach. This pre-registered study will leverage an existing dataset of 216 youths (individuals with disruptive mood dysregulation disorder, attention-deficit/hyperactivity disorder, and healthy volunteers; mean age = 13.8 years; 60.2% male) with parent ratings of irritability, inattention, and hyperactivity based on the Conners Comprehensive Behavioral Rating Scale. Exploratory factor analysis will determine the six highest-loading items for each dimension, which will serve as input for the bifactor analysis. To validate our bifactor results, we will test for associations between each latent variable (i.e., the unique and shared aspects of irritability, inattention, and hyperactivity) and structural brain network characteristics (e.g., efficiency - the capacity to exchange information). Although prior studies of these symptom domains have reported lower fractional

anisotropy in individual tracts, it is unknown how network-level measures will correspond to each latent factor. Findings will enhance our mechanistic understanding of these three phenotypes and may suggest new focused treatment targets.

2-I-353 Control energy detects discrepancies in good vs. poor readers' functional activation during rhyming task

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While MRI studies have localized brain function and structures that support reading, little evidence has revealed more specifically how the brain's functional dynamics during reading are constrained by white matter fibers. Network control theory proposes that the change of activation states is linearly determined by the white matter connectome, with control energy for completing the procedure (Kim et al., 2015), such that higher control energy is required to transition toward more difficult-to-reach states. The present study aims to explore if this theory might also apply to understanding how brain dynamics is linked to reading ability in school-age children. A total of 51 children ages 8.25 -14.6 years were included. Participants performed an in-scanner rhyming task, deciding if pairs of words/non-words rhyme. Each trial was presented in visual-only, auditory-only, and audiovisual modalities, in separate runs. Experimental conditions also involved the crossing of orthographic (spelling) and phonological (rhyming) congruency. White matter network and fMRI data were used to compute the control energy of each condition relative to a null fixation state. Repeated ANOVA results showed that the control energy for audiovisual trials was significantly lower than unimodal trials, especially in the orthographically incongruent trials. Non-word trials required higher energy than word trials. Spelling-sound conflict was only significant in the visual-only modality, with higher required energy for conflict trials. In addition, the mean energy of all trials was negatively correlated with children's phonemic decoding and sight word reading abilities assessed outside the scanner. Together, this study highlights that control theory can explain variations of cognitive demands in reading tasks, and help in understanding the role that phonology plays in reading impairment. More generally, it provides insight into neural development beyond functional and structural MRI measures alone.

2-I-354 Language first, cognition later: Different trajectories of sub-components of the future-reading network in processing narratives from kindergarten to adolescence

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Narrative comprehension is a linguistic ability that has a critical role in language processing. According to the Simple View of Reading (SVR) model, reading is acquired through intact linguistic processing and decoding and therefore, narrative comprehension quality in pre-reading age is critical. Several brain networks compose the "Reading network", including semantic, phonological, visual, syntactic processing and executive functions networks, and overlap with networks involved in processing narratives. This study aimed to determine the involvement of the reading network in processing narratives from pre-reading to proficient reading age. Functional MRI data were collected from 32 healthy English-speaking children ages 5-18 years scanned while listening to stories (for up to 12 years). Changes in within and

between functional connectivity of the networks that comprise the reading network were calculated and compared between the years. Behavioral age-appropriate batteries that assess cognitive and language abilities were administered. A hierarchical linear regression analysis revealed that at pre-reading age, the networks related to basic language processing (i.e., visual, phonological, syntactic) were more involved, and at age 17, the involvement of more complex networks (i.e., executive functions) was predominant. Our results suggest that networks composing the reading network are highly involved in processing narratives along development. Networks related to semantic, phonological and syntactic processing predict reading ability earlier in life, and more complex networks (such as executive functions) predict reading proficiency later in life. These results strengthen the involvement of EF in the SVR model together with the language processing component.

2-I-355 Differences in functional network controllability in infants with high-likelihood for autism spectrum disorder in the first year of life

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Autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects 2.3 in every one hundred children, while less is known about the functional architecture of the brain and how trajectories of brain development in early life may underlie the onset of ASD. We applied controllability analysis to functional connectivity data from 70 infants. Participants were divided into high-likelihood (HL; n=37) and low-likelihood (LL; n=33) groups based on having a sibling with ASD, and scanned at 1 month and 9 months during resting state and native-language listening sessions. Data were processed using standard connectivity methods for infants. 90x90 functional connectomes were generated using an infant functional atlas. To study the controllability of each brain region, we employed the average controllability (AC) to measure the ability to drive nearby brain state transitions and the modal controllability (MC) to measure the ability to drive distant brain state transitions. Whole-brain AC was significantly correlated with MC ($r=0.574$, $p<e-16$), suggesting that brain networks support both nearby and distant brain transition. Both AC and MC during the language-listening task (AC=1.1118; MC=0.9773) were significantly higher than those during the resting state (AC=1.0987; MC=0.9142), indicating that the language task is cognitively more demanding than resting. At 1-month, no significant group difference between the LL and HL groups was detected. At 9-months, AC of the temporal lobe for the LL group was significantly higher than that of the HL group ($P=0.026$, $t=2.284$) and MC of the motor network for the LL group was significantly lower than that of the high-likelihood group ($P=0.045$, $t=-2.058$). In sum, we implemented network control theory and quantified controllability under different tasks and across the first year of life. Our results suggest that regional controllability can successfully show different brain functional characteristics between HL and LL groups.

2-J-210 Maternal Hair Cortisol Predicts Periodic and Aperiodic Infant Frontal EEG Activity Longitudinally Across Infancy

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Maternal stress is known to be an important factor in shaping child development, yet the complex pattern of associations between stress and infant brain development remains under-studied. To better understand the nuanced relations between maternal stress and infant neurodevelopment, research investigating longitudinal relations between maternal chronic physiological stress and infant brain function is warranted. In this study, we leveraged longitudinal data to disentangle between- from within-person associations of maternal hair cortisol and frontal electroencephalography (EEG) power at three time points across infancy at 3-, 9-, 15-months. We analyzed both aperiodic PSD slope and traditional periodic frequency band activity. On the within-person level, maternal hair cortisol was associated with a flattening of frontal PSD slope and an increase in relative frontal Beta. However, on the between-person level, higher maternal hair cortisol was associated with steeper frontal PSD slope, increased relative frontal Theta, and decreased relative frontal Beta. The within-person findings may reflect an adaptive neural response to relative shifts in maternal stress levels, while the between-person results demonstrate the potentially detrimental effects of chronically elevated maternal stress. This analysis offers a novel, quantitative insight into the relations between maternal physiological stress and infant cortical function.

2-J-356 Objectively measured total sleep time predicts internalizing symptoms in adolescents: Findings from the ABCD dataset

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Introduction. Subjectively reported sleep problems, including short total sleep time (TST), are associated with severity of adolescent psychopathology. Extant studies of objectively measured sleep have replicated these effects but with relatively small samples. We analyzed actigraphy and self-report data from nearly 2,000 children and adolescents to examine the association of TST and pubertal stage (PS) to psychiatric symptom severity. Methods. Data were from ABCD dataset (timepoint 2.0). Adolescents wore an actigraph (FitBit) for approximately 2 weeks. Only participants with least 7 contiguous days of Fitbit recording were included (N = 1,977; 938 girls, M = 143 months of age). Using GLM, we examined associations of TST and self-reported PS to our primary outcome measure, dimensional psychopathology (CBCL Total Problems). In secondary and tertiary analyses, we examined additional dependent variables (CBCL internalizing, externalizing, and syndrome subscales). Age, sex, and PS, and TST x PS were included in all models. Results. Primary. Lower TST predicted higher CBCL Total Problems, $F(1, 1971) = 9.853$, $p = .002$. Lower TST was more strongly associated with Total Problems in later PS, $F(1, 1977) = 7.494$, $p = .006$. Secondary. Lower TST also predicted higher internalizing ($p = .014$) but not externalizing ($p = .110$) subscales. TST x PS was significant for internalizing symptoms ($p=.041$). Tertiary. Effects remained significant for many subscales (internalizing: depression, withdrawn depression, social, thought, attention, obsessive-compulsive disorder, stress, sluggish cognitive tempo; externalizing: ADHD). Conclusion. Results demonstrated an association of objectively measured short sleep to adolescents' severity of psychopathology, moderated by pubertal maturity. As the current study is cross-sectional, future studies should examine longitudinal associations of objective sleep and pubertal maturation to trajectories of adolescent psychopathology.

2-J-357 Gut microbiota diversity and infant brain development

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Associations between the gut microbiota and brain development are well documented in animals (Cowan et al., 2019; Heijtz et al., 2011). A few studies have documented links between microbiome diversity and composition and neurocognitive development in humans (Callaghan et al., 2020; Carlson et al., 2018; Gao et al., 2019). Specifically, higher Alpha diversity at 12 months has been found to be negatively correlated with measures of language at 24 months (Carlson et al., 2018). However, only one study has examined associations between gut microbiota diversity and measures of brain activity in infancy (Gao et al., 2019). The current study will examine associations between Alpha diversity of the gut microbiota and infant brain activity, measured via EEG, at 15 months of age in a sample of 20 typically developing infants. Using 16sRNA sequencing performed on infants' stool samples, we calculated Alpha diversity of bacteria present in the gut. We collected resting EEG from infants at 15 months of age and will use the aperiodic exponent as our main measure of brain activity, which reflects the exponential decrease of power spectral density (PSD). This slope flattens across early development, and is thought to reflect the ratio of excitatory to inhibitory brain activity (Karalunas et al., 2022). In this study, we will examine how Alpha diversity of the gut microbiota at 12-months predicts this slope at 15-months of age. Though no previous research has examined these associations, based on available evidence regarding microbiota Alpha diversity and neurocognitive development, we hypothesize that higher Alpha diversity will be positively associated with the aperiodic exponent (a steeper slope), thus indicative of less mature patterns of neural activity. This study will be one of the first of its kind to measure microbiota diversity and EEG in infancy, and contribute to a growing body of evidence for the importance of the microbiota-gut-brain axis in early neural development.

2-J-358 Differences in neural activity in physiological and perceived stress responses during adolescence

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Background: Adolescence is a developmental period associated with an increased sensitivity to social stress. Functional neuroimaging studies have identified stress-reactive brain regions, which relate to both cortisol reactivity and perceived stress levels. However, self-reported stress is often not predictive of an individual's concurrent neuroendocrine response; for example, cortisol may not increase during events that individuals perceive to be stressful. These interactions between physiological, psychological, and neural stress responses during adolescence remain poorly understood. Methods: 107 adolescents (ages 11-14) completed a social stress task concurrent with fMRI scanning. The social stress task reliably elicits psychological/neuroendocrine stress responses by requiring participants to prepare/deliver a speech and complete math problems while evaluated by two confederate judges. Neuroendocrine reactivity was measured by salivary assay, and cortisol responder status was determined by 115% increase in cortisol relative to baseline. Perceived stress was measured by self-report. Statistical analyses were conducted to examine if cortisol reactivity and perceived stress predicted neural activity in response to the social stress task. Results: Stress-related brain regions (e.g., amygdala,

hypothalamus) showed task-related increases in neural activity during stress conditions in the full sample. Preliminary analyses suggest greater self-reported stress levels predicted increased amygdala activity in response to the social stress task, but only for cortisol responders. Subsequent work will probe additional associations between other brain regions and stress measures. Conclusions: These findings suggest that different patterns of neural activity may underlie individual differences in stress response profiles. Future work will further probe distinct neural response patterns related to physiological and psychological stress responses. Data collection is ongoing.

2-J-359 Response inhibition in first-time fathers: neural correlates and associations with chronic stress

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Objective: We propose to investigate first-time fathers' neural correlates of response inhibition (RI) and the associations with chronic stress measured through hair cortisol. RI, defined as the ability to suppress an immediate response and engage in a more appropriate action, is a core executive functioning process that may facilitate self-regulation. Chronic stress has been found to affect multiple brain regions and compromise cognitive functioning, including RI. A recent meta-analysis found that RI engages the left anterior insula and the fronto-striatal system. To our knowledge, no previous studies have investigated this relationship among first-time fathers. Methods: In our sample of 38 first-time fathers, men's hair cortisol was measured at approximately six months postpartum as part of a laboratory visit. Within 4 weeks of the visit (although some data collection was delayed due to the COVID-19 pandemic), fathers completed an MRI scan and the well-validated Go/No-Go task, which is commonly used to measure RI. Hypothesis: We predict that fathers who have higher levels of hair cortisol will have more neural activation in regions implicated in RI while accurately regulating on the Go/No-Go task, thus suggesting that chronic stress may influence first-time fathers' RI processing. Analysis: We plan to conduct a general linear model analysis in FSL and contrast correct No-Go with Go trials (i.e., No-Go > Go) while including hair cortisol levels as a regressor in higher-level analyses. Implications/Importance: Both chronic stress and poor RI have the potential to impact fathers' mental health and parenting abilities. Therefore, this study will not only add to the current parental and neuroscience literature, but can guide future interventions to support first-time fathers who are experiencing greater stress as they adjust to fatherhood.

2-J-360 Longitudinal associations between pubertal hormones and white matter microstructure

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The rapid development of white matter (WM) is a key neurobiological process that characterizes adolescence. A wealth of evidence using animal models has demonstrated that pubertal hormones play a pivotal role in organizing the connections between neural circuits. However, it remains unclear how pubertal hormones influence WM connectivity in humans. While advances in diffusion MRI (dMRI) have

enabled researchers to characterize human WM development in vivo, few studies to date have investigated the longitudinal relationship between pubertal hormones and WM microstructure in adolescence. To address this gap, the present study will examine whether changes in basal hormone concentration are associated with changes in WM microstructure in 174 adolescent girls across three timepoints. Participants in this sample were 10-13 years old at enrollment, and were measured at intervals of approximately 18 months. To assess WM microstructure, we will quantify the mean fractional anisotropy (FA) of major WM tracts using a longitudinal probabilistic tractography pipeline trained on manually annotated tracts from the Human Connectome Project (Maffei et al., 2021). We will then calculate basal estimates for estradiol, testosterone, and DHEA using salivary hormone concentrations measured by Salimetrics Enzyme-Linked Immunosorbent Assay (ELISA) kits. At each timepoint, saliva samples were collected once per week on four consecutive Saturdays prior to dMRI acquisition. Basal estimates for each hormone will then be extracted from raw concentrations using linear mixed models. Finally, we will compute the association between change in hormone concentration and change in mean FA for each hormone and tract pair. By exploring the longitudinal relationship between pubertal hormones and FA of major tracts, this descriptive analysis will help clarify how pubertal hormones may influence the development of WM microstructure in humans.

2-J-361 Emotion dysregulation moderates the association between inflammation and basal ganglia network connectivity in adolescents

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Researchers have identified links between negative emotionality and inflammation in adolescents and have elucidated relations between emotion regulation and brain network connectivity. Few studies, however, have examined whether difficulties in emotion regulation amplify the association between inflammation and basal ganglia network (BGN) functional connectivity. A community sample of 66 adolescents (40 F; 15.39±1.12) underwent resting-state fMRI and provided blood samples that were assayed using a multiplex instrument, from which we assayed IL-6 and TNF-α. Prior to statistical analyses, we normalized these cytokines for non-specific binding using orthogonal nonlinear least squares and log transformed the resulting values. Independent components analysis followed by dual regression was conducted on the resting-state fMRI data to derive within-network functional connectivity of the BGN. We examined linear associations between each cytokine and BGN connectivity, and tested whether difficulties in emotion regulation, assessed using the self-report Difficulties in Emotion Regulation Scale (DERS), moderated these associations. Higher levels of IL-6 and TNF-α were associated with lower connectivity in the BGN (B=-1.21, p=0.003; B=-0.85, p=0.009). DERS moderated the association between TNF-α and BGN (B=-0.04, p=0.04); this effect was driven by adolescents who endorsed greater difficulty regulating emotions while engaging in goal-directed behavior (B=-0.22, p=0.003). Emotion dysregulation, specifically when completing tasks or pursuing goals, appears to amplify the association between higher inflammation and lower BGN connectivity in adolescents. Given that emotion dysregulation is modifiable, our results suggest that this is a target that could help mitigate the maladaptive effects of peripheral inflammation on adolescent brain function. Longitudinal research is required to test this formulation more explicitly.

2-J-362 Pubertal stage and daily sleep

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Insufficient sleep is prevalent in adolescence and can lead to poor psychological functioning. Understanding associations of different aspects of sleep quality with puberty may inform the development of healthy sleeping habits early in adolescence. Given inconsistent relations between perceived and objective sleep, it is important that researchers use multiple metrics to assess sleep quality to best understand this relationship. 84 participants (63% female, ages 13-20) reported their pubertal stage (Tanner stages 3-5) and provided sleep data. Actigraphy and self-reported sleep data were collected at home for two weeks. Sleep efficiency and sleep duration were obtained from actigraphy data as objective indices of sleep quality. Perceived sleep satisfaction and duration were obtained each morning through a smartphone app regarding the prior night's sleep. Tanner stage and age were included as separate variables in regression models to disentangle effects of age and pubertal stage in relation to objective and perceived sleep quality. Tanner stage was uniquely associated with perceived sleep satisfaction (β=0.30, p=0.010) above and beyond age, body mass index, and perceived stress; age was not associated with sleep satisfaction (β=0.02, p=0.887). Although perceived sleep satisfaction and duration were correlated (r=0.46, p=0.001), neither Tanner stage nor age was associated with perceived sleep duration, objective sleep duration, or sleep efficiency. Our findings show that pubertal stage from mid- to post-puberty is related to perceived sleep satisfaction, possibly indicating a likely affective association between pubertal stage and sleep satisfaction. Elucidating associations of pubertal stage with sleep satisfaction is important for the development of scalable interventions and identifying those who may need it. For instance, primary care physicians may inquire about sleep satisfaction in adolescents, particularly in those at later stages of puberty.

2-K-215 Prediction of attention profiles at age 3 and 4 years using a machine learning approach

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Attentional development involves complex interactions between multiple cognitive processes and other systems. Individual differences in attentional tasks depend not only on age-related changes, but also on nonlinear relationships among genetic, temperament, cognitive and physical conditions, environment, and motivation. Classical statistical methods have serious constrains to address this complex nature. Therefore, this study proposes to use several machine learning algorithms (ML) to predict characteristic results of normal development and deviations in the development of executive attention at 3 and 4 years old, considering cognitive, behavioral and EEG data, and parent reported measures, collected in a longitudinal study. This approach is expected to accurately classify the attentional profiles based on the task performance, and to identify very early markers of executive attention development. This study is part of one funded longitudinal project involving an initial sample of 151 babies and their families who participated on three waves of data collection (at 6, 9, and 16-18 months-old). Two waves of data collection are added: at 36 and 48 months old. Several measures were taken, involving behavioral tasks, eye-tracking tasks, EEG/ERPs protocols, parent-reported measures of child temperament and home

environment. Other measures are included in the last two waves: WPPSI-IV, spatial conflict task, sustained attention task, visual sequence learning task, delay of gratification task, EEG resting protocol, BeeAT Task, child's temperament, family SES, parenting styles, parents' mental health, and ASD/ADHD symptomatology. ML methods (e.g., artificial neural networks, fast large margin, decision trees, etc.) and time series analyses will be developed through training and cross-validation phases to study the attentional trajectories across ages. Sensitivity analyses will be carried out to provide measures of the relative importance of each predictor.

2-K-363 Comparing Analytic Approaches to Infant Functional Near-infrared Spectroscopy Data

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Near-infrared spectroscopy (NIRS) is increasingly used to study brain function in infants, but the development and standardization of analysis techniques for use with infant NIRS data has not paced other technical advances. Here we quantify and compare the effects of different methods of analysis of infant NIRS data. Specifically, we analyzed two independent NIRS datasets involving 6-9-month-old infants contrasting results from more traditional, fixed array analyses with several functional channel of interest (fCOI) analysis approaches. In addition, we tested the effects of varying the number and anatomical location of potential data channels to be included in the fCOI definition. Over two studies we find that fCOI approaches are more sensitive than fixed array analyses, especially when channels of interests were defined within-subjects. Applying anatomical restriction and/or including multiple channels in the fCOI definition does not decrease and in some cases increases sensitivity of fCOI methods. Based on these results, we recommend that researchers consider employing fCOI approaches to the anlaysis of infant NIRS data and provide some guidelines for choosing between particular fCOI approaches and settings for the study of infant brain function and development.

2-K-364 Testing for Within x Within and Between x Within Moderation using Random Intercept Cross-Lagged Panel Models

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Random-Intercept Cross-Lagged Panel Models (RI-CLPM) have recently gained in popularity within longitudinal research as they allow for the decomposition of measurements into between- and within-person components. Here, we describe how developmental researchers can implement, test and interpret interaction effects in such models. Using an empirical example from developmental psychopathology research, we illustrate the analysis of Within x Within and Between x Within, utilising data from the Millennium Cohort Study - a longitudinal cohort study based in the United Kingdom. Specifically, we investigate whether within-person deviations form baseline levels of peer problems as well as stable between-person differences in peer problems and early child cognitive abilities moderate the longitudinal within-person associations between conduct problems and emotional problems. Moderation analyses were implemented in Mplus using Bayesian Structural Equation Modelling. Results indicate that peer problems and cognitive abilities moderate the strength of the longitudinal

associations between conduct problems and emotional problems. Overall, results suggest that the analysis of moderation effects has the potential to increase our understanding of the processes underlying causal cascades leading to the development of mental health problems. Such analyses are likely to be of benefit to a range of researchers conducting analyses using longitudinal data. In particular, moderation analyses within a RI-CLPM framework may not only aid the testing of existing hypotheses but also encourage the consideration of moderation effects in developmental theory since the availability of new modelling methods can lead to theoretical innovations just as much as theoretical innovations can drive methodological developments.

2-K-365 Measuring dimensions of adversity across the lifespan: Guidelines and an applied example

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The dimensional model of adversity and psychopathology (DMAP) specifies mechanistic pathways that differentially link the dimensions of threat and deprivation exposure to health and well-being outcomes later in life (McLaughlin, et al., 2014; Sheridan & McLaughlin, 2014). While research utilizing this theory has increased, substantial discussion and disagreement exists about which experiences comprise each dimension. Here we provide details about recommended approaches from our recently published manuscript (Berman et al., 2022) including specific measure recommendations. We will provide delineated guidelines on measure selection that are informed by participant age (childhood, adolescence, adulthood), available informants (youth, caregivers), and study characteristics (e.g., prospective vs. retrospective). Further, we will provide a concrete example of how the dimensions of threat and deprivation were constructed from a sample of 4-7 year old children at risk for adversity exposure and their caregivers using a combination of standardized measures (i.e., VEX-R, CTQ, JVQ, CTS, CTS-PC, CTS-2, MACE for threat and CTS-PC, MNBS, MACE, HOME, STIMQ for deprivation). We will describe multiple methods for calculating scores (e.g., any threat, or number of threat domains endorsed) and the implications of each approach. Variability in how adversity is conceptualized and measured across studies has been a major impediment to progress. Utilizing these recommended approaches in research to assess and classify adversity exposure by dimension will yield consistent predictors that can stimulate progress in understanding how particular dimensions of early environmental experience uniquely contribute to lifelong health.

2-K-366 Infant and parent predictors of infant MRI scan success

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MRI data in infants has in recent years become a crucial part of our toolkit to understand the developing brain. Collecting imaging data from infants, though, comes with a host of challenges, including the nature of scanning sleeping infants, the large sample sizes needed to address many questions, and the extensive resources needed. Thus, when recruiting infants for MRI imaging, it would be helpful for researchers to understand variables that might predict the likelihood of a successful MRI scan. METHODS: The Baby Connectome Project (BCP) is a longitudinal study of brain and behavioral

development in typical development from 0-5 years of age. BCP data from the University of Minnesota were examined to determine rates of successful MRI data collection during natural sleep across infants. Parent questionnaire data, including infant sleep characteristics from the Brief Infant Sleep Questionnaire and maternal anxiety levels from the State Trait Anxiety Inventory, were compared to scan success rates. Logistic regression with Bonferroni corrections was used to determine if any of the variables were a significant predictor of scan success. Infant age was included as a covariate in all models. RESULTS: Success was defined in two ways, 1) acquisition of two sequences (T1, T2) and 2) scan attempts needed (1, 2, or never succeeded). Overall, 733 scan visits were attempted and 544 were successful (496 after 1 visit attempt; 75 after 2 visit attempts). The infant typically falling asleep alone (OR=0.37 [95% CI: 0.20-0.64], p=0.007) was negatively associated with a successful scan. Neither of the maternal anxiety measures were associated with scan success. No measures were associated with scan attempts needed. CONCLUSIONS: Infant sleep variables may exert a small effect on successful acquisition of MRI data in infants and toddlers. This information may inform decision making for future data collection efforts.

2-K-367 Developing a Biomarker Assessment tool to evaluate the performance of EEG Proxy Markers of Sensory Sensitivities in Autism Spectrum Conditions.

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Biomarkers are an objective measure of biological processes which underpin more complex behaviours. However, there are challenges defining biomarkers and limited consensus about how they should be used in research and clinical practice. Sensory neurophysiological markers measured using electroencephalography (EEG) have been reported in Autism Spectrum Disorder (ASD). However, there are currently no formal criteria against which the performance of such biomarkers can be evaluated. We aimed to screen existing EEG studies of sensory processing in autism, alongside biomarker guidelines to develop a tool to assess how well biomarkers achieve their intended function (diagnosis, prognosis etc). Guidelines from the The Food and Drug Association (FDA) for approved biomarkers were used to inform criteria required for biomarker qualification and expert discussion used to reach a consensus and create a biomarker tool. Key characteristics for different types of biomarkers included; context of use, sensitivity, specificity, accuracy, precision, effect size, replication, test-retest reliability and symptom associations. Following literature search we applied the tool to 71 sensory studies study-by-study. Our preliminary results indicate that numerous potential biomarkers are in the early stages of development. Several studies do not meet the minimum critiera (i.e. replication, effect size) and therefore require further development to fulfil the criteria specified. Using this tool we hope to recommend a minimum set of reporting criteria for biomarker studies to improve consistency in the field and facilitate the translation of biomarker research into clinical settings.

2-K-368 BIBSNet: a deep learning network for segmentation of infant brain MRI scans

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The first year of postnatal life is a dynamic period of life marked by significant neuronal development. MR images can be used to annotate segmentations of tissue types, such as gray and white matter, for further use as biomarkers or generation of complex metrics. Segmentation algorithms, like joint label fusion (JLF), have difficulty segmenting infant brain MR images properly due to rapidly evolving changes in tissue contrasts. Deep learning may improve performance, but is typically limited in training by the number of manually annotated segmentations, sample size per age group, and exclusion of the skull. Here, we trained a deep neural network, named BIBSNet, to automatically and robustly segment MR images of infant brains. BIBSNet combines software from nnU-Net and SynthSeg. MR images were collected from 84 participants ranging in age from 0-8 months, of which a subset were extensively manually annotated by highly trained staff, and all were used for model training. Images were processed through the Developmental Cognitive And Neurodevelopment lab infant processing pipeline in three separate ways: 1) with JLF, 2) with manual segmentations, and 3) with BIBSNet predicted segmentations. Using paired T-tests and Dice Similarity Coefficients (DSC) (N=38; ages in months 1(2), 3(5), 4(5), 5(8), 6(6), 7(8), 8(4)), gray matter volume was significantly different between JLF and manual segmentations ($T=4.68$, $p<0.001$, $DSC=0.868$), whereas BIBSNet and manual segmentations were not ($T=1.2$, $p=0.23$, $DSC=0.869$). The same pattern arises with white matter volume, where JLF and manual segmentations were significantly different ($T=8.13$, $p<0.001$, $DSC=0.85$), whereas BIBSNet and manual segmentations were not ($T=1.44$, $p=0.15$, $DSC=0.88$). These results reveal that BIBSNet is a robust segmentation method that outperforms JLF on important morphological metrics and more closely resembles metrics produced from manual segmentations. Given the challenges of brain segmentation during this early

2-K-369 Data collection strategies: Decreasing participant burden and increasing retention in neuroimaging research in typically and atypically developing pediatric populations

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Obtaining functional magnetic resonance imaging (fMRI) data in children, particularly those with neurodevelopmental delays, has historically been challenging (Yerys 2009). This makes reliable precision functional mapping (PFM) of the human brain, which requires >40 minutes of low motion data (FD>0.2mm) (Gordon 2017), increasingly difficult. To reconcile these problems, our protocol utilizes a combination of novel strategies to engage and optimize fMRI data collection in 9 and 10 year olds with ADHD and/or ASD, as well as typically developing controls. Study staff employ various techniques to obtain a minimum of 45 minutes of low motion functional connectivity fMRI data over a course of 4 scanning sessions. Prior to the first scan, the child completes an MRI education session with the same operator that conducts the first scan. This interactive experience also includes a mock scan in which the child receives visual feedback on motion (MoTrak). During the real scans, staff utilize motion monitoring software (FIRMM) to provide verbal feedback to children on their movement. Children watch videos,

programmed as randomized task paradigms, to stay still and alert throughout resting state scans. Participants receive verbal praise from the operator between series runs for holding still. Building on previous research that posits the success of incentives, we have implemented prizes, snacks and compensation for the completion of each scan. This has resulted in sufficient data for reliable PFM in children with and without these psychopathologies in a multi-site protocol. We will present on the success of data collection across enrolled populations (anticipated N≥30). This will include an evaluation of the tactics used and corresponding amounts of low motion data that were collected. Lastly, participant burden will be assessed via exit surveys. Sharing results will help facilitate successful resting state scan acquisition in children with a range of neurodevelopmental concerns.

2-K-370 Studying cognitive and behavioural network topology in very preterm and term children

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Background: Compared to full-term (FT) born peers, children who were born very preterm (VPT; <32 weeks' gestation) display more cognitive and behavioural difficulties, including elevated autism spectrum condition (ASC) traits. Cognitive and behavioural outcomes tend to be studied independently, failing to account for how different facets of child development interact. Aim: To employ network analysis to study how ASC traits, behavioural, cognitive and temperamental outcomes are interrelated in VPT and FT children. Methods: 93 VPT and 55 FT children (median age 8.79 years) were recruited into the Brain Immunity and Psychopathology study. Network analyses were conducted separately for the VPT and FT groups on ASC traits, behavioural, cognitive and temperamental outcomes. Network analysis graphically represents partial correlations between variables and yields information on each variable's centrality and propensity to form a bridge between other variables. Results: Both networks were significantly different, p=.02. In the VPT group network, the most central (i.e., connected) variables were executive measures: attention Shift and Inhibition; while the most important bridges were Negative Affectivity and Shift. For the FT group network, the most central variables were Social Cognition and Shift, while Negative Affectivity and Emotional Problems were the most important bridges. Conclusions: Cognitive and behavioural network topology differs in VPT and FT children. In VPT children, clusters of outcome dimensions are anchored in core components of executive function, attention shift which relates to cognitive flexibility, inhibition which supports selective attention, and socio-emotional outcomes. In FT controls, these are anchored in ASC traits, socio-emotional outcomes and attention shift. Our findings have implications in informing person-based interventions, highlighting the importance of targeting different aspects of development to support VPT and FT children.

2-L-211 Responding to Threat: Associations between Neural Reactivity to and Avoidance of Threat in Pediatric Anxiety

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Background: Previous research implicates elevated threat responsivity, including neural reactivity to and avoidance of threat, in the maintenance of anxiety disorders. However, these two potential mechanisms have previously been considered separately. Using multiple levels of analysis to improve our understanding of threat responsivity could maximize the clinical utility of empirical findings. The present study uses a multimodal approach to investigate the association between neural reactivity to and avoidance of threat in pediatric anxiety. Methods: A sample of 65 children with anxiety disorders (Mage=8.95, SD=1.93) completed clinician- and laboratory task-based measures of avoidance, as well as a functional magnetic resonance imaging task probing neural reactivity to threat. All analyses controlled for age, sex, anxiety symptom severity, and the order of fMRI task runs (counterbalanced across participants). Results: Consistent with hypotheses, clinician-rated avoidance was positively associated with right amygdala activation to threat, β=0.32, p=.03. Contrary to our predictions, laboratory-based avoidance was not significantly associated with amygdala activation, p>.05. Furthermore, clinician-based avoidance was negatively associated with left ventral anterior insula (vAI) activation, β=-0.31, p=.03, whereas laboratory-based avoidance was positively associated with right vAI activation, β=0.27, p=.04. Conclusions: This study provides novel insight into patterns of association between neural reactivity to and avoidance of threat in pediatric anxiety. The distinct associations between clinician- and laboratory-based avoidance indices and neural reactivity to threat may elucidate distinct components of avoidance captured by these two metrics and may provide essential, nuanced insight into our understanding of the clinically significant construct of threat responsivity.

2-L-371 Investigating tactile processing precursors of cognitive development in the premature newborn brain

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Study's objective Prediction-based processes are considered a core feature of cognitive development (Baek et al., 2020), regulating sensory processing through repetition suppression (RS) or enhancement of neuronal responses to relevant or unexpected stimuli. Thus, sensory prediction (SP) may be a key to understanding early trajectories of neurodevelopment. We propose to examine these cognitive precursors in the tactile modality at birth and their relationship with later neurodevelopment, as somatosensory processing is often atypical in neurodevelopmental disorders (ND) (Cascio, 2010). Methods and Hypothesis Brain activity of preterm neonates (aiming at N=90) born before 34 weeks of gestational age (GA) is being measured at 34 to 35 weeks of corrected GA during a tactile SP task (vibrotactile stimuli presented on the forearm, randomly interspersed with deviant and omitted stimuli). We use simultaneous 128 channels whole-head EEG and fronto-central fNIRS. We hypothesize that the contralateral somatosensory cortex displays activation when stimuli were randomly omitted in the sequence (SP) and a decreased activation to stimuli along the sequence (RS), and that the fronto-central regions display a mismatch response to deviant stimuli. General implications of the study Participants are enrolled in a follow-up cohort with periodic medical examinations involving ND screening questionnaires, assessment of cognitive and social milestones, and neurosensory development. We will compare neonatal measures of somatosensory processing with these outcome measures. If neonatal

somatosensory processing skills are predictive of cognitive development at 2 years, it will allow us to use them as early determinants of neurodevelopmental outcome in these vulnerable patients and to design early prevention programs. References Baek, S. et al. (2020). Progress in Brain Research, ISSN:0079-6123 Cascio, C. J. (2010). Journal of Neurodevelopmental Disorders, 2:62-69.

2-L-373 Childhood white matter morphology predicts persistence of ADHD symptoms into adolescence

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Objective: Anomalous white matter organization has been implicated in the pathophysiology of ADHD, with some evidence of ADHD-related sex differences. Whether childhood white matter microstructure predicts longitudinal change in ADHD symptoms and the impact of sex is unknown. This study compared longitudinal change in ADHD symptoms from childhood (ages 8-12) to adolescence (ages 13-17) among children with ADHD (n=102, 31 girls) relative to typically developing (TD) children (n=73, 24 girls) and whether whole-brain white matter morphological properties in childhood predicted symptom change among youth with ADHD (n=49, 14 girls). Methods: Diffusion weighted imaging data (b = 700 s/mm2, 2 x 32 directions) were collected on a 3T MRI scanner in childhood. Parent-ratings of ADHD inattention and hyperactivity/impulsivity symptoms (Conners Parent Rating Scale, age- and sex-adjusted T-scores) were obtained in childhood and adolescence. White matter tracts were reconstructed using TractSeg, a semi-automated tractography method. For each tract, we derived measures of fiber bundle cross-section (morphology) using Fixel-Based Analysis (FBA), a novel and fiber specific analysis framework. Results: Among children with ADHD, only girls with ADHD showed significant improvement in inattention symptom severity (p=.002; boys, p=.578; Sex x Time, p=.004). In contrast, hyperactive/impulsive symptom severity tended to decrease from childhood to adolescence among children with ADHD (p=.065), with similar improvement among girls (p=.022) and boys (p=.066). Regression analysis revealed that higher fiber cross-section in childhood within several white matter tracts (e.g., anterior thalamic radiation, corticospinal tract) predicted greater improvement in ADHD symptom severity from childhood to adolescence. Conclusions: Results suggest that atypical structural connectivity in childhood may be an important predictor of ADHD symptom progression into adolescence.

2-L-374 The associations among puberty, brain development, and internalizing symptoms in girls transitioning to adolescence: a combined multivariate pattern and brain network approach

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Background: Existing models propose that social brain development mediates the link between puberty and internalizing symptoms (INT) (Pfeifer & Allen, 2021). Most studies use only one puberty measure and/or conceptualize puberty as a moderator. We extend this work here by using a multimodal

measurement of puberty (hormones, self-reported status) and examine brain function as a mediator linking puberty and INT. Objective: This study will examine associations among puberty, brain network, and INT to test three hypotheses: (1) More advanced pubertal timing will relate to higher INT (2) More advanced pubertal timing will predict several brain network metrics indicating higher modular segregation and global integration, and (3) These network metrics will be associated with more INT. An exploratory aim will test the differential role of pubertal timing versus pubertal status. Method: The sample will include 108 girls (9-15; M=11.81) recruited for enhanced INT who underwent an fMRI social observation task. Multi-voxel pattern analysis (MVPA) using a SVM algorithm with a 5-fold nested cross-validation will generate weighted activation maps indicating voxels' prediction of task condition (observed versus implicit baseline). MVPA results will inform node selection, which will be used to compute a weighted directed matrix to calculate network metrics such as global efficiency, participation coefficient, and average within- and between-module connections. Puberty will be measured in two ways: self-reported pubertal status (M=2.78, SD=0.83) and a latent hormone factor comprised of DHEA, estradiol, testosterone, and progesterone. INT will be derived from self-report and clinical interview. Regression will be used to examine associations among puberty, brain network metrics, and internalizing psychopathology. Implications: This study has the potential to inform adolescent neurobiological models of social processes and developmental risk markers of psychopathology.

2-L-376 The relationship between connectivity in the EEG theta frequency and development of social skills in children with and without neurodevelopmental disorders

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There are large individual differences in the social development between children, especially in populations with neurodevelopmental disorders. Which neural mechanisms underlie such differences in social development and how alterations affect social difficulties is still largely unknown. Insights from cognitive neuroscience research has shown that there is a specialized network of brain areas that is activated during processing of social information, often called the social brain. A recent study by Van der Velde and colleagues (2021) proposed that this network can be measured in infants using electroencephalography (EEG) and analysing the functional connectivity across brain areas in the theta frequency when watching social versus non-social videos. In a large consortium project, we will exploit the same analysis approach to investigate the development of the social neural network in preschoolers with typical and atypical development. In the Preschool Brain Imaging and Behaviour Project (PIP), part of the AIMS-2-TRIALS consortium, more than 500 young children are followed from 2.5 years of age (currently >50% have completed the first assessment). Four groups are included; children with ASD, ADHD, developmental delay and no diagnosis. We will test whether we replicate findings of the selectivity of the theta network for social versus non-social stimuli. Extending previous findings, we will test whether the strength in theta synchronicity is related to better social abilities, measured with the Socialization domain of the Vineland Adaptive Behavior Scales and the Social Responsiveness Scale. Additionally, we will examine whether there are differences in the theta network between the four groups. We expect less synchronized theta activity across the network in the ASD group. The findings of

this study will shed light on the development of the social brain network and potential impact of alterations in this development in children with a neurodevelopmental disorder.

2-L-377 Transdiagnostic connectome-based mapping of autistic traits in children with autism and/or attention deficit/hyperactivity disorder

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Symptoms of autism spectrum (ASD) and attention deficit/hyperactivity disorder (ADHD), often co-occur. Atypical brain connectivity has been reported in both conditions with studies yielding mixed results of specific and/or shared findings. The present work aims to characterize the extent to which autistic symptom overlaps are rooted within the brain connectome across these conditions.We examined data from 166 children with a DSM-5 diagnosis of ASD and/or ADHD (n=63 ASD,n=103 ADHD;9±2 yrs). Across all, scores derived from the Autism Diagnostic Observation Schedule-2 administered "blindly" to clinical history indexed ASD traits. Low motion resting-state fMRI images were analyzed using voxel-wise whole-brain multivariate distance-based matrix regression (MDMR) to identify regions whose connectivity was associated with ASD or ADHD traits across and within diagnostic groups. Follow up seed-based correlation analysis (SCA) followed. Analyses were corrected by Gaussian random field theory at Z>3.1,p<0.05. MDMR revealed 2 main nodes significantly correlated with ASD traits: posterior cingulate (PCC) within the default network (DN), and middle frontal gyrus (MFG) of the fronto-parietal network (FP). Posthoc SCA revealed that, regardless of diagnosis, those with more severe ASD traits had stronger FP-DN internetwork connectivity. Notably, lower internetwork iFC seen in the subgroup of ADHD with low ASD traits (n=61) similar to that observed in an independent typically developing sample (N=53). A significant effect of diagnosis by ASD traits interaction resulted in a ASD-specific negative association between ASD traits and interhemispheric MFG. Results showed both transdiagnostic and diagnostic-specific brain-behavior relations exist for ASD traits. This suggests that atypical network segregation may be a risk factor for ASD traits in some children with ADHD. However ASD-specific interhemispheric patterns may also contribute to symptoms severity.

2-L-378 Treatment-related change in task control network functional connectivity is developmentally specific in OCD

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Objective: Reduction of obsessive-compulsive disorder (OCD) symptoms after treatment may derive from enhanced cinguloopercular (CON) and frontoparietal network (FPN) interactions which, in turn, may be more likely during more plastic (adolescence) compared to more stable (adulthood) periods of brain development. To test the relevance of shifts in CON-FPN dynamics for symptom expression in adolescent compared to adult OCD, we used functional magnetic resonance imaging (fMRI) to study pre-

to-post treatment changes in CON-FPN functional connectivity during a cognitive control task in patients from both age groups. Methods: 51 OCD and 30 healthy control (HC) adolescents (ages 13-17) and 60 OCD and 28 HC adults (ages 25-45) were scanned during a cognitive interference task, before and after CBT or an active comparator, stress-management therapy. Group Iterative Multiple Model Estimation examined person-specific, task-related functional connectivity focusing on the dorsal anterior cingulate cortex (dACC) and dorsolateral prefrontal cortex (dlPFC) regions of the CON and FPN, respectively, across time. The strength of time-lagged connectivity between these regions and within-CON density were assessed from pre- to post-treatment, in both treatment conditions and age groups, using multilevel modeling. Results: Functional connectivity of the dACC-dlPFC lagged connection increased to a level equivalent to HCs in adolescent patients only (HC > OCD adolescents at baseline), after treatment in the CBT condition only, ($b = -.34$, $p < .001$). Additionally, CON density was greater in OCD adolescents, but not adults, compared to HCs across both time points ($b = -.05$, $p < .001$). Conclusions: This study demonstrates that, for adolescent OCD patients, CBT can restore connectivity between network regions to the level of healthy controls. This pattern was not observed after treatment in adults, demonstrating the unique malleability of youth to experience neural changes with CBT.

2-L-379 Understanding the neural correlates of irritability in adolescent depression: A pilot study using a novel, co-produced hybrid resting state fMRI task

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Aims: Irritability is a core symptom of depression in adolescence and a risk factor for emotion regulation problems. However, its neural correlates are not well understood. Existing functional magnetic resonance imaging (fMRI) research on irritability typically overlook its social context. Here, we pilot a novel fMRI task that reflects the social nature of irritability in adolescence, using a co-produced design. We investigated how brain network connections differed in relation to depression and irritability scores, comparing our hybrid irritability (HI) task to a standard resting state (RS) scan. Methods: 28 adolescents (MAge=18.9 yrs; 77.4% female) with low mood were recruited through the community. Depression and irritability ratings were measured using the Revised Children's Anxiety and Depression Scale (RCADS) and the Affective Reactivity Index (ARI). The HI task comprised reading 20 irritating scenarios, which participants were asked to imagine during a RS scan. Imaging data was pre-processed using HALFpipe, and network analysis performed using CONN toolbox. HI and RS sessions were modelled as separate conditions. An AAL region adjacency matrix was calculated for each participant, and global efficiency, betweenness, centrality and clustering coefficient (CC) derived. The HI>RS difference for each was regressed by ARI and RCADS depression scores, with FDR correction. Results: The HI>RS CC of the anterior cingulate cortex (ACC) was significantly negatively associated with ARI scores (β=-0.03, $T(26)=4.98$, $pFDR=0.005$). This remained significant after covarying for RCADS depression ($pFDR=0.019$). No differences were found for other network metrics or RCADS depression scores. Conclusions: We find differences in graphical network properties of the ACC with increasing irritability, manifesting as increased dominance over a fragmented network. This highlights the important role of this emotion regulation region and its connections in the neurobiology of irritability.

2-L-381 Anxiety, externalizing behaviors, and exposure to violence: Investigating associations with amygdala-PAG functional connectivity in adolescents

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Anxiety and externalizing behaviors often co-occur and are linked to exposure to violence (ETV) across the lifespan. Individuals with comorbid anxiety and externalizing problems exhibit greater impairment than those with either symptom profile alone. Delineating neurobiological factors related to the interaction between anxiety, externalizing behaviors, and ETV could inform early identification and intervention targets. Given prior research demonstrating that anxiety, externalizing behaviors, and ETV are related to atypical neural responsivity to threat, we will use resting-state functional MRI to examine whether externalizing problems and ETV moderate the relation between anxiety and amygdala-periaqueductal gray (PAG) functional connectivity (FC), brain regions central to threat responding, in a large sample (n>4,000) from the Adolescent Brain Cognitive Development (ABCD) Study using the ABCD BIDS Community Collection (ABCC; NDA Collection 3165). ETV is assessed using the KSADS, and anxiety and externalizing symptoms using the Child Behavior Checklist. We will use hierarchical multiple regression analysis to examine associations between anxiety, externalizing behaviors, and ETV with amygdala-PAG FC and to test the hypothesized three-way interaction on amygdala-PAG FC. We hypothesize that higher anxiety, higher externalizing problems, and higher levels of ETV will each be associated with stronger positive amygdala-PAG connectivity. We also hypothesize that the association between higher anxiety and greater positive amygdala-PAG coupling will be strongest among individuals with higher externalizing behaviors and greater ETV. If our hypotheses are supported, this evidence could indicate that co-occurring externalizing behaviors exacerbate aberrant patterns of subcortical FC associated with anxiety following ETV. Taken together, this study can inform the broader literature on neurobiological factors linking ETV with transdiagnostic psychopathology.

2-L-382 Dimensions of adolescent social media use, internalizing psychopathology, and functional brain connectivity in the ABCD Study

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Emerging research suggests that the impact of social media on youth mental health is nuanced, with some individuals more susceptible to deleterious effects than others. Social media use in early adolescence is indeed increasing, with 38% of 8- to 12-year-olds using social media (Rideout et al., 2022) and almost three-quarters of adolescents acquiring a smartphone by the age of 13 in the U.S. (Rideout & Robb, 2019). During this window of early adolescence, vast changes are occurring in the structure and function of the adolescent brain. Recent research suggests that structural brain development is differentially associated with levels of adolescent social media use and mental well-being (Achterberg et al., 2022). Yet, despite the ubiquity of smartphones and social media in the lives of youth today, empirical research on the associations between social media use, mental health, and brain function is lacking. In this pre-registered study, we will use latent variable modeling to examine the differences in

functional brain networks for four distinct profiles of adolescents from the Adolescent Brain Cognitive Development (ABCD) Study (N=11,878, baseline ages 9-11 years): high or low social media users who experience either high or low internalizing psychopathology. Average resting-state functional connectivity within and between functional brain networks will be specified using the Gordon parcellation in the ABCD baseline and 2-year follow-up data releases. Social media use will be measured objectively through passive mobile sensing of social media app usage. Internalizing psychopathology will be measured by the Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS) and the Child Behavior Checklist. Sex differences and age-related associations will be tested as moderators. Through this study, we aim to elucidate potential neural mechanisms related to developmental sensitivity to social media as it relates to adverse mental health outcomes in adolescence.

2-M-216 Effects of the working memory load on involuntary attention capture by task-irrelevant sounds in children and adolescents

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Attention can be involuntarily captured by task-irrelevant sounds causing distraction. Working memory (WM) plays a key role in attention control. It has been proposed that WM load on the target task might reduce distraction by increasing attention to the task. Yet, the modulation of attention capture by WM load has been barely studied from a developmental perspective. This study investigates whether increasing WM load on the primary task would reduce the distraction by irrelevant sounds in children and adolescents. The attention control mechanism develops during childhood and shifts towards maturation after 10 years of age. Yet, current knowledge about attention development in adolescents is very limited. This study examines attention-related brain activity in children and adolescents. An auditory oddball paradigm combined with a visual n-back task is used in this study. Children (5-6-year-olds) and adolescents (12-14-year-olds) watch a series of animal pictures and also hear sounds that are irrelevant to the pictures. The experiment includes two conditions: 0-back and 1-back. In the 0-back condition, the subjects respond when they see the picture of a dog, and in the 1-back condition, when the picture they see matches with the picture they saw one trial ago. We record reaction times (RT), correct responses (CR) and EEG during the experiment. Preliminary results show that the RT was significantly slower and CR was lesser in the 1-back condition than the 0-back condition. The ERP showed a decreased amplitude in the 1-back condition around the 250-350 ms (P3) time window, which reflects a reduced attentional capture compared to the 0-back condition. The focused attention and inhibition of the distractor might share a common mechanism to insert controlled allocation of attention. As the ERP results indicate, an increased WM load might enhance attention to the target task and attenuate attention toward distractors due to the lack of available cognitive resources.

2-M-383 Reading in a foreign language could change auditory attention in adolescents: A pre-registered study combining EEG and pupillometry

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Bilingual teaching methods gain ground in educational contexts worldwide. However, investigations on the neurocognitive effects that learning in a foreign language might have upon attention and distraction are scarce. In this study, adolescents attending the 9th grade read short educational texts in German (L1) and in English (L2) while we quantified attentional distraction by task-irrelevant novel sounds using EEG and pupillometry. In an oddball paradigm, unpredictable novel environmental sounds (20%) were played within a chain of repeated standard sounds (80%) while readers were instructed to ignore the auditory stimulation and focus on reading. Compared to standard sounds, novel sounds can involuntarily capture attention, as indicated by changes in electrophysiology and pupil dilation. To highlight the focus on comprehension, readers answered a multiple-choice question after each text. With data collection still ongoing (n=13; target n>40), our descriptive results suggest relevant differences in auditory attention while reading educational texts in the L1 and the L2. Transient pupil dilation is overall larger in response to the novel as opposed to the standard sounds, but this difference is reduced when participants read in their L2 compared to their L1. This suggests reduced attention allocation to irrelevant novel sounds in the more difficult L2. Our preliminary ERP analysis reveals reduced N1 in response to the sounds while reading in the L2 compared to the L1, regardless of sound type. Lastly, whereas we observe a P3a component for novels as compared to standards, reading language does not seem to modulate this oddball effect. Our preliminary results indicate stronger bottom-up suppression of potentially distracting signals in more demanding contexts. Full inferential analyses--including reading performance and temporal principal component analyses on the neural data--will be available at the conference. Our study is pre-registered (https://osf.io/8kwdx).

2-M-384 Brain markers of distractibility in children and adults: an EEG study

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Distractibility is a state allowing one to focus while ignoring distracting information. Attention can be endogenously oriented toward relevant objects through Top-Down (TD) brain mechanisms. But attention can also be exogenously captured by a salient and unexpected irrelevant event (i.e. a distractor) through Bottom-Up (BU) brain mechanisms. TD and BU attention brain networks undergo significant development in childhood. However, it is not yet clear how brain changes may relate to attention skills during childhood. To fill this gap, we used a recently developed paradigm, the Competitive Attention Test (CAT), to characterize the electrophysiological (EEG) and behavioral development of auditory distractibility from childhood to adulthood (6-7,11-13 and 18-25-years-old; N=45). During the CAT, participants are presented with a visual cue indicating (or not) the ear in which a target sound will be played. Between the cue and the target, a distracting sound is rarely presented, allowing to measure distraction. We plan to analyze behavioral and EEG brain responses to relevant and irrelevant auditory events to dissociate the trajectories of TD and BU processes. The relation between the behavioral and brain TD and BU attention measures will also be investigated to better understand how distractibility in the developing brain can shape the child's behavior. We expect TD attention brain markers (cue effects on reaction times, CNV before and P3b to targets) to increase during development, and the responses to distracting sounds (P3 complex and the RON) to decrease with age in association

with a reduced behavioral distraction effect. Findings from this study will provide important information to develop new neuropsychological tests that seek to objectively diagnose attention deficits in children.

2-M-385 Anxiety influences perceptual processing in mid childhood: elucidating the role of cortical excitability

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In the UK, 11 year old children make the transition from primary to secondary school. This can be both an exciting and worrisome period for children and their parents. Interpersonal relationships begin to extend beyond the limits of the family as peer influences become important, and at the same time, the brain is experiencing rapid maturation, shaping cognitive and emotional processes. Understanding how brain maturation shapes cognition and emotion at this time is important to help design interventions to support children through transitions smoothly. This study aimed to understand how cortical excitability contributes to emotional and cognitive processes in girls in the last year of primary school. 49 female children aged 10-12 years old underwent a magnetic resonance spectroscopy scan of the dorsolateral prefrontal cortex (dlPFC, a key region in emotion regulation networks) to measure cortical excitability. Cortical excitability is estimated in terms of the ratio of glutamate to GABA, which reflects the balance of excitation and inhibitory neurotransmitters and is referred to as E/I ratio. Girls also performed the attention network test (ANT) and completed questionnaires on their anxieties. The results showed that high E/I ratios facilitated performance in using alerting cues and diminished performance in using orienting cues, whereas low E/I ratios had the opposite effects. Different anxiety levels were also related to bottom-up attention networks, but not executive control networks. Notably, there was no direct relationship established between anxiety levels and cortical excitability in the dlPFC. Together, results indicate the cortical excitability is closely tied to perceptual processes, and that anxiety levels can shape performance in attentional tasks. To better understand emotional behaviour, further investigations need to elucidate how anxiety relates to cortical excitability either directly, or via cognitive mechanisms.

2-M-386 Exploring Default Mode Network Connectivity following stimulant washout periods in individuals with Autism Spectrum Disorder (ASD)

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Attentional dysregulation is a common secondary symptom in individuals with Autism Spectrum Disorder (ASD), most commonly treated with stimulant medication. Stimulant washout is a common practice used to mediate the long-term effects of stimulant medication use in functional neuroimaging studies. Although this is a common practice there is little evidence supporting the full recovery of functional connectivity (FC) alterations following a washout period, even less addressing washout in ASD. Participants for this study were obtained from the Autism Brain Imaging Data Exchange (ABIDE) database (n=97; age(yrs)=12.29±2.17 (mean±SD); 82.5% male). Individuals with ASD were identified and extracted using diagnostic data confirmed through the Autism Diagnostic Observation Schedule or the Autism Diagnostic Interview. Information was gathered about stimulant medication use and washout status and three groups were determined: on stimulants (n=19), stimulant naïve (n=65), and stimulant

washout (n=13). Statistics were completed using R software where average connectivity within the default mode network (DMN) was calculated for each individual and then group-level analysis was completed confounding for the site, sex, and age. Based on an ANOVA we found insignificant differences (p=0.47) in the DMN average connectivity between the groups. This suggests that stimulant medication does not have a significant impact on the internal DMN average connectivity. These results suggest that if there are significant impacts of stimulant medication or stimulant washout on FC, they are not represented by the DMN average connectivity in individuals with ASD. Additional analysis will be done to determine if there are significant alterations in FC between regions within the DMN and other parts of the brain.

2-M-387 Neural correlates of spatial bias and reading fluency development in school-aged children

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The allocation of spatial attention has been related to neural signals of the fronto-parietal attention network in adults (Szczepanski et al., 2013). However, how the neural basis for spatial attention changes across development and how it relates to reading acquisition has yet to be established in children. Using a line-bisection task adapted for children, a recent paper found that for children ages 6-14, spatial attention is biased towards the left visual field, and its development is correlated with reading fluency (Hoyos et al., 2020). This finding suggests that the development of the reading network temporarily perturbs the attention network--potentially based on the left-to-right reading convention of the English language. Here, we take a multimodal approach to probe this question further, collecting behavioral measures of spatial bias and reading fluency, as well as resting-state fMRI and diffusion MRI measures in a separate cohort of children ages 6-12. This is a novel approach, as functional, structural, and behavioral changes throughout development have rarely been linked in the field. Using the HCPMMP1 whole brain atlas (Glasser et al., 2016), we extract resting-state functional connectivity measures and structural measures of anatomical weights, mean diffusivity, and fractional anisotropy in the native space to yield functional and structural connectomes for each subject. Using these connectomes, we identify brain regions whose functional and structural relationship predict spatial bias and reading fluency. We further assess the extent to which these behavioral measures rely on overlapping networks, and where the overlap lies. These findings will help elucidate the relationship between the development of reading and spatial attention as well as its neural correlates.

2-N-388 Phonological and semantic specialization in 9- to 10-year-old children during auditory word processing

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One of the core features of brain maturation is functional specialization. Although the adult brain is highly specialized for phonological and semantic processing, it remains unclear when and how such specialization matures during early childhood development. Previous research has found that 7- to 8-year-old children start to specialize in both the temporal and frontal lobes. However, as children

continue to develop their phonological and semantic skills rapidly until around 10 years old, whether any changes in specialization later in childhood would be detected remains to be further investigated. Thus, the goal of the current study was to examine phonological and semantic specialization in 9- to 10-year-old children during auditory word processing. Sixty-one children were asked to perform a sound and a meaning judgment task, each with both hard and easy conditions in order to examine parametric effects. Consistent with the results from the 7- to 8-year-old children, direct task comparisons revealed language specialization in both the temporal and frontal lobes in 9- to 10-year-old children. Specifically, the left dorsal inferior frontal gyrus showed greater activation for the sound than the meaning task whereas the left middle temporal gyrus showed greater activation for the meaning than the sound task. In contrast to the previously reported finding that 7- to 8-year-old children primarily engage a general control region during the harder condition for both tasks, the current study showed that 9- to 10-year-old children recruited language-specific regions to deal with the more difficult task conditions. Specifically, the left superior temporal gyrus showed more activation for the phonological parametric manipulation whereas the left ventral inferior frontal gyrus showed more activation for the semantic parametric manipulation. Overall, our findings suggest that language specialization is continuing to mature and become more adult-like at 9 to 10 years old.

2-N-389 Early Neural Signatures of Atypical Language Acquisition in Infants at Elevated Likelihood for Autism

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Objective: Passive fMRI paradigms have shown that newborns can already distinguish normal from distorted speech at the neural level (Perani et al., 2011). However, toddlers with autism spectrum disorder (ASD) display atypical brain responses to speech stimuli (Redcay & Courchesne, 2008; Lombardo et al., 2015). Here, we will examine the neural underpinnings of native language acquisition in infants at typical (TL) and elevated (EL) likelihood for ASD by comparing neural responses to native vs. non-native speech at two key timepoints. H1: Overall, EL infants will have reduced neural response to speech, reflecting diminished attention to linguistic input. H2: Across the entire sample, speech processing will be more left-lateralized at 9 months compared to 1.5 months, but EL infants will experience reduced lateralization (Eyler et al., 2012). H3: Individual differences in brain activation and laterality will predict later language skills. Methods: Participants are presented with alternating blocks of English and Japanese speech in a stimulus-evoked fMRI paradigm during natural sleep. We expect a final sample of 32 TL, 40 EL aged 1.5 months, and 22 TL, 40 EL aged 9 months after assessing data quality. Functional data will be preprocessed and analyzed using FSL, and language skills will be assessed with the Macarthur-Bates Communicative Development Inventory at 12, 24, and 36 months and the Mullen Scales of Early Learning at 6, 12, 24, and 36 months. Statistical comparisons will examine the effects of ASD risk groups (EL vs TL), timepoints (1.5 vs 9 months), and their interaction (H1). Brain activity metrics in language regions will be extracted from group results to test for laterality differences (H2) and associations with later language skills (H3) using linear regression models in R. Implications: This

investigation is expected to identify early brain-based biomarkers of later language delays associated with ASD, allowing for earlier interventions.

2-N-390 Experimentally-controlled and naturalistic neuroimaging task to study language development

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Objective: To characterize the cortical basis of cognitive function and how it changes with development, cognitive neuroscientists have used two approaches with complementary strengths: controlled experiments and naturalistic stimuli. We aimed to combine the strengths of both approaches by using rich, engaging stimuli containing carefully controlled manipulations to test specific hypotheses. We developed and tested two language tasks for future use in toddlers by manipulating video clips from Sesame Street. Methods: The first task presents 20-second edited audiovisual clips during which either a single puppet addresses the viewer or two puppets speak to each other while the auditory speech is played either forwards or backwards. The second task presents 1-3 minutes of continuous dialogue in which the interleaved speech of one character is played in reverse. We scanned 20 adults using functional MRI while they watched our two novel tasks, as well as an independent language localizer (Scott et al, Cog Neuro, 2017). Results: We found high-moderate overlap comparing the group-level responses to the three tasks for our language contrast (Forward>Backward for our tasks; Intact>Degraded for auditory language localizer). Individually-defined functional regions of interest for language responded more to forward than backward speech conditions in both tasks. Finally, using a leave-one-subject out approach, the time course of brain activity in language regions was more similar for participants who heard the same speech stream paired to each video, compared to participants who heard the opposite (i.e., opposite characters forward and reversed), in continuous dialogue. Conclusion: We were able to integrate an experimental manipulation (forward vs. backward speech) as well as naturalistic elements (engaging videos in which action unfolds over time) into a language fMRI task. These tasks illustrate a promising approach for measuring language responses in developmental samples.

2-N-391 Altered audiovisual congruency effect in late but not early ERP time windows for beginning typical vs poor readers

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Objectives Previous studies have shown deficient letter-speech sound integration and audiovisual (AV) mismatch processing in dyslexics. It remains unclear, however, how and when whole-word AV processing in children with poor (PR) vs typical (TR) reading skills differs. With an AV EEG paradigm, we therefore examined how auditory information modulates processing of subsequent congruent (con) and incongruent (inc) visual information in PR and TR. Methods 78 native German-speaking 2nd-3rd graders (8.82±0.65 y, n=42 PR, n=36 TR) participated in 128-channel EEG recordings. Children performed an explicit AV matching task involving con or inc word (W), pseudoword (PW), and object (O) stimuli. Mean event-related potential (ERP) amplitudes were extracted in early (N1: 183-243 ms) and late windows

(P2: 298-358 ms; LP: 443-503 ms). For each interval, we ran a linear mixed model with factors group (PR/TR), condition, congruency, and nonverbal IQ (covariate) to examine mean amplitude differences in representative electrode clusters. Results As expected, TR responded faster and more accurately to AV text (W, PW) than PR. Congruency and condition effects were observed in all analyzed ERPs. Stronger amplitudes were found in N1 and LP for congruent pairs, while the P2 showed the reverse effect. Importantly, a condition-congruency-group interaction in the LP indicated that the congruency effect was driven by the text conditions and was stronger in TR. Discussion Results revealed early AV congruency detection and condition differences across PR and TR. Group differences, however, were apparent only in late visual ERP components. This is in accordance with a previous AV matching study reporting diminished amplitudes for auditory processing in PR. Our data suggest similar alterations for AV text matching in PR. Such group differences underline difficulties of PR to make use of multimodal information, which may affect further reading development.

2-O-393 Individual differences in default mode network functional topography provides a link between variability in complex cognitive and basic motor abilities

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Although cognitive and motor abilities are generally regarded as distinct, there is evidence of considerable overlap in their variability (e.g., gait speed and IQ tend to be correlated within an individual). This overlap is often leveraged in clinical settings where a simple assessment of basic motor ability may be used to infer current cognitive ability and forecast cognitive decline in older adults. However, the underlying mechanisms between these links are largely unknown. Here, we examine the extent to which such correlations may reflect variability in common versus distinct functional brain networks. Traditional measures (e.g., connectivity) assume that functional brain networks are spatially identical across people; however, recent advances have demonstrated that there is substantial variation in the spatial layout of functional brain networks and that this spatial variation is related to individual differences in behavior. Accordingly, we used Multi-Session Hierarchical Bayesian Modeling (MS-HBM) to estimate individualized maps of functional brain networks (i.e., functional topography) using 27 minutes of fMRI data collected from 762 adults at age 45. We then mapped variability in age-45 IQ and gait speed, a simple index of basic motor ability, onto individualized functional topography. Analyses revealed that increased surface area of the default mode network was positively correlated with both IQ (β=0.11, p=0.003) and gait speed (β=0.12, p=0.001). We also observed that surface areas of limbic networks, adjacent to the default mode network, were negatively correlated with both IQ and gait speed. These patterns suggest that variability in gait speed reflects differences in high-order functional brain networks most often associated with IQ. This may help explain why these abilities are correlated in the same person and, moreover, why clinical assessment of basic motor abilities can inform current cognitive abilities and future cognitive decline.

2-O-394 Sex differences in intrinsic functional connectivity associated with the development of internalizing and externalizing symptoms in adolescents

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Adolescence is a period during which sex differences in cognitive and affective functioning, including abnormal development, emerge. Indeed, female adolescents are at twice the risk for developing Major Depressive Disorder (MDD) as their male counterparts and have more severe and longer-lasting depressive symptoms. Despite preliminary evidence of sex-specific relations between metrics of adolescent brain development and depression, little research has examined sex differences in intrinsic functional connectivity in the context of the progression of depressive symptoms. We collected data from resting-state fMRI and administered the Youth Self-Report (YSR) to 129 adolescents (73 females) ages 9-14 years at baseline (T1), and again two years later (T2). We conducted multi-voxel pattern analysis (MVPA) using imaging data and change in symptoms scores (T2-T1; controlling for T1) to identify patterns of functional connectivity that are associated with changes in the severity of internalizing and externalizing symptoms in boys and girls. In girls, negative connectivity of a posterior node of the default mode network (DMN) with a frontoparietal area and with a temporal node of the DMN at T1 was associated with increasing internalizing and externalizing problems, respectively. In contrast, in boys, negative connectivity between salience-motor areas at T1 predicted increased internalizing symptoms, and positive connectivity between the posterior DMN and executive control areas predicted increasing externalizing symptoms. In this study we identified sex differences that may be implicated in the development of depressive symptoms during adolescence. Elucidating neural substrates of MDD in adolescence that differentially predict changes in depressive symptoms in boys and girls using a data-driven, whole-brain approach can advance our understanding of sex differences in brain biomarkers of adolescent MDD.

2-O-395 Exploring the neural basis of fast logic

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Dual-process theories characterize thinking as an interaction between intuitive and deliberate thought processes. For instance, logical reasoning is assumed to require effortful deliberate thinking. In recent years, however, a number of findings obtained with new behavioral paradigms have questioned the traditional dual-process characterization. A key observation is that people can process logical principles intuitively without deliberation. However, the nature of this newly discovered fast logical reasoning is not clear. For instance, its neural basis has not been explored. We aim to address this shortcoming in a functional magnetic resonance imaging (fMRI) study. We'll compare brain activity and behavioral performance in a reasoning task for fast (intuitive) and slow (deliberate) trials to investigate whether intuitive and deliberate processes recruit different brain areas. Two groups of participants (Correct and Biased, based on a behavioral pretest) solved conflict and no-conflict variants of the bat-and-ball problem while in an fMRI. In conflict trials, intuitive and deliberate processes cued conflicting responses, while they cued the same response in no-conflict trials. Half of the trials were slow trials in which participants got 20s to deliberate. The other half were fast trials in which they only had 5s to think and needed to rely on intuitive processing. Those were presented in alternating blocks of either fast or slow trials. A short training intervention mid-study also explained the correct solution strategy to participants. Our main goal is to identify the unique neural basis of correct intuitive reasoning for the first time. To do

so, we'll contrast brain activations in fast and slow trials for correct and incorrect conflict responses. We'll also explore differences between pre- and post-training blocks. In particular, Biased pre-training responders were expected to switch from biased to correct intuitive conflict responses after training.

2-O-407 Screen time and brain functional connectivity: a random intercept cross-lagged panel analysis of a longitudinal adolescent cohort

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The recent widespread diffusion of screen-based devices in adolescent population has raised questions about the effects of the time spent interacting with digital screens (i.e. screen time (ST)) and adolescent brain functional connectivity. Most of the studies carried out so far used a cross-sectional design and showed functional brain alteration associated with ST at brain areas involved in control, including areas of the default mode network (DMN), and reward systems. The aim of our study was to investigate lagged and dynamic associations between ST and resting-state functional connectivity with a random intercept cross-lagged panel model (RICLPM), using for the first time, as far as we know, data from a longitudinal adolescent cohort. We studied four popular ST modes in order to test for different effects related to different content natures. Our sample included 151 adolescents ages 12-14 at study entry without any neurological illness who were assessed three times during a 5-year follow-up. We assessed ST by asking participants how much time per day they spend on social media (Facebook, Twitter or other social networking site), playing video games (on computer, cell phone or game console), watching shows or movies on television and practicing other activities on computer. The time spent in front of digital screens was operationalized into 4 categories, from 0 to 3 hours and 30 minutes or more. Resting state functional magnetic resonance imaging (fMRI) data were collected using a 3T Magnetom Trio scanner (Siemens) with a single 6-minutes scan. After fMRI data preprocessing, we analyzed functional connectivity using DMN network seed regions. Longitudinal associations between regions of interest couplings and each ST variable were investigated by RICLPM, in order to distinguish general and time-sensitive neural markers of ST risk from potential neural consequences of ST. Data are still in process and will be fully presented at Flux Conference in September 2022.

2-P-396 Maternal sensitivity at the age of 8 months associates with the child local connectivity of the medial prefrontal cortex at 5 years of age

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The quality of mother-child interaction and especially maternal sensitivity in caregiving behavior plays an important role in child's later socioemotional development. Numerous studies have indicated associations between poor mother-child interaction and brain development. However, it is not as well understood how normal variation in the quality of early caregiving associates with child's brain development. We investigated whether maternal sensitivity at 8 or 30 months is associated with functional changes in the child's brain at 5 years of age from the FinnBrain Birth Cohort Study (17 and 39

mother-child dyads, respectively, with an overlap of 13). Maternal sensitivity was assessed during a free play interaction with Emotional Availability Scales at 8 and 30 months of child's age. Task-free Functional Magnetic Resonance Imaging (fMRI) was acquired at the age of 5 years with 7-min scanning while watching the Inscapes movie. Regional Homogeneity (ReHo) maps were created from fMRI data, and multiple regression analysis were performed to assess the relation between maternal sensitivity and ReHo. Maternal sensitivity at the age of 8 months was positively associated with child ReHo values within the medial prefrontal cortex (thresholded at $p<0.005$, FWE corrected $p=0.027$, cluster size (kE) 704). Distal connectivity of this region showed no significant association with maternal sensitivity in a seed-based correlation analysis. No associations were found between maternal sensitivity during toddlerhood and brain functional connectivity. Together, these results suggest that maternal sensitivity especially in infancy may influence functional brain development; however, studies with larger sample sizes are warranted.

2-Q-217 Sex differences in the relationship between adolescent anxiety sensitivity and brain circuits related to emotion regulation

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Introduction: Adolescence is a developmental period marked by the onset of internalizing pathologies, particularly in females. Previous research has linked the onset of pathological anxiety in adolescence to deficits in emotion regulation, but the mechanisms involved remain understudied. To address these gaps, we used fMRI to examine sex differences in the relationship between anxiety sensitivity and circuits involved in emotion regulation. Methods: 66 adolescents (M/SDage=12.23/.97; 51.5% female) completed the Childhood Anxiety Sensitivity Index (CASI; M/SD=28.42/6.28), which measures sensitivity to anxiety-related physiological sensations, and an emotion regulation task during an fMRI scan. Analyses examined whether CASI moderated responses to regulation condition (regulate emotion vs. react) and stimulus valence (negative vs. neutral), along with the moderating role of biological sex. Results: CASI moderated neural responses to regulation demands in left Brodmann areas 6 and 8, with higher CASI linked to greater activation during regulate but not react. Biological sex moderated the relationship between CASI and neural responses to the stimulus valence in right orbitofrontal cortex (OFC) and frontal pole (FP). Specifically, CASI was positively related to OFC activation when encountering negative (but not neutral) stimuli in females only, whereas CASI was negatively associated with FP activation when viewing negative (but not neutral) stimuli in males only. Discussion: Our results provide novel insight into sex differences in the relationship between anxiety sensitivity and emotion regulation during adolescence, with anxious females showing heightened responses to negative stimuli in a region implicated in maintaining stimulus value and anxious males showing weaker responses to negative in a region involved in top-down control. Across sex, anxious adolescents showed higher activation during regulation in several regions involved in top-down control.

2-Q-218 Listen to Us: A mixed-methods approach to understanding the psychosocial impact of COVID-19 on adolescents.

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Adolescents may be at risk of adverse effects due to the COVID-19 pandemic. Pandemic-specific risk factors may have negatively impacted the psychosocial development of adolescents. However, not all individuals exposed to the same stressors experience adverse effects thus demonstrating resilience. Hence, in addition to risk factors, it is important to identify factors that encourage resilience during the COVID-19 pandemic. To this end, this study examined adolescents' psychosocial development and factors impacting their resilience by conducting a mixed-method study gathering qualitative data from adolescents aged 14-17, as well as quantitative data. The sample was taken from an existing panel survey we conducted one month into the first national lockdown on the impact of Covid-19 on young people aged 13-24 as part of the COVID- 19 Research Consortium Study (https://osf.io/v2zur/wiki/home/). Semi-structured interviews were performed to better explore and understand participants' opinions, behaviour, and experiences and has been missing from research on the impact of COVID-19 on young people. The same individuals who were interviewed, or took part in the existing panel survey, were asked to complete an additional survey, measuring their levels of anxiety, depression, wellbeing, and an online social evaluation task. Data analysis at the time of abstract submission is not yet complete. However, three key themes are developed from the interviews: a growing closeness to family members, a change in friendships, and a sense of missingness of their education due to the pandemic. Our project captures adolescents' dynamic experience of the pandemic and how this impacts their psychosocial development and will identify future resources that could be useful when managing difficulties and enhancing resilience within young people as a consequence of COVID-19.

2-Q-398 A Systematic Review of the Link between the Brain and Resilience in Childhood and Adolescence

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Research examining the neurobiological mechanisms of resilience has grown rapidly over the past decade. However, there is vast heterogeneity in research study design, methods, and in how resilience is operationalized, making it difficult to gauge what we currently know about resilience biomarkers. Hence, this preregistered systematic review aimed to review and synthesize the extant literature to identify neurobiological mechanisms of resilience to adversity during childhood and adolescence. Literature searches on MEDLINE and PsycINFO yielded 3,742 studies and a total of 46 studies were included in the final review. Findings were synthesized by mental health/psychological outcome and neuroimaging modality. Our results demonstrated mostly inconsistent findings, possibly due to heterogeneity in the operationalization of resilience. For example, although most studies conceptualized resilience as the absence of psychiatric disorders post-adversity, some studies also examined it as a trait using resilience measures. Nevertheless, some interesting patterns were observed. Namely, resilient trauma-exposed children/adolescents (i.e., children/adolescents who did not develop posttraumatic disorder post-trauma) generally showed increased grey matter volume across different brain regions. Furthermore, several cross-sectional and longitudinal studies also consistently reported resilience (i.e., lower internalizing symptoms following adversity) to be associated with lower amygdala activity to threat and negative emotional cues. Overall, the current resilience literature suggests that while lower

amygdala activity to negative cues may be a promising neurobiological marker of resilience, more methodological consistency across studies (e.g., definition of resilience and study design) is required for advancing knowledge in this field. High-quality replication studies with large sample size may also be beneficial for improving research in the space.

2-Q-399 Somatosensory prediction among preschool children : a cross-sectional study

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Background: Sensory prediction (SP) is the ability to anticipate future stimulations on the basis of previous sensory inputs. It is related to mismatch detection (MMD, the ability to detect an unusual or deviant stimulus among familiar ones), and to repetition suppression (RS, the reduction of neuronal activity when a stimulus is repeated or becomes irrelevant). This work aims to describe somatosensory RS, MMD, and SP in neurotypical preschool children. We hypothesize a deactivation in the somatosensory cortex when a tactile stimulation is repeated, a fronto-central mismatch response to deviant stimuli, and a somatosensory activation with late frontal components when the stimulation is unexpectedly omitted. Method: We aim at including 60 children from 3 age groups: 2, 4, and 6 years old. Brain activity is measured using 128-channels electroencephalography (EEG). The vibrotactile oddball-omission protocol contains 290 trials (200ms-long vibrations that feel like moving on the skin on the anterior part of the forearm). RS is quantified by comparing amplitudes of potentials evoked by the first (familiarization) and the last (control) 40 standard trials. In between, 30 deviant stimuli (movement is reversed) are presented among standards and used to evaluate the MMD (amplitude difference between deviants and standard), and 30 omissions to evaluate SP (significant neuronal activation compared to baseline in the absence of an expected stimulus). So far (N=13), we observe a strong RS from 2 years of age. We need more participants to analyze MMD and SP. General implications: There is still little information on tactile processing in children despite the importance of this modality in understanding sensory impairments associated with neurodevelopmental disorders. If somatosensory predictive mechanisms can be quantified from 2 years old, they could be used as early markers to screen for atypical neurodevelopment among vulnerable populations, such as premature neonates.

2-Q-400 Transcriptomics, development, and the parcellation of the human cerebral cortex

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Objective: Transcriptomic contributions to the functional and anatomical parcellation of the human cerebral cortex (HCC) has become a major interest in cognitive neuroscience. Recent research shows that active transcription of a small set of genes contributes to large-scale gradients and functional hierarchies in the HCC, with recent work from our lab showing that different sets of genes contribute to anatomical and multimodal organization of regions throughout HCC. While our work has largely explored the relationship between transcriptomics and parcellations of the adult HCC, here, we aim to examine the relationship among transcriptomics, development, and the parcellation of the HCC using the BrainSpan atlas (BSA). Methods & Results: The BSA contains RNA sequencing samples from various brain regions across 31 developmental stages from 8 gestational weeks to 40 years of age. Using the top

200 genes identified in our previous work that have different molecular functions and biological processes contributing to the anatomical and multimodal parcellation of HCC, we mapped the expression of these 200 genes in the developmental samples and applied distance metrics to examine how the expression of these 200 genes changes over time within and between regions. Our preliminary data identify a potential cyclic pattern of expression change in which periods in late prenatal, late childhood, and late adolescent stages have the greatest difference in the expression of the 200 'adult' genes compared to other stages. Furthermore, some functional regions seem to have similar developmental trajectories (such as M1 and S1) while other regions (such as V1) have unique developmental trajectories. Conclusions: Altogether, these preliminary findings suggest that the expression of important organizational genes in adulthood vary in their expression across development in a potential cyclic pattern that is either i) shared between a subset of regions or ii) unique to other regions.

2-R-240 Do infants and adults process others' actions differently based on others' linguistic group?

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The perception of others' actions is influenced by social cues such as group membership and prejudice. Seeing actions of an out-group member relative to an in-group has been found to decrease the extent to which participants mimic others' actions and activate brain regions associated with action perception. Here, we aim at exploring the developmental roots of the influence of social cues on attentional and perception-action coupling mechanisms. We focus on language as a relevant social category that conveys social meaning to people--but which is underrepresented in psychological research about social categories. Previous studies found that infants show a preference for familiar-language speakers. Here, we asked if 9-month-old infants' attention toward others' actions is influenced by others' linguistic group. In 2 studies, 64 9-month-old infants preferred to attend to the actions of a familiar vs unfamiliar language speaker while both grasped a toy side by side, but they showed no preferences when presented with static pictures of both speakers. We plan to follow-up on these results investigating how linguistic cues modulate the neural correlates of action perception. As a first step, we will collect EEG data of 40 adults while they observe the actions of familiar and unfamiliar language speakers. Event-related alpha (8-12Hz) and beta (15-25Hz) suppression over central-parietal areas will be compared as a function of the speaker's linguistic group. We hypothesize that adults may show greater alpha suppression when observing the actions of familiar vs unfamiliar language speakers, which could indicate different allocation of attention to process the goal and sensory consequences of the action. However, we expect no differences or the opposite pattern in the beta band, which has been related to computations of movement parameters. These studies will provide critical grounding to better understanding and further exploring the consequences of early-emerging social bias.

3-A-23 Dynamic Multi-Layer Neuronal Networks Supporting Working Memory and Emotion: Insights from Graph Theory

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Brain activity supporting working memory (WM) is dynamic; adapting and accessing flexible neuronal networks to meet task demands. In electroencephalography (EEG), theta(4-8Hz) and alpha(8-12Hz) band activity support WM, yet their network dynamic activity has been less clear: how does EEG band network activity adapt from moment to moment? The current study investigated these networks in two affective WM tasks: one for updating (n-back) and one for inhibition go/no-go task (AGNG). Methods: 30 participants had EEG recorded via 64-channel BioSemi Active2 system during WM tasks. n-back: participants identified images (from International Affective Picture System) presented 1 or 2 items-ago. GNG: participants withheld a pre-potent response to a particular affective category. For each task and affective category (positive, neutral, or negative) we extracted evoked power in theta and alpha for each node (electrode) and the correlated between-node activity as the network edges. Analysis: Overall theta and alpha power were consistent with previous research: elevated theta and reduced alpha for targets in the n-back and lures in the AGNG. Clustering coefficients will be compared across task and valence. Overall centrality and clustering quantified static network features. We then created a multi-layered temporal network over each average task trial and extracted dynamic network communities. Dynamic network community number and flexibility will be compared across task and valence, and we will use these features in supervised machine learning to determine the degree to which task or valence may be predicted. Implications: These results would be the first to differentiate dynamic features that support WM. This is an important first step to better understand real-time neuronal network processing with better sensitivity. This work would lay the foundation to learn how these networks form, develop, and adapt to meet task demands.

3-A-236 Neural correlates of working memory moderate the association between perceived neighborhood threat and externalizing symptoms in youth

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Neighborhood threat is consistently associated with increased risk for externalizing problems, including aggressive, oppositional, and delinquent behavior. However, there is considerable variability in how youth respond to neighborhood threat. Recent evidence suggests impairments in working memory (WM), a core executive function involved in storing and manipulating information, may increase risk for externalizing problems among youth who experience neighborhood threat. Yet, it remains unclear whether alterations in neural systems underlying WM play a similar role in conferring risk for externalizing among youth who experience neighborhood threat. Furthermore, while accumulating research suggests threat in different social contexts may have distinct influences on brain development and behavior, most research on neighborhood threat does not account for youth's experiences in other social contexts such as their schools and families. Utilizing data from the Adolescent Brain Cognitive Development StudySM we identified four profiles of youth based on threat in their neighborhoods, schools, and families: low threat in all contexts; elevated family threat; elevated neighborhood threat; and elevated threat in all contexts. The Elevated Neighborhood and Elevated All profiles showed diminished WM performance (d') during an emotional n-back task relative to the Low Threat and Elevated Family threat profiles. However, only the Elevated Neighborhood threat profile showed parallel

decreased fMRI activation in frontoparietal and dorsal attention networks during the WM task. Further, decreased patterns of WM-related fMRI activation were associated with higher externalizing symptoms among youth with higher probabilities of membership in the Elevated Neighborhood threat profile. Together, these findings indicate that threat in youth's neighborhoods, in particular, may influence brain development related to WM function and contribute to risk for externalizing.

3-A-402 Error monitoring, social observation, and fear of negative evaluation in Chinese adolescents

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Objective - Unlike other forms of anxiety, social anxiety appears to be specific to social settings. Thus, it is critical to study social anxiety within social contexts. Moreover, the developmental period of adolescence is marked by increased social motivation and heightened concerns of peer evaluation. Fear of negative evaluation (FNE) has been proposed to be one of the essential underlying constructs in social anxiety. Thus, the main aim of this study was to examine how individual differences in FNE among adolescents relate to neural measures of error monitoring in social and nonsocial settings. Method - The current sample consisted of 30 adolescents from mainland China (mean age = 16.98; 16 female, 14 male), 27 with usable EEG data. EEG was recorded while performing a flanker task under two conditions: once while being observed by a gender-matched peer, and once while not being observed. Social anxiety and FNE were measured by self-report surveys. The error-related negativity (ERN) was computed as a neural measure of error monitoring. Results - An ANOVA model identified a significant interaction between social context and response accuracy. Post hoc analysis suggested that ERN was more negative in the social condition than the non-social condition. Additional correlational analyses revealed that FNE was significantly correlated with ERN under the social condition ($r = -.452$, $p = .027$), but not in the nonsocial condition. In contrast, social anxiety was not significantly correlated with ERN in either condition. Conclusion - Social observation increased the ERN. While magnitudes of the ERN were not correlated with individual differences in overall ratings of social anxiety, individuals with a higher level of FNE, in particular, exhibited an enhanced ERN in the social evaluative context, specifically. Future work with larger sample sizes should further examine the link between FNE and neural correlates of error monitoring within real-world social contexts.

3-A-405 Intergenerational Effects of Maternal Depression on Brain Structure, Function, and Child Psychopathology

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Background: Maternal depression is a robust intergenerational risk factor--contributing a 2-4-fold greater risk for psychiatric disorders among offspring and increasing risk for deficits in cognitive control processes. Unknown is whether maternal depression has intergenerational effects on the structure and function of control circuits in mothers and their school-age offspring, contributing to the emergence or escalation of childhood psychopathology. Method: Multimodal MRI data were acquired from 50 dyads

(children: Mage =7.83; SD=0.82 years; mothers: Mage=34.60; SD=6.14 years) enrolled in an ongoing study. Mothers self-reported on their current depressive (CES-D) and their child's (RCADS) symptoms. Structural data were processed using Freesurfer; RSFMRI networks were processed with the DECAN pipeline; components were isolated using FSL Melodic Independent Component Analysis (ICA) and examined within dyads in relation to psychopathology, controlling for age, sex, and ethnicity. Results: Maternal depression trended with child internalizing symptoms (p=.08) and was associated with thinner cingulo-opercular regions in mothers (left anterior insula [AI; p=.001]) and their children (right inferior frontal gyrus [IFG; p=.02]). Frontal-DMN connectivity in mothers, i.e., weaker anti-correlation, associated with maternal depression (p=.001) and predicted child frontal-DMN connectivity (p=.003) and greater child internalizing (p=.003) and externalizing (p=.000) symptoms. Conclusion: Maternal depression is associated with structural and functional alterations in control circuits in mothers and their children, which may contribute to child internalizing and externalizing symptoms. Subsequent analyses in a larger sample will index similarity across dyadic brain profiles and relate dyadic structure-function to maternal depression, controlling for additional variables (e.g., poverty, trauma), in order to identify potential treatment targets for intergenerational psychopathology

3-A-410 Do conversation disruptions in early childhood predict executive functioning and externalizing psychopathology?

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Conversational turn-taking requires both linguistic and executive functioning (EF) skills, including processing communication while simultaneously forming and inhibiting responses until one's socially appropriate turn. Children's verbal turn-taking skills are associated with stronger verbal and cognitive outcomes; however, frequent interruptions and overlapping speech may impair turn-taking. Given that language and EF development rely on overlapping prefrontal circuitry, frequent conversational disruption may impede the development of EF and increase risk for developing externalizing psychopathology. In a longitudinal study of 275 socioeconomically diverse mothers and their 3-year-olds, we performed a pre-registered analysis examining whether conversational disruptions (utterance overlaps and interruptions) predicted EF in the short-term (9 months later) and externalizing pathology in early adolescence (age 10-12 years). Contrary to hypotheses, greater conversational disruptions were associated with better EF performance and marginally with lower externalizing symptoms, controlling for the child's sex, age, socioeconomic status (SES), and language ability. These effects were driven by maternal-initiated disruptions. Exploratory analyses revealed that SES moderated these relationships, such that disruptions had a more positive association with EF skills for lower SES children, and no association in higher SES children. Ongoing analyses investigate whether cooperative interruptions, in which caregivers express engagement with the child speaker, may be positive for language and EF in certain contexts.

3-A-411 When is intra-individual variability adaptive in children? Testing effects of training on going and stopping.

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Fluctuations in performance are a hallmark of cognitive processing, and recent research shows that intra-individual variability (IIV) measures of performance are more sensitive to developmental differences than conventional mean measures. This has resulted in a wealth of investigations using IIV measures, which generally assume that reductions in IIV over development are adaptive. However, it is not yet clear whether and how such fluctuations (and their adaptive nature) is modulated by repeated practice across distinct cognitive processes during childhood. Leveraging on the malleability of inhibitory control during childhood, here we tested how repeated practice modulates IIV of two well-defined cognitive processes: stopping and going. A group of 208 6-11 year-old children underwent an 8-week inhibitory control (experimental group) or response speed (control group) training, and completed the stop-signal task both before (T0) and after (T1) training. An ex-Gaussian approach was used to generate mean (mu) and IIV (sigma, tau) measures of stopping and going at T0 and T1, while Gaussian mean and SD measures were extracted for each training week. We found that, after the training, the control group showed better going performance and reduced sigma. Instead, the experimental group showed better stopping performance and, surprisingly, increased sigma and tau. We also found that over the training weeks both groups improved training performance in going and stopping, respectively, however the control group showed reductions in going SD while the experimental group showed increases in stopping SD. These findings challenge our current understanding of IIV in cognitive processing during childhood, with implications for developmental and intervention studies.

3-A-420 Developmental changes in cognitive control among girls and boys with ADHD: Associations with ADHD symptom progression

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Introduction: Findings suggest boys, compared to girls, with Attention-Deficit/Hyperactivity Disorder (ADHD) show greater improvement in response inhibition into adolescence and that better childhood inhibition predicts greater reduction in ADHD inattentive symptoms (DeRonda et al, 2021). This study examined whether similar developmental patterns are observed for other cognitive control (CC) measures and associations with clinical scales. Method: Data were obtained from 286 participants (ADHD: n=175, 53 girls; typically developing (TD): n=111, 43 girls) using a cross-sectional and longitudinal design (age at first visit: M=11.7, SD=2.6). A subset (n=66) completed one or two follow-up visits, after age 12, at least 2 years apart. Participants completed CC tasks: go/no-go (GNG), stop signal (SST) and flanker. Measures of response inhibition (ComRate), response variability (tau), inhibitory control speed (SSRT, SSD), interference control (flanker congruency effects) and parent-ratings of ADHD symptoms (ADHD-RS-IV) and executive dysfunction (ED; BRIEF-2) were obtained. Mixed effects models tested developmental changes in CC across diagnosis and sex. Correlation and regression analyses examined whether childhood CC performance predicts change on clinical scales among children with ADHD (n=32). Results: Mixed model analyses revealed significant Diagnosis x Sex x Age interactions for inhibition measures (GNG ComRate: p=.019; SST ComRate: p=.006, SSD: p=.028, SSRT: p=.021), but not for interference control. Diagnosis x Sex subgroup comparisons revealed girls with ADHD showed increasing

CC impairments into adolescence compared to TD girls and boys with ADHD. Among children with ADHD, poorer CC in childhood predicted less improvement in parent-rated inattentive symptoms and ED. Conclusion: Our findings help address heterogeneity in ADHD, supporting the value of CC tasks as biomarkers for predicting ADHD/ED progression and suggest that girls with ADHD show greater impairment.

3-B-403 Neural Correlates of Emotion Regulation in Racial Discrimination's Effect on Internalizing and Externalizing Symptoms in Black American Adolescents from the ABCD Sample

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Racial discrimination in adolescence is a pathogenic psychosocial stressor that is associated with risk for the development of psychopathology in minoritized youth. Recent empirical findings suggests that differences in the activation of neural correlates associated with emotion regulation may moderate the link between adversity and psychopathology. The aim of the present study is to examine whether adolescents' neural response to emotional cues moderates the effect of racial discrimination on internalizing and externalizing problems. Using a subset of 720 Black adolescents (Mage = 11) from the Adolescent Brain and Cognitive Development study, we tested whether experiences of interpersonal discrimination predicted internalizing and externalizing symptoms 12 months later. We then tested if frontolimbic and temporal neural responses to negative emotional faces differentially moderated this association. We found the blood-oxygen-level-dependent (BOLD) signal to negative faces in brain regions associated with emotion processing significantly moderated this link. As the BOLD signal increased, the effect of discrimination on internalizing symptoms increased and as the BOLD signal decreased, the effect decreased. Next, we found the BOLD signal in response to negative faces in brain regions associated with emotional control moderated the link between racial discrimination and externalizing problems. As the BOLD response decreased in these regions, the effect increased. The psychological effect of discriminatory experiences are pernicious and our research aimed to show that these effects are not linear. We found that the heterogeneity in youth brain responsivity to emotional stimuli may function as a moderator of the effect of discriminatory experiences on youth's risk for psychopathology. These findings inform prevention programs and policymaking. Because the brain is malleable, a preventive intervention program can be employed to attenuate these effects.

3-B-409 The Role of Social Anxiety and Sensitivity to Delayed Reward on Parental Accommodation Behavior

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Parents often modify their routine to accommodate socially anxious children. This temporarily curbs a child's distress, but can increase long-term symptom severity. Accommodation may also temporarily curb parental distress, particularly among socially anxious parents. The basic drive for immediate gratification, quantified by sensitivity to delay, or delayed discounting (i.e., the degree to which immediate rewards are valued more than those obtained after a delay) may potentiate accommodation

in socially anxious parents. In 78 parents, we tested the extent to which frequency to accommodate varied as a function of social anxiety and sensitivity to delay measured by a monetary delayed discounting task. More severe parental social anxiety was associated with more frequent accommodation ($r = 0.26$, $p < .05$). Sensitivity to a delay moderated the relation between social anxiety and accommodation ($R2 = .114$, $F(1, 74) = 10.36$, $b = -.294$, $p = .002$) in an unanticipated way. More severe social anxiety symptoms were associated with more frequent accommodation among those who were relatively insensitive to delay (Johnson-Neyman < -1.503). Exploratory analyses showed that among non-socially anxious parents, greater sensitivity to delay was associated with more frequent accommodation ($N = 23$, $r = .683$, $p < .001$). Data suggest that interventions aimed at curbing parental accommodation should differ for socially anxious and non-anxious parents. Targeting symptoms, such as fear of social evaluation when their child is being reactive, may be critical for socially anxious parents. Conversely, targeting the general need for immediate gratification may be critical for non-socially anxious parents. Future work should test these relations in the other clinically relevant contexts (i.e. childhood irritability, disruptive mood dysregulation disorder).

3-B-421 Differences in the neural processing of dynamic expressions in toddlers born preterm

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Introduction. Research investigating emotional processing in young children has mainly used static facial emotional expressions. Little is known about how dynamic information modulates children's neural responses. To fill in the gap, this study examined event-related potentials (ERPs) to dynamic facial expressions in toddlers. Methods. The sample consisted of 15 toddlers born preterm (nine male children, M = 2.75 years, SD = 0.64 years, range = 1.65-4.12 years) with 20 data points in total due to pre-and post-intervention visits. Stimuli consisted of short 1,000-ms dynamic facial expression videos in which the race of the actress matches the child's race. The electroencephalogram (EEG) was recorded using a 64-electrode Brainvision ActiCHamp system with a sampling rate of 1000 Hz. EEG data were processed using HAPPE (Lopez et al., 2021). Fz and Cz were averaged. A time-window of 330-530 ms was chosen to extract Negative component (Nc). N290, P400 and late positive potential (LPP) were also extracted from given time windows. For each of the four components, peak and mean amplitude and peak latency were computed and entered in the repeated ANOVA models. Results. Analysis performed on the Nc peak amplitude revealed a marginally significant effect of condition, $F (2,38)= 3.18$, $p = 0.05$, $\eta 2p = 0.04$. Post-hoc analyses showed a larger Nc peak in response to angry faces ($M = -11.50$ µV, $SD = 5.75$) than to happy faces ($M = -9.06$ µV, $SD = 4.92$), $t (20)= -2.30$, $p =0.03$, unadjusted, $d = 0.51$. Conclusions. Our results indicate that toddlers are more sensitive to angry faces than to happy faces. On the other hand, previous infants studies reported larger Nc response to happy faces than to angry faces, indicating infants do not process threat (Grossmann et al., 2007; Quadrelli et al., 2019; Schupp et al., 2004). Our findings suggest that the development of threat processing and its underlying neural mechanism occur in the early two to four years of life.

3-B-58 Morality and disgust in children with Autism Spectrum Disorders (ASD)

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Objective:Physical disgust leads to harsher moral evaluations in typical developing (TD) individuals. Children with ASD experience abnormal disgust processing, yielding abnormal avoidant behaviors. Further, they may have impaired moral processing and difficulties maintaining social relationships. However, how impaired disgust processing may be related to moral decision making in ASD has not been investigated. Methods:We will recruit 40 children with ASD and 40 TD children, ages 8-17. Individual differences in disgust processing will be measured by the Disgust Propensity and Sensitivity Scale - Revised. Participants will listen to pre-recorded vignettes with morally violating (e.g., urinating in a public pool), physically disgusting (e.g., touching a worm), and negatively-aligned (e.g., watching a sad movie) behaviors. Children will use Likert scales to rate the behavior of the main character in these vignettes. For each group, half the participants will be randomly assigned to a room with a mildly disgusting odor (odor-priming subgroup), while the others in an odor-neutral room (non-odor priming group). Expected Results:We expect children with ASD to rate accidental situations harsher than the TD group. In line with prior studies, we expect the odor-priming TD subgroup to rate the same scenarios more harshly than the non-odor priming TD group. However, we expect odor-priming to have no significant effects in the ASD group, due to atypical embodied disgust processing. We also expect these results to vary with nuances in individual disgust propensity and sensitivity. Implications:While it is well known that many children with ASD exhibit abnormal disgust processing, research on moral disgust in ASD has been limited. Greater understanding of disgust processing in children with ASD could yield a better understanding of how sensory and social difficulties are related in ASD, and may contribute to targeted interventions for individual needs.

3-D-101 Higher corticostriatal fractional anisotropy at 9-10 years predicts urgency at 11-12 years: Preliminary evidence

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Objective: Urgency, the tendency to act rashly in response to extreme positive and negative emotions is associated with risk for several psychiatric conditions. Due to typical neurodevelopmental processes, adolescents may be particularly susceptible to risky behaviors (e.g., substance use) linked to high levels of urgency. We sought to identify the extent to which an indirect index of fiber collinearity (fractional anisotropy; FA) in white matter tracts implicated in risky behaviors (i.e., corticostriatal tracts; CS) could help predict urgency two years later. Method: Adolescent Behavior Cognitive Development (ABCD) study data from 305 participants (49% female, 56% White, 15% Black, 16% Hispanic, 12% Other) with no major neurologic/psychiatric conditions or exposure to alcohol/other substances were included. Two linear regression models were used to assess the effects of left and right CS mean FA at 9-10-years old on urgency (abbreviated youth UPPS-P scale) at 11-12-years while controlling for baseline urgency, sociodemographic factors (age, sex, race, pubertal level, parental income), and study site. Results: Baseline urgency accounted for 6.5% ($p<.001$) of variance in urgency at follow-up. Left and right CS FA accounted for an additional 1.0% ($p=.067$) and 1.4% ($p=.030$) of variance, respectively. FA in right CS

tracts (β=.58, SE=.27, p=.030) and to a lesser extent in left (β=.49, SE=.27, p=.068) was positively associated with urgency at follow-up, suggesting that fiber collinearity in tracts implicated in risky behaviors could help explain higher levels of urgency at follow-up above what could be explained by baseline urgency alone. Conclusions: Future work should examine whether developmental changes in CS white matter are also related to changes in urgency in childhood and adolescence and whether this information could help better predict the emergence of urgency-related psychiatric conditions (e.g., substance use disorders, eating disorders) in adolescence.

3-D-97 Brain-iron neurophysiology and its relationship to the effects of reward- and methylphenidate-related dopaminergic modulation on response inhibition in children with ADHD and typically developing children

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Children with ADHD exhibit impairments in response inhibition that are ameliorated by dopaminergic modulation. This effect has been demonstrated via administration of both rewards and dopamine (DA) agonists like methylphenidate (MPH), the current first-line treatment for ADHD. It is currently unclear, however, whether intrinsic DA availability impacts the effects of dopaminergic modulation on response inhibition. Thus, the goal of this project is to test whether within-subject variability in intrinsic DA availability is related to responsivity to dopaminergic modulation. To examine this, 36 medication-naïve children with ADHD and 30 typically developing (TD) children (8-12y) underwent fMRI scans and completed standard and rewarded versions of a Go/No-Go task. Children with ADHD participated in a double-blind, randomized, placebo-controlled, crossover MPH challenge. MR-based assessments of tissue iron, estimated by normalization of the fMRI T2* signal sensitive to non-heme iron, are correlated with DA availability and will thus be used as an indirect indicator of DA-related neurophysiology. Linear regressions covarying for age and sex will examine the relationship between tissue iron in the basal ganglia and response inhibition performance. In both groups, we will assess whether variability in tissue iron predicts responsivity to reward. In the ADHD group, we will also assess whether variability in tissue iron predicts responsivity to MPH with and without the presence of rewards. Statistical tests in each analysis will be FDR-corrected at $p<0.05$, separately for each group. We hypothesize that individuals with higher brain tissue iron will exhibit better response inhibition and greater improvements in response inhibition following the administration of rewards and/or MPH. This study will clarify the role of basal ganglia DA-related processes in the cognitive effects of reward- and MPH-related dopaminergic modulation in children with ADHD and TD children.

3-G-132 Low interoceptive accuracy as a neural mechanism linking childhood trauma with adolescent psychopathology

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Childhood violence exposure is associated with increased risk for psychopathology, often beginning in adolescence. Difficulties with interoception - the perception of the body's internal visceral state - have been proposed as a mechanism contributing to transdiagnostic risk for psychopathology in adolescence. However, interoception and its associated neural pathways remain unexplored in children or adolescents. The proposed study will investigate the following hypotheses: 1) violence exposure is associated with lower interoceptive accuracy on a heartbeat counting task; 2) interoception elicits activation in anterior insula; 3) violence exposure is associated with lower interoception-related activation in the insula; 4) lower interoceptive accuracy and lower interoception-related activation in the insula are associated with greater transdiagnostic psychopathology. The sample for this study is 80 adolescents aged 13-18 years, over half of whom have some exposure to violence. As of submission, data has been collected on 68 participants, 64 of whom completed the MRI scan. To measure violence exposure, we will create a violence exposure composite. To measure transdiagnostic psychopathology, p-factor scores will be calculated. In the scanner, participants push a button with their finger every time they detect a heartbeat while their heart rate is measured. BOLD activation during heartbeat detection compared to pushing the button once a second is used as a measure of neural activation during interoception. For individual differences analyses (hypotheses 3 and 4), a spherical region of interest will be centered on the voxel with peak activation during interoception vs. counting seconds within an anatomical insula mask. Findings from this research would establish the neural mechanisms of interoception in adolescence and provide mechanistic insight into the link between violence exposure and psychopathology, informing preclinical interventions for trauma-exposed youth.

3-G-406 Early Parenting Intervention Effects on Amygdala Volume and Associated Internalizing Symptoms Among High-Risk Adolescents: A Randomized Clinical Trial

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We examined the long-term causal effect of an early attachment-based parenting program (Attachment and Biobehavioral Catch-up; ABC) on adolescents' amygdala volume and associated depressive symptoms. Participants included 81 adolescents at risk for early caregiving adversities. Their mothers had been randomly assigned to participate either in the ABC (N = 39, M/SD ages: at time of intervention=1.22/.515, at time of MRI=13.5/.403) or a control parenting intervention (N = 42, M/SD ages in years: intervention=1.11/.572, MRI=13.4/.338) before the children were 2 years old. Adolescents completed T1- and T2-weighted structural MRI and self-reported on their depressive symptoms using the Children's Depression Inventory 2. FreeSurfer 6 was used to process MRI data. We found significant group differences in left amygdala volume, such that adolescents who had received ABC had significantly smaller left amygdalae than adolescents who had received the control intervention. Moreover, smaller amygdala volume was associated with fewer depressive symptoms, suggesting that smaller left amygdala may be protective against depression in high-risk contexts during adolescence. Our results suggest that the ABC intervention is causally linked to differences in structural amygdala development, which may lead to fewer mood problems during adolescence. Considering that optimal amygdala development supports healthy emotion regulation, ABC may support emotional wellbeing through more favorable brain development 11 years after the intervention was completed.

3-G-412 White matter volume and multi-toxicant exposure in young children

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Exposure to neurotoxic chemicals has become increasingly common, both in the United States and across the globe. Rodent research suggests that frequent exposure to chemicals commonly found in ambient air, food, housing materials, and personal care products may harm the developing brain, particularly the developing white matter. However, no studies to date have concurrently measured developing white matter structure and exposure to more than one chemical class in young children. In the present study, exposure to flame retardants, phthalates, pesticides, and air pollutants were assessed via silicone wristband, a proxy for ambient exposure over 1 week, in N= 82 children (age 4.5 - 9.7; 53.7% female), N= 67 of whom also successfully underwent structural magnetic resonance imaging. A principal components analysis was conducted with all chemical compounds detected in the wristbands, and compounds most representative of each chemical class were selected for inclusion in multivariate regression analyses. Controlling for age and sex, associations were detected between white matter volume and the pesticide cis-chlordane (β= 0.23, t(63)= 2.14, p= .036) and the phthalate DINP (β = -0.25, t(63)= -2.36, p=.034). These preliminary results have implications for policymakers, pediatricians, parents, and all those who wish to protect the developing brain.

3-G-415 Topological network properties of resting-state functional connectivity patterns are associated with metal mixture exposure in adolescents

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Background: Exposure to neurotoxic metal adversely impact cognitive, motor, and behavioral development. Only few studies have addressed the underlying brain mechanisms of metal-associated developmental outcomes. Furthermore, metal exposure occurs as a mixture, yet often consider only a single exposure. In this cross-sectional study, we investigated the relation between exposure to neurotoxic metals and topological brain metrics, such as global, local efficiency and centrality measures, in adolescents. Methods: In 193 participants (53% females, ages: 13-25 years) enrolled in the Public Health Impact of Metals Exposure (PHIME) study, we measured concentrations of five metals (manganese, lead, zinc, copper and chromium) in biological matrices (blood, urine, hair, and saliva) and acquired resting-state functional magnetic resonance imaging scans. Using graph theory metrics, we computed caudate eigenvector centrality (EC) and efficiency (global:GE; local:LE) in 111 brain areas (Harvard Oxford Atlas). Weighted quantile sum (WQS) regressions were used to examine association between metal mixtures and each graph metric (GE, LE or EC), adjusted for sex and age. Results: We observed significant negative associations between the metal mixture and GE and LE (β_GE = -0.004, 95% CI [-0.006, -0.002]; β_LE= -0.011, 95% CI [-0.02, -0.003]). Blood lead (18%) and hair chromium (17%) contributed most to this association. The metal mixture was positively associated with EC in the caudate

(β_EC = 0.625, 95% CI [0.144, 0.825]). Blood manganese (24%) and copper (11%) contributed most to the mixture association. Conclusions: Our results suggest that exposure to the metal mixture during adolescence reduces the efficiency of integrating information in brain networks at both local and global levels. Results further suggest these associations are due to combined join effects to different metals, rather than to a single metal.

3-H-337 Subcortical brain volumes in children of parents who attempted or died by suicide: Adolescent Brain Cognitive Development study

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Introduction Suicidal behaviour runs in families, but little is known about neurobiological substrates of risk transmission. Subcortical brain regions are important in emotion processing. We studied differences in subcortical brain volumes as a function of parental suicidal history in school-aged children from the Adolescent Brain Cognitive Development (ABCD) baseline assessment. Method Quality T1 neuroimaging data, lifetime parental suicidal history, and study covariates were available for 9,918 children (mean age 9.9 years). Lifetime history of suicide attempt or death in either parent (n = 621) was used to create a binary parent suicidal history variable. Linear mixed effects models (lme4 in R) were fitted to examine associations between parental suicidal history and volumes in 14 subcortical brain regions (bilateral: amygdala, putamen, hippocampus, caudate, nucleus accumbens, pallidum, thalamus). Fixed effects were age, income, sex, MRI platform, and intracranial brain volume. Nested random effects were used to account for the effects of family within research site. The Benjamini-Hochberg procedure was used to control for the false discovery rate. Follow-up specificity analysis added history of parent psychopathology and parent depression as fixed covariates. Results Parental history of suicide attempt or death was associated with smaller left and right putamen volumes (left putamen: Cohen's d = -0.13, pFDR<0.05 ; right putamen: Cohen's d = -0.13, pFDR<0.05). Controlling for parent general psychopathology and depressive history rendered suicide specific effects nonsignificant. Conclusion Neurobiological differences can be detected in children of parents with lifetime suicidal behaviour as early as ages 9-10 in brain regions implicated in reward processing. These differences are explained by parent general psychopathology and depression. Results provide a preliminary basis for investigation of biological mechanisms underlying inherited suicide risk.

3-H-418 The association of Brain age with pubertal timing and How they relate to psychopathology

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Individual differences in the timing of pubertal maturation have been linked to increases in psychopathology and the development of underlying brain systems during this period. However, few longitudinal studies investigate the relation between pubertal timing and brain development. Additionally, adolescence coincides with changes in brain structure that are triggers for mental disorders. Recently, normative indices of brain age (index for brain development) and puberty age (index for pubertal timing) have been associated with psychopathology. Comparing these indices, which

are similarly defined by deviations against age, in predicting psychopathology would be valuable. Data was sourced from the Adolescent Brain Cognitive Development Study and the Human Connectome Project Development. Brain age models, as well as three puberty age models(from hormonal assays, physical measurements, and their combination), were trained to model brain and pubertal maturation. mixed-effect modeling was used to investigate associations between three puberty age models and global/regional brain age. We compared the models based on their predictive capabilities across a range of psychopathologies. Results indicated that an earlier puberty age predicts brain age longitudinally. The physical puberty age was the best model to predict brain development. The brain development in the temporal lobe and subcortical regions were most prominently implicated by puberty age. Puberty age could significantly predict many psychopathology dimensions, but brain age was not associated with psychopathologies in the ABCD cohort. This study highlighted the importance of pubertal development as a predictor of psychopathology and brain development in adolescence. This could be taken into account in early diagnosis and intervention. Finally, this study showed that puberty age could better capture early normative deviations associated with psychopathology that are not detectable solely from brain age information.

3-H-419 Regional specificity of structural brain alterations in autism: A pilot voxel-based morphometry meta-analysis

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Introduction: Autism is a neurodevelopmental condition diagnosed on the basis of differences in social communication and the presence of repetitive behaviors and circumscribed interests. Despite recent efforts, structural brain alterations and their regional specificity are incompletely understood. Here we conducted a pilot study to establish the feasibility of using a harmonized voxel-based morphometry (VBM) protocol across multiple independent cohorts to examine the structural neural correlates of autism. Objective: Characterize the regional specificity of brain structure alterations in individuals with autism compared to neurotypical subjects. Methods: The ENIGMA VBM pipeline (https://sites.google.com/view/enigmavbm) was used to perform a meta-analysis on T1-weighted brain MRI data from 278 participants (152 with autism, 126 neurotypical controls; 80.6% male; 5.2-46.6 years old) across 5 publicly available datasets from ABIDE and the NIMH Data Archive. Specifically, we assessed gray and white matter volume differences between the autism and neurotypical groups by using the DARTEL VBM pipeline and controlling for intracranial volume (ICV) and age within each site. The resulting T-maps were then meta-analyzed using Seed-based d Mapping (SDM). Threshold-free cluster enhancement (TFCE) was applied to correct for multiple comparisons. Results: We found decreased white matter volume in the corona radiata, fornix, tapetum, and subcortical white matter of the temporal operculum in the autism group compared to the neurotypical group. After correcting for multiple comparisons, no significant differences were found in gray matter volume between the autism and neurotypical groups. Conclusions: These analyses demonstrate the feasibility of using a meta-analytic VBM approach to characterize neuroanatomical alterations in autism. Our future work will expand on these findings by including a substantial number of additional cohorts.

3-I-351 Evaluation of brain network segregation using resting state functional MRI in pediatric brain tumor patients treated with proton beam therapy

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Objective: Mechanisms of cognitive injury in pediatric brain tumor (BT) patients are poorly understood and biomarkers predicting cognitive deficits are lacking. Resting state functional MRI (rsfMRI) can evaluate large-scale brain networks to provide insight into neural changes that follow diagnosis and treatment. This project studied functional brain network segregation in pediatric BT patients treated with proton beam radiation therapy (PBRT). Methods: rsfMRI scans were acquired from 21 pediatric patients (4 female, 17 male) with any brain tumor diagnosis treated with PBRT. Data were processed to reduce contamination, and correlation matrices were generated using all gray matter voxels. Brain network segregation (BNS) was measured and compared to 112 age-matched controls. Analysis included comparison of BNS in association systems (comprised of default mode, frontoparietal, dorsal attention, language, salience, and cingulo-opercular networks) and somatosensory systems (including auditory, visual, and somatomotor networks). Clinical factors were evaluated for relationships to BNS. Patients underwent cognitive testing using the NIH Toolbox Cognitive Domain (NIH-TCD). Results: Median age at PBRT was 10 years (range 2.2-17.9). PBRT volume was whole brain in 11 and conformal in 10. rsfMRI occurred at a median time of 3.1 years (1.0-5.9) after PBRT. Average BNS of association systems was significantly lower in patients than in controls (t= -7.6, p<10^-10), but there was no significant difference in BNS of somatosensory systems (p=0.8). There was a trend towards worse BNS in association systems in patients <10 years old at PBRT (p=0.09). Patients demonstrated deficits in cognitive testing as assessed by the NIH-TCD, but there were no significant relationships between score and BNS. Conclusion: Pediatric BT patients treated with PBRT demonstrated normal BNS in somatosensory systems but decreased BNS in association systems, which control high-level cognitive processing.

3-L-191 Neural correlates of working memory in adolescents with suicide attempt, suicidal ideation, and nonsuicidal self-injury

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Introduction: Prior studies identified abnormal working memory function in individuals with suicide ideation (SI) and suicide attempt (SA). The hippocampus plays a central role in memory; piror studies found abnormal hippocampal volume, resting state connectivity, and gene expression in individuals with SI or SA. However, the functional relevance of these hippocampal abnormalities is poorly understood. This study examined hippocampal activation during a working memory task in adolescents with lifetime SA; current active SI, passive SI, and nonsuicidal self-injury (NSSI). Methods: 7,576 children (3,445 girls) from the ABCD study completed measures at 2 timepoints (T0: M = 119 months; T2: M = 143 months). Participants completed an n-back task (2-back vs 0-back) during fMRI. SA, SI, and NSSI were measured by KSADS (groups did not overlap). Results: Left Hippocampus (LH). Activation in LH was unrelated to SA, p = .145. Higher LH activation predicted higher odds of current, active SI, F(1, 13474) = 3.960, p = .047 (OR

= 1.380, 95% CI = 1.005 to 1.896). LH activation marginally predicted odds of passive SI, F(1, 13,487) = 3.77, p = .052. Right Hippocampus (RH). Higher RH activation predicted higher odds of lifetime SA, F(1, 13,473) = 5.392, p = .020 (OR=1.410, 95% CI = 1.055-1.885). RH activation was unrelated to active SI, p = .121. RH activation predicted higher odds of passive SI, F(1, 13,487) = 4.407, p = .036 (OR=1.296, 95% CI = 1.017 to 1.652). NSSI. Left (p=.343) and right (p=.526) hippocampal activation was unrelated to odds of current NSSI. Conclusion: The results suggest hippocampal activity during working memory is a promising marker of adolescent suicide risk. Results remained significant after controlling for severity of psychopathology (CBCL), and were specific to SI/SA (vs. NSSI).

3-L-372 Basal ganglia connectivity in adolescent myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS)

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Background: Profound, unexplained fatigue is a hallmark symptom of adolescent ME/CFS. Disturbances within basal ganglia networks connecting the thalamus, limbic system and higher cortical areas are strongly implicated in fatigue pathophysiology, yet differences in basal ganglia network connectivity between adolescents with ME/CFS compared to healthy controls has yet to be explored. Objectives: Using a network-based approach, this study aims to examine basal ganglia connectivity in adolescents with ME/CFS compared to healthy controls and how this relates to the primary symptoms of fatigue, cognition and pain. We hypothesise the ME/CFS group, as compared to controls, will show reduced structural connectivity within basal ganglia networks, and this will be associated with fatigue severity. Methods: 48 adolescents aged 13-18 years (25 ME/CFS) were recruited. Participants underwent diffusion and T1-weighted MRI scans, cognitive testing (CogState Computerized Testing of Cognitive Function) and self-report measures assessing fatigue severity (PedsQL Multidimensional Fatigue Scale) and pain (PedsQL Pediatric Pain Questionnaire). Streamlines tractography was performed using QSIprep 0.15.3 with an MRtrix3 multishell ACT-HSVS pipeline combined with a Brainnetome246 parcellation scheme to create structural networks. Planned analysis: Network measures of integration (global efficiency), segregation (local efficiency), and centrality for basal ganglia regions and networks will be compared between cases and controls. General linear models controlling for demographic variables will be used to assess associations between network metrics and behavioural data (z-scores of CogState and PedsQL subscales). Implications: As there is no established aetiology or treatment for adolescent ME/CFS, identifying neural substrates associated with the condition will enhance understanding of this complex illness and support development of targeted treatment in this population.

3-L-375 Atypical functional connectivity of the amygdala relates to emergent sensory symptoms in infants at an elevated likelihood of autism

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Background: Sensory over-responsivity (SOR), an extreme negative response to sensory stimuli, is a common and impairing symptom of autism spectrum disorder (ASD) linked to amygdala hyperactivity

and atypical functional connectivity (FC) in adolescents (e.g., Green et al., 2015). Despite evidence that SOR is an early-emerging symptom of ASD, the associated underlying neurological mechanisms are unknown (Wolff et al., 2019). Objective: To explore the stability of parent-reported SOR in the first year of life and identify related atypical FC of the amygdala in early infancy. Methods: At 6 weeks, infants with and without a sibling with ASD (elevated likelihood of ASD; ELA, n=37 and typical likelihood of ASD; TLA, n=37, respectively) completed an 8-minute resting-state scan during natural sleep. Parent report on Infant Toddler Sensory Profile-2 sensitivity items at 3, 6 and 12 months were used to measure SOR. FMRI analyses were thresholded at z=2.3 and cluster corrected for multiple comparisons at p<.05. FC of the right and left amygdala with the full brain were compared between groups and correlated with SOR in the ELA group only (n=21). Results: There were no significant group differences in SOR or FC. Within the ELA group, SOR scores showed significant stability across 6 to 12 months (r=.53 p<.001), but not 3 to 12 months r=.29 p=.13), thus 6-month scores were used to correlate with FC. Higher SOR was correlated with greater FC between the right and left amygdala and primary and association sensory and motor cortices as well as cingulate and precuneus. Conclusions: Results suggest that parent reported SOR may be stable as early as 6 months. However, the neurobiological underpinnings of SOR may emerge as early as 6 weeks prior to the emergence of stable and identifiable SOR behaviors. Early amygdala hyper-connectivity with sensorimotor cortex could indicate heightened attention to extraneous sensory stimuli leading to emergence of atypical sensory processing symptoms.

3-L-401 Individual-Specific Resting-State Functional Connectivity as an Important Tool for Identifying Neural Correlates of Sustained and Persistent Psychotic-Like Experiences

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The present study used Adolescent Brain Cognitive Development℠ (ABCD) study data to examine associations between youth psychotic-like experiences (PLEs) with resting-state functional connectivity (RSFC). Previous research using this data has indicated that distress and persistence may be important features for distinguishing clinical relevance of PLEs in this age range. Examining individual-specific RSFC may be critically important given the heterogeneity in the course of PLEs. The current study used three waves of ABCD PLEs assessments to examine whether persistent and/or distressing PLEs showed specific associations with individual-specific and traditional group-based RSFC metrics (total n=1040). Individual-specific network surface area and within- and between-network RSFC metrics were created by template-matching cortical functional networks to each participant's data. Results indicated that overall, individual-specific surface area and RSFC were more sensitive to distress and persistence of youth PLEs compared to traditional group-based approaches. Specifically, greater distress was associated with lower individual-specific surface area in several networks (e.g., frontoparietal, ventral attention) and altered individual-specific RSFC in networks including the salience network. Greater persistence of PLEs was associated with lower individual-specific within-network frontoparietal RSFC. There were also several distress x persistence interactions, with distressing persistent PLEs showing the lowest individual-specific surface area, including for the salience network. For group-based RSFC, there was only a trend-level association for greater persistence associated with lower within-network cingulo-opercular RSFC. Overall, results highlight the utility of examining individual-specific RSFC features,

indicating that this relatively novel methodology may hold promise for identifying otherwise undetectable features associated with heterogeneous early psychosis symptoms.

3-L-413 Developmental Trajectories of ADHD Symptom Severity Predict Functional Connectivity of Reward and Salience Networks in Adulthood

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Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder of childhood that commonly persists into adulthood. ADHD is associated with negative outcomes in a number of social, economic, health, and psychological domains. Although neuroimaging research has documented alterations in brain function in youth and adults with ADHD, what remains unclear is how severity and persistence of ADHD symptoms across development relate to brain function at adulthood. Here, we analyzed resting state fMRI (rsfMRI) from 285 participants in the Pittsburgh ADHD Longitudinal Study. Participants with ADHD were recruited in childhood (7-11 years old) and followed to adulthood. In adulthood, analyzed participants completed a neuroimaging study. Using the rsfMRI functional connectivity measures of node dissociation index (NDI) and within module strength (WMS), we quantified the functional integration/segregation (FI/S) of four functional networks (default mode, frontoparietal, reward and salience) previously implicated in ADHD pathophysiology. We quantified the developmental trajectories of ADHD symptom severity by dividing the trajectories of inattention (IN) and hyperactivity/impulsivity (Hyp/Imp) symptoms separately into two components: symptom severity during childhood and the average cumulative change from initial severity over development. Using a mixed effects linear modeling approach, both initial severity and average cumulative change in Hyp/Imp symptoms were associated with increased FI and decreased FS of the reward network, as well as increased FS and decreased FI of the salience network. Conversely, initial severity and average cumulative change in IN symptoms were related to decreased FI and decreased FS of the reward network only. These findings indicate that severity and persistence of Hyp/Imp and IN symptoms have a differential impact on the functioning of neural networks underlying motivated behavior in adulthood.

3-L-417 Age-related changes in neural responses to sensory stimulation in autism

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Over 90% of youth with autism spectrum disorder (ASD) experience sensory processing atypicalities. While impairing sensory symptoms such as sensory over-responsivity improve in some autistic individuals with age, the neural mechanisms underlying these developmental changes remain unclear. Objective: To investigate age-related changes in neural responses to aversive sensory stimulation in ASD and typically developing (TD) youth. Methods: We collected functional magnetic resonance imaging (fMRI) data to examine neural activation in response to mildly aversive sensory stimuli in 53 ASD (14F) and 41 TD (13F) participants. Groups did not differ in age and sex (aged 8-18 years). Results were cluster corrected for multiple comparisons at $p<0.05$ and thresholded at $z>2.3$, with IQ and head motion covaried. We used both a correlational approach (covarying age) and a categorical approach (comparing

children, <13 years, to adolescents, >13 years). Results: In ASD, age was negatively correlated with activation in the precuneus and lateral occipital cortex, and positively correlated with activation in frontal regions, insular cortex, temporal pole and paracingulate gyrus. In TD, conversely, age was negatively correlated with activation in frontal regions but positively correlated with precuneus and lateral occipital cortex activation. When comparing age groups, ASD children showed stronger activation in occipital regions, superior temporal gyrus, insular cortex, supramarginal gyrus and cerebellum compared to ASD adolescents. However, there were no significant differences between TD child and adolescent groups. Conclusion: Findings suggest that neural activation in response to sensory stimulation may show greater developmental changes across time in ASD compared to TD adolescents, with atypical trajectories especially in frontal regions and the precuneus. These developmental atypicalities could provide insight into compensatory mechanisms for sensory processing in ASD.

3-M-404 Neurophysiological markers of attention deficits in early use of smoked cocaine

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Neurocognitive plasticity associated with executive functions and attention processing is critical for maturation throughout adolescence. These adaptive processes are also predictors of early drug consumption and increased vulnerability for developing addictions. Early cocaine consumption has been associated with cognitive impairment, characterized by attention and executive functions deficits. Smoked cocaine (SC) is the earliest intermediate product of cocaine hydrochloride (IC) production and represents a public health problem for teenagers in developing countries. Our previous results showed that the severity of these deficits depends upon the route of administration with fasters routes showing stronger impairments upon functional and structural fronto-caudal relationship associated to cognitive performance in clinically validated tasks. To further characterize this process, we assess the relation between attention and SC dependence (SCD) developed over adolescence in a sample of 25 participants who fulfilled criteria for dependence on such a drug, 22 participants addicted to IC (ICD); and 25 healthy controls (CTR) matched by age, gender, education, and socioeconomic status. All consumers had age onsets of consumption between 14 and 16 years old. We used Global Local task and measured modulations of the P-300 potential during a passive auditory oddball paradigm that evaluates brain response to violations of temporal regularities that are either local in time or global across several seconds. We hypothesized that SCD will show a reduced amplitude and similar latency of CTR and might differentiate significantly from ICD subjects. These results study will support our previous results and in an on-line task giving a level of evidence not explored before, providing a solid background with translational applicability.

3-M-408 Neurophysiology of attention (P300) in smoked cocaine dependents with and without ADHD comorbidity

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During adolescence, the brain areas responsible for executive functions, attention and behavior control are still maturing. This predisposes to greater vulnerability to transition from experimental substance use to addiction, and has been proposed this may be enhanced by attention deficit hyperactivity disorder (ADHD) comorbidity. Our previous results showed that the early use of smokeable cocaine (SC) is associated with deficits in executive functions and attention related to disrupted striatal-frontal connectivity. At the neurophysiological level, children diagnosed with ADHD present an attenuated P300 to attentional demands, a response consistent with clinically observed inattention. Moreover, no experimental online tasks have been assessed in SCD with and without ADHD. The objective of this study is assess the relation between attention and SC dependence developed over adolescence in 20 SC dependence with comorbidity with ADHD (SCD ADHD), 20 without ADHD (SCD); and 20 healthy controls (CTR) matched by age, years of education, gender, educational level, and socioeconomic status. All consumers had age onsets of consumption between 14 and 16 years old. We used the Global Local auditory task and measured modulations of the P-300 potential. We hypothesize that during the active task there will be significant differences in P-300 between SCD-ADHD and CTR, and between consumption groups, with SCD-ADHD showing a significantly reduced amplitude compared with SCD and CTR. These results will allow expanding knowledge about risk factors for substance use present in development to be used in early detection of problematic use in adolescents. Also, it contributes to the understanding of the neurophysiological bases that underlie the clinical manifestations of SCD and inform the complexity of their rehabilitation.

3-O-392 Does the brain?s anticipatory responses to driving hazards distinguish learner and experienced drivers?

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Objective: Young drivers' crash risk is highest during the first year of independent driving. The ability to detect and respond to driving hazards is a critical safety skill that improves with experience, yet the neural underpinnings of driving hazard perception and how the cognitive process develops with experience are not well understood. Using multi-voxel pattern analyses (MVPA), a data-driven whole-brain fMRI approach, we will examine task-related differences in functional connectivity between young Experienced drivers (ED) and Learner drivers (LD) as they view near crash events and routine driving. Methods: fMRI data were collected from 7 LD and 12 ED (16-21 years old) during our Driving Hazard Perception Task. LD had a learner's permit and <1,000 miles driving experience; ED had a driver's license for ≥ 2 years and drove >3,000 miles in the past year. The task consisted of 60 randomly presented naturalistic driving videos that were either Event (evasive action needed to avoid driving hazard) or Non-Event (routine driving) 30s clips. Hypotheses: 1) Across all participants, greater engagement of attention regulation and sensorimotor processing will be observed in the Event videos compared to Non-Event videos. 2) ED will show greater engagement of bottom-up attention regulation/sensorimotor processing networks during Event Videos, while LD will rely on top-down attention regulation/executive control networks. Analysis Plan: We will conduct mixed-effects MVPA to assess differences in functional network engagement between groups (ED vs. LD) as a function of driving condition (Event vs. Non-Event). Implications: A positive finding would imply that improved driving safety could be attained by

augmenting bottom-up attention regulation and sensorimotor processing. Interventions to increase the reliance on these networks should be investigated.

3-P-414 Salivary microRNA molecules may help explain clinically-relevant dMRI abnormalities in 12-17-year-old adolescents presenting with anxiety symptoms following a recent concussion

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To build upon recent diffusion MRI (dMRI) findings indicating that abnormalities in emotion regulation tracts might help explain the relationship between a recent concussion and the emergence of de novo anxiety symptoms in 105 adolescents with or without concussion, we aimed to further examine the extent to which signaling molecules of inflammation and/or apoptosis, as measured by salivary microRNA molecules (miRNAs), could help explain our dMRI findings above and beyond a diagnosis of concussion in isolation. Here, we detected 41 miRNAs in a subsample of 37 adolescents. Recognizing that abnormalities in emotion regulation tracts can be present in some, but not necessary all concussed adolescents, we examined the extent to which abnormal miRNAs (as indexed by a significant interaction between concussion and miRNA) could help explain our dMRI findings. Allowing for the testing of a large number of variables in relatively small samples, feature section techniques (i.e., regularized regressions) were used. Among these, Group-Lasso INTERaction-NET (GLINTERNET) allows for the modelling of interaction terms. Eight miRNAs (miRNA-125b_5p, miRNA-2053, miRNA-4516, miRNA-7b_5p, miRNA-4284, miRNA-630, miRNA-1253, miRNA-23b_3p) had a main effect on our dMRI findings. The best prediction models were able to explain 37% of the variance in the left forceps minor abnormalities ($F[8,28]=3.7$, $p=0.005$; adjusted R-squared=0.37) and 22% of the right cingulum abnormalities ($F[6,30]=3.7$, $p=0.033$; adjusted R-squared=0.22) across all participants. Importantly, the concussion by miRNA-2053 interaction (27-28% in each prediction model) provided a greater contribution than concussion alone (0.1% and 3% respectively). These findings suggest that miRNAs, which reflect signaling pathways of cellular processes (e.g., inflammation, apoptosis), might help better explain neural correlates of symptom-domains (e.g., anxiety) emerging after injury in adolescents with a recent concussion.

3-P-416 Dimensional ADHD symptoms are associated with advanced measures of white matter microstructure in late childhood

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Introduction: Categorical attention-deficit/hyperactivity disorder (ADHD) diagnoses have previously been associated with conventional measures of white matter microstructure. However, ADHD symptoms are continuously distributed in the population, and the association between ADHD and more refined microstructure metrics remains poorly understood. Objective: Characterize the association between dimensional ADHD symptoms and white matter microstructure using advanced diffusion models. Methods: Participants consisted of 9- to 10-year old children from the community-based ABCD

study (discovery/replication cohort: 3,394/3,394 youth). Dimensional ADHD symptoms were quantified using the Child Behavior Checklist Attention Problems subscale (discovery/replication: 7.1%/7.6% t-scores>65). Microstructure measures were derived using advanced restriction spectrum imaging (RSI) and traditional diffusion tensor imaging (DTI) in 21 white matter regions of interest (ROIs), with FDR correction across ROIs in the discovery cohort. Group-level analyses included standard nuisance covariates, with follow-up analyses also covarying for intracranial volume. Results: RSI and DTI measures exhibited significant and replicable associations with ADHD symptoms across multiple white matter tract ROIs. Greater ADHD symptoms were related to lower intracellular directional diffusion (ND), intracellular total diffusion (NT), and fractional anisotropy in association and limbic tract ROIs (|std. betas|=0.03-0.06), as well as lower ND and NT in superior corticostriatal tract ROIs (|std. betas|=0.04-0.05). Supplemental analysis adjusting for intracranial volume yielded similar ND and NT findings in association tract ROIs (|std. betas|=0.03-0.05). Conclusions: We found significant and replicable associations between ADHD symptoms and white matter microstructure in late childhood, such that higher symptoms were associated with lower neurite density and white matter integrity in association and limbic tracts.