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2017 Poster Abstracts

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1-A-1 Social Interaction Recruits Mentalizing and Reward Systems in Middle Childhood

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Social cognition develops in the context of reciprocal social interaction. However, most neuroimaging studies of mentalizing have used non-interactive stimuli (e.g., descriptions of fictional characters) and may not reflect real-world mentalizing. Recent adult studies have shown that social-interactive context modulates activity in regions linked to social cognition, attention, and reward, but few interactive studies have been done with children. The current fMRI study examines middle childhood (ages 8-12, N=16), a period of increasingly complex peer interactions accompanied by social-cognitive advances. Using a novel paradigm in which children believe they are chatting online with a peer, we compared mental and non-mental reasoning about a live partner (Peer) versus a story character (Character), testing the effects of reasoning type and partner type in a 2 x 2 design. Consistent with prior research, mental versus non-mental reasoning engaged the mentalizing network, including the temporo-parietal junction and anterior temporal lobes. Furthermore, similar regions, plus anterior and posterior midline regions, were engaged more for Peer than Character, even when the task did not require mentalizing. Across reasoning type, Peer also more strongly engaged reward regions (ventral striatum and orbitofrontal cortex). Our results demonstrate that social interaction modulates both mentalizing and reward networks during middle childhood and contribute further evidence that social-interactive paradigms are needed to fully capture how the brain supports social processing.

1-A-2 Probing the biased competition theory of selective attention in the developing brain: An fMRI study in school-aged children

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Different functions of attention are associated with distinct developmental trajectories. Prior work found that stimulus-driven attention functions mature by 6 years while top-down control continues to improve in late childhood. However, neural mechanisms underlying attention functions during development remain unclear. Here, we used hypotheses derived from the biased competition theory of selective attention to explore the neural basis of visual attention in elementary school children (age 6 to 12). According to the theory, multiple stimuli that are present simultaneously compete for neural

representation due to the limited processing capacity of the visual system. We hypothesized that such sensory competition would be observed in multiple areas of the visual processing hierarchy in the child brain, as previously shown in the adult brain. We test the hypothesis by comparing the neural responses to multiple stimuli presented either simultaneously or sequentially in the periphery of the visual field. The degree of sensory competition is also quantitatively evaluated in multiple topographically organized areas. Our results on sensory competition will show a neural correlate for the limited processing capacity of the developing visual system and thereby provide a neural basis for the filtering of unwanted information during attentional selection. The results of these studies may have implications for a better understanding of attention-related deficits in neurodevelopmental disorders.

1-A-3 Greater learning-dependent change in hippocampal systems relates to reward learning

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The ability to encode and incorporate contextual information is enhanced during the adolescent period and is thought to be driven by the refinement of hippocampal systems, supported by peaks in reward sensitivity that facilitate experience-dependent plasticity. Building on initial diffusion imaging studies that suggest changes in the structural properties of hippocampal systems after short-term training, we investigate structural changes after a rewarded spatial learning task using the Magnetization Transfer Ratio (MTR), sensitive to myelin content. Specifically, we investigate short-term learning dependent changes in the hippocampal-cortical spatial learning system, in a sample of 80 adolescents and adults (range = 18-30y; M = 23.4, SD = 3.6) that performed a task in which they explored a grid map with squares of varying reward probability. A total of 46 participants passed inspection for artifacts in both pre- and post-task MTR images. We found that MTR significantly increased following the task and this change was positively associated with multiple indices of spatial learning in the fornix, hippocampus, and parahippocampal cortex (PHC), but not in a control region (occipital pole). Further, the degree of change in MTR significantly decreased with age in the PHC, suggesting heightened plasticity during adolescence that decreases into adulthood. Together, these findings provide compelling evidence for experience-dependent plasticity facilitating associative memory encoding that may underlie developmental improvements in spatial learning that persist into adulthood.

1-A-4 Prospective memory in adolescence and adulthood

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Prospective memory (PM) is the ability to remember to perform an intended action after a delay. FMRI studies in adults have associated PM with activity in the rostrolateral prefrontal cortex (RLPFC, including Brodmann area 10). There are few behavioural studies investigating PM in adolescence, with mixed evidence regarding further behavioural development after age 13. To our knowledge, there are no fMRI studies of PM in adolescence, which is warranted since the RLPFC exhibits protracted functional and structural development until adulthood. In this study, we compared changes in PM performance and associated neural correlates in 28 typically developing adolescents (12-16 years) and 19 adults (23-30 years). In the ongoing task, participants had to indicate the relative position of a triangle compared to another shape. In infrequent trials (PM task), participants had to remember to press a different key if both shapes were the same colour (cue-identification condition) or in a particular spatial configuration

(intention retrieval condition). We found behavioural evidence for improved performance for prospective memory trials independent of condition between adolescence and adulthood. Further, we documented reaction time costs for the ongoing trials, which were highest for the intention retrieval condition. These performance costs did not vary between age groups. We observed increased activity in a frontoparietal network, including bilateral RLPFC, in both adolescents and adults for prospective memory trials compared to the ongoing task.

1-A-5 Relational memory and pattern separation across the lifespan

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Episodic memory is a multifaceted process and undergoes robust age-related changes across the lifespan. Episodic memory relies crucially on relational memory ? memory for the co-occurrence of multiple elements of an event to form a cohesive episode. Another critical property of episodic memory is the ability to discriminate between highly similar events, accomplished by a transformative process termed pattern separation. Little is known about whether age-related differences in these two key processes relate to each other across the lifespan. We developed a task using dynamic and engaging animations that taps both processes in a single paradigm, allowing us to track the age-related changes of relational memory and pattern separation in young children (ages 4 and 6), young and older adults (ages 65-80). We found that relational memory improves significantly between the ages of 4 and 6, with no difference between 6-year-olds and adults. Older adults performed worse than young adults, did not differ from 6-year-olds, and performed better than 4-year-olds. Four -year-olds performed worst among all age groups in pattern separation, with no differences found among the 6-year-olds, young adults, and older adults. Replicating our previous work, we found that relational memory and pattern separation did not correlate in 4-year-olds, 6-year-olds, or young adults. Interestingly, these two processes correlated in older adults. These findings suggest that while relational memory and pattern separation may develop in a dissociable manner, their declines are coupled in normal aging.

1-A-6 Salient visual events disrupt memory-guided attention in adults but not children

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Both the sudden onset of salient visual events and spatial memories associated with specific environmental contexts drive shifts in attention orienting in children and adults. Despite extensive work examining these two sources of orienting in isolation, it remains unclear how perceptually cued and memory-guided attention interact and whether the nature of these interactions changes over time as the cognitive and neural systems supporting both memory encoding and spatial orienting develop. To probe these questions, we collected data from 27 children (7 - 12 years old) and 30 adults (18 - 31 years old) as they first learned to associate scenes with specific spatial locations and then completed a covert attention orienting task. During orienting, participants had to discriminate a target preceded by two different attentional cues: 1) a scene with an associated memory and 2) a perceptual stimulus that flashed briefly on top of the scene. The validity of the cues was orthogonalized such that on each trial, one of them, both of them, or neither of them indicated the location of the upcoming target stimulus. While children demonstrated reaction time benefits from both cues ($ps < .01$), adults demonstrated reaction time benefits from the perceptual stimuli only ($p < .001$), despite forming more precise spatial

memories than the children ($p < .05$). These data suggest that in the presence of competing, salient visual information, children use memories to orient their attention to a greater degree than adults.

1-A-7 Introducing the Human Connectome Project - Development: Behavioral, Cognitive, and Biological Measures

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The Human Connectome Project - Development (HCP-D) is a national study investigating multimodal neural correlates of neuropsychiatric and cognitive measures in healthy children, adolescents, and young adults. The study will enroll 1,350 healthy participants (ages 5-21) at four sites with extensive neuroimaging expertise. HCP-D will collect comprehensive behavioral, cognitive, and biological measures to assess how these traits relate to brain development from childhood into adulthood. Here we describe the standardized self- and parent-reports of physical and mental health, pubertal development, sleep, substance use, family environment, and early adversity that will be administered. Further, we describe the extensive neuropsychological battery administered to participants, which is designed to capture individual differences in a range of domains crucial to typical development. These include -- but are not limited to -- executive function, episodic and working memory, language, motor and sensory processing, personality/temperament, mood, and social responsiveness. These data will be supplemented by biological measures obtained via immunoassayed bio specimens. Hormonal concentrations will be quantified using both saliva and hair samples. HCP-D will also investigate putative neural correlates of diabetes and obesity risk by measuring two common prognostic indicators: hemoglobin A1c (HbA1c) concentrations in blood and body mass index (BMI). Preliminary descriptive analyses of the data collected thus far will be presented.

1-A-8 The NIMH Longitudinal Study of the Neurobiologic and Endocrine Events of Puberty: Hormonal and Metabolic Changes that Accompany Puberty in Typically Developing Children

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In humans, puberty involves the (re)activation of separate but overlapping hormonal systems that include adrenal androgens (adrenarche), the hypothalamic-pituitary-gonadal axis (gonadarche), and the growth axis, all of which may be reflected in brain changes. Our comprehensive, high-density longitudinal study aims to more precisely characterize physiologic markers of puberty beyond those typically employed and to relate those markers to brain features. Children are monitored every 8-10 months from age eight (pre-gonadarche) to age 18. Clinicians determine that each prepubertal child meets pubertal stage 1 criteria, is medically and psychiatrically well, is between the 15th and 85th %ile BMI, and has age-appropriate bone development on x-ray. A second cohort 12-13 years old are similarly evaluated and selected for longitudinal study. Puberty-related measures include gonadal and adrenal steroids (LC-MS/MS), bone age, MRI-measured gonad volume, and metabolic measures (visceral fat and body composition). Multimodal neuroimaging (MRI, fMRI, DTI) is also obtained at each visit. Trajectories

of sex-differences in adrenal and gonadal plasma hormone levels, bone ages, and selected metabolic measures will be presented. These data demonstrate the relative non-synchronization of adrenal and gonadal sex hormone exposures in pre-gonadarchal children and the failure of composite pubertal staging to predictably define a specific hormone state.

1-B-10 Neural Correlates of Improved Decision-Making as Assessed by the Iowa Gambling Task

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Decision-making on the Iowa Gambling Task (IGT) improves with age. Few studies have observed neural correlates of this improvement. Research suggests an integral role for orbitofrontal cortex (OFC) in the updating of expected values of choices during the IGT. The amygdala, insula, and nucleus accumbens also integrate responses to rewards and punishments. This longitudinal study investigated healthy adolescents' IGT performance across a ten-year span. 189 individuals (ages 9-23) completed a baseline session and were followed every two years yielding five assessments. A 100-trial IGT version was used, similar to the original IGT. Overall performance (OP; good-bad decisions), decision-making under ambiguity (difference for trials 1-40) and decision-making under risk (DUR; difference for trials 41-100) were measured at each session. Structural brain scans were acquired. Data from the baseline scan is used in this study. Linear mixed effects analyses in R were used to model metrics as a function of age. Baseline cortical thickness values and subcortical volumes for selected regions-of-interest were added to the models. Participant sex and overall task experience were controlled for. As reported previously, a linear effect of age yielded the best fit for OP. Age and overall experience with the task positively predicted OP. Lateral but not medial OFC cortical thickness also positively predicted age-related changes in OP and DUR. Analyses of the brain data are ongoing and other regions may emerge as additional significant predictors.

1-B-11 How do D2R-expressing MSNs in the dorsomedial striatum contribute to goal directed choice?

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A lack of flexibility and insensitivity to negative outcomes is characteristic of multiple psychiatric disorders. Previous data from our lab and others implicate the activity of D2 receptor-expressing medium spiny neurons (D2R MSNs) of the dorsal medial striatum (DMS) in action selection, avoidance behavior, and response to negative feedback. In order to test the hypothesis that D2R MSNs of the DMS play an active role in inhibiting choice after negative outcomes, we employed the chemogenetic tools hM4Di and hM3Dq to selectively inhibit or excite D2R MSNs in mice during the recall and reversal phases of a 4-choice odor-based discrimination task. We predicted that inhibiting D2R MSNs would not affect recall of a learned contingency but would impair the ability to inhibit choosing the previously rewarded odor after reversal. However, we found that inhibition of D2R MSNs did not significantly alter recall or reversal performance. In contrast, chemogenetic excitation of D2R MSNs significantly impaired task performance during the recall phase: DIO-hM3Dq mice took more trials to reach criterion, due to more frequent selection of unrewarded odors. Our data therefore do not support the common working model in which the 'braking' activity of D2R MSNs in DMS is required for behavioral inhibition to enable flexible choice updating. Instead, our results suggest a more integrative role for activity in D2R MSNs of

the DMS in encoding the relative value of multiple cues and/or choices. In follow up, we are investigating the role of activity of D1R expressing MSNs in this task.

1-B-12 Like me back: Youths' feelings about unknown peers influences neural response during predicted peer evaluation

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In the transition from childhood to adolescence, concern with peer evaluation increases. A key component of youths' initial social evaluation of unknown peers is perceived reciprocity: how I feel about you informs how I think you will feel about me. While prior work has examined youths' neural responses as they anticipate or receive evaluation from their peers, research has not explored neural response when predicting perceived reciprocity during peer evaluation. In the present work, we examined the neural correlates of perceived reciprocity in 50 youths (age 8-16 years) as they predicted how unknown peers would feel about them (like or dislike). During an fMRI brain scan, participants viewed photos of age-matched peers and first indicated if they liked or disliked each peer, and then predicted whether each peer would like or dislike them. At the neural level, participants displayed increased activation in the ventral striatum to peers whom they liked and predicted would like them back (i.e., mutual liking); in contrast, participants displayed increased DMPFC, insula, and TPJ activation to peers they liked, but whom they predicted would dislike them (i.e., unreciprocated liking). Neither age nor gender influenced these effects, suggesting that predicting a reciprocally positive evaluation from peers is rewarding, whereas providing a positive evaluation but predicting a negative evaluation in return requires more mentalizing.

1-C-13 Working Memory-Related fMRI Activation as a Function of Pubertal Status and Sex in Typically-Developing Children and Adolescents

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Neurocircuitry underlying working memory (WM) matures through development, but effects of puberty on these neural substrates are less known. Here, we examined WM-related activation in children and adolescents, with pubertal status (PS) determined by clinicians. A total of 55 typically developing children (PS1, N=28, age=8.9±0.4 yrs, 60% boys) and adolescents (PS2-5, N=27, age=13.1±0.7 yrs, median=4, 56% boys) performed an N-back WM task during 3T fMRI scans. Data were analyzed using SPM5 for main and interactive effects of sex and PS. There were no sex or PS differences in WM accuracy, but adolescents had faster reaction times in the 1-back task (1bk). Adolescents had greater bilateral dorsolateral prefrontal cortex (DLPFC) and inferior parietal lobule activation in the 2-back task (2bk), and greater bilateral hippocampus (HIP) deactivation in 1bk than children ($p<.001$, uncorrected). Main effects of sex revealed that girls deactivated while boys activated left HIP during 1bk and left DLPFC in 2bk ($p<.001$, uncorrected). The PS-by-sex interaction analysis showed that PS2-5 boys had greater and PS2-5 girls had decreased DLPFC activation during 1bk and 2bk than PS1 ($p<.005$, uncorrected). The differential recruitment of WM regions according to sex and PS suggests that modulation of these neural substrates may emerge following exposure to gonadal sex-steroid

hormones, though larger studies with sufficient power to parse age and PS effects are needed. Additionally, future work will consider the effects of changes in endocrine and metabolic measures on neurodevelopment.

1-C-14 Relations between pattern separation ability and hippocampal subfield volume in childhood

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Episodic memory relies on pattern separation, the ability to keep similar memories separate (e.g., where you parked your car today versus yesterday). Research in adults suggests subfields of the hippocampus, dentate gyrus (DG) and CA3, work together to facilitate pattern separation. Work examining hippocampal development suggests these regions exhibit prolonged development well into childhood. However, the association between pattern separation and hippocampal subfields has not been examined during this transitional developmental period. To address this gap, the current study examined relations between performance on a modified Mnemonic Similarity Test, which reflects pattern separation, and hippocampal subfield volumes. Bilateral subiculum, CA1, and CA2-4/DG volumes were derived from ultra-high resolution T2-weighted structural MRI scans. Manual tracing was conducted on 20 cases using boundaries described in Joie et al., 2010 and used in conjunction with the Automatic Segmentation of Hippocampal Subfields software (ASHS, Yushkevich et al., 2014) to yield volumes for all participants. All volumes were corrected for intracranial volume differences. Preliminary analyses include 55 4- to- 8-year-old children. Results indicated an interaction between age and left DG volume when predicting pattern separation ability. Specifically, left DG volume was positively correlated with pattern separation ability in younger (4-6 years) but not older children (7-8 years). These findings will be discussed in relation to the developmental trajectory of the hippocampus during early childhood.

1-C-17 Individual connectomes are unique and stable in the developing brain from adolescence to young adulthood

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It has previously been shown that individuals' functional connectomes are unique and stable across multiple days. The extent to which the individual connectome remains identifiable across longer time frames has not been investigated. Using three publicly available resting-state datasets (n = 105, 98, and 26) from the Consortium for Reliability and Reproducibility, we investigated the uniqueness of the individual connectome over longer time intervals (mean test-retest of 443, 643, and 928 days; mean subject age of 19.6, 15.2, and 20.2 years, respectively). We achieved identification rates (the ability to identify individuals using only their connectivity matrix) of approximately 60% ($p < 0.0001$) using whole-brain data. Restricting the identification to specific edges, we find that edges in the frontal and parietal regions tend to lead to the highest identification rates (30-96%, $p < 0.0001$). We demonstrate that characteristic edges - edges contributing the most to a successful identification - tend to connect nodes in the frontal and parietal regions, while edges contributing the least link cross-hemispheric homologs. Edges changing strength between sessions ($p < 0.001$ uncorrected) are distributed across the entire brain, as are edges significantly correlated with age ($p < 0.001$ uncorrected). These data suggest that despite developmental changes in adolescents-to-young adults, an individual connectivity matrix

maintains its uniqueness across the span of 1-3 years, and the frontal and parietal cortices are important in defining individual uniqueness.

1-C-18 Characterizing the functional connectivity development of the Prefrontal Cortex

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The prefrontal cortex (PFC) is critical to an array of executive functions. Different regions of the PFC exhibit distinct age-related trajectories in gray and white matter morphology into adulthood. Such anatomically defined subdivisions have been applied to healthy and clinical populations to characterize developmental changes in volume and cortical thickness of PFC regions. Such an approach has not been directly applied to examine the functional maturation of different PFC regions. Thus, relative to structural trajectories, little is known about the developmental changes in connectivity of PFC subdivisions. The present study will apply a validated RS parcellation method to segment the PFC, seed-based analysis, and graph theory metrics to examine developmental changes in RSFC patterns of different PFC regions. Participants are 1000 individuals (8-21 years old) from the Philadelphia Neurodevelopmental Cohort dataset. We have three main aims: 1) to characterize patterns of age related differences in RSFC across subdivisions of the PFC using seed-based analysis. Seeds are systematically placed across the PFC to cover dorsolateral, ventrolateral, orbitolateral, orbitomedial, ventromedial, and dorsomedial regions; 2) examine degree centrality and participation coefficient to characterize developmental differences in node properties across the PFC; and 3) examine the relationship between PFC RSFC profiles and individual differences in executive functioning, as well as, psychopathology symptom measures (e.g. mood and anxiety).

1-C-20 Community Violence Exposure: Longitudinal Associations with Hippocampal Structure and Function

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Community violence is a common stressor that has been understudied with the neuroimaging literature. In a sample of 22 adolescents living in a large city, participants reported on community violence exposure (specifically, how often they had witnessed a beating, shooting, stabbing, arrest, drug deal, or other form of community violence) in early adolescence, and then underwent a neuroimaging scan an average of four years later (average age 16.92). Community violence exposure in early adolescence was associated with smaller manually traced left and right hippocampal volume in late adolescence in a model that controlled for age, gender, and concurrent community violence exposure (measured in late adolescence). These results held after controlling for family income and another form of early adversity, family aggression. Community violence exposure was also associated with stronger resting state connectivity between the right hippocampus (using the manually traced structure as a seed region) and a left frontotemporal cluster in the temporal pole, extending into the supramarginal gyrus and parietal operculum. To our knowledge, this is the first study specifically examining community violence in conjunction with brain structure and function. However, these results dovetail with other research on the effects of childhood adversity and poverty on the brain, specifically research linking adversity to smaller hippocampal volumes in adolescence and adulthood. These results suggest that even community-level exposure to neighborhood violence can have detectable neural effects.

1-C-21 Neural correlates of rewards for self and charity: prosocial development during adolescence

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Prior studies have consistently found that adolescents show more reward-related striatum activity, for monetary and social rewards, which might explain increased risk-taking behavior adolescence. Recently, it has been suggested that this adolescent-specific increase in reward-sensitivity might lead to increased prosocial behavior as well. The social reward gained from performing a prosocial action may also be stronger in adolescence, and as such increase motivation to perform prosocial actions. participants (N=160, ages 11-21) performed a task in which they could earn money for themselves and a self-chosen charity by selecting one of two options with unknown outcomes, to reveal an outcome for self, charity or both. Results indicated higher activity in the nucleus accumbens (NAcc) when winning for self than when winning for charity. There was a main effect of age for self-gain, charity-gain and both-gain: 11-14-year-olds had more NAcc activity than 15-17-year-olds and 18-22-year-olds. After the scan, participants could donate part of their participant money to charity in a coin division task. Participants who kept most coins to themselves showed higher NAcc activity during self-gain than participants who donated most coins to charity. participants who kept most coins to themselves showed lower NAcc activity during charity-gain than participants donated most coins to charity. Together, these results demonstrate a link between striatum activity and prosocial giving, and show that early adolescence is a sensitive period for reward-activity.

1-C-22 Effects of trauma exposure on fear inhibition circuitry in the developing brain

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Childhood trauma is a major risk factor for the development of psychopathology, such as posttraumatic stress disorder (PTSD). Childhood trauma and PTSD have been associated with impaired inhibition; however, most neuroimaging studies investigating childhood trauma have been retrospective. The current study investigated the effects of violence exposure on brain activation during an emotional response inhibition task in at-risk children, and investigated if altered brain response was associated with impaired fear inhibition. Forty children (8-14 y/o) were recruited from an ongoing study in a highly traumatized, African-American population. Violence exposure was measured with the VEX-R. An emotional Go/NoGo fMRI task was used to measure response inhibition and emotional response inhibition. The amygdala, vmPFC, and hippocampus were used as regions of interest. Fear inhibition was measured as the eye blink response during a fear-potentiated startle task. Violence exposure significantly correlated with amygdala, vmPFC, and hippocampal activation during response Inhibition, and with amygdala and hippocampus during emotional response inhibition. vmPFC activation negatively correlated with fear inhibition. Increased hippocampal and vmPFC activation have previously been associated with decreased risk for PTSD. Our findings may therefore represent an adaptive response to trauma exposure in this highly traumatized, but low-symptom population, at this stage of development. However, further longitudinal research is needed to determine long-term effects of altered brain activation.

1-C-23 Introducing the Human Connectome Project - Development: Task-fMRI Paradigms

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The Human Connectome Project - Development (HCP-D) launched in 2017 and is acquiring and analyzing high quality neuroimaging and associated behavioral datasets on 1,350 participants 5-21 years of age. A major component of the project is the acquisition of three functional MRI (fMRI) tasks focused on functional domains central to child and adolescent development. In the Reward task, participants make an arbitrary guess and receive feedback whether they win (if correct) or lose (if incorrect) high or low amounts of bonus money. A novel stakes manipulation allows for identification of scaling neural activity with increasing reward and punishment value. This task also induces reward and punishment associations to circular and square shapes by delivering reward or punishment feedback inside either a circular or square frame (counterbalanced). The Inhibitory Control task is a modified Go/NoGo paradigm where the NoGo cues are the circle and square previously seen in the Reward task. This design facilitates the examination of inhibitory control development in general, and how this is modulated by reward history (reward or punishment). Finally, in the Emotion task, participants complete blocks of matching shapes and faces depicting negative emotional expressions. Preliminary behavioral and fMRI results on the data collected to date will be presented. Data from these paradigms will be publicly shared along with the rest of the neuroimaging and behavioral datasets collected by the HCP-D, providing rich, multimodal data on biological and cognitive constructs across a broad age range.

1-C-24 Developmental trajectories of resting-state functional connectivity in adolescence: a longitudinal study

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Recent studies suggest age-related changes in connectivity between subcortical regions, ventral medial prefrontal cortex (vmPFC) and dorsal medial prefrontal cortex (dmPFC) in adolescence. However, a comprehensive study of network changes including longitudinal measurements is still lacking. A powerful approach to study development of functional connectivity, independent of task-demands, is resting-state functional connectivity (rsFC). In this large longitudinal neuroimaging study (N=255, 619 scans; 3 time points with a 2-year interval) we tested age-related rsFC changes in children, adolescents, and adults (8-29 years). Specifically, we assessed the developmental trajectories of rsFC (1) within a subcortical network including the nucleus accumbens, caudate, amygdala, and hippocampus, (2) between these subcortical regions and cortical midline regions, particularly the vmPFC and dmPFC, and (3) within this cortical midline network. First, results showed a strengthening of subcortical connectivity between amygdala, hippocampus, and nucleus accumbens with age. Second, striatal connectivity with dorsal regions of the mPFC strengthened with age, whereas striatal connectivity with ventral regions of the mPFC weakened with age. Finally, functional connectivity between the vmPFC and dmPFC increased with age. Taken together, these findings point towards a crucial role of the vmPFC as a convergence zone, showing decreasing connectivity with subcortical regions and increasing connectivity with dmPFC with advancing age.

1-D-27 How does peer evaluation influence hot and cool inhibitory control in adolescence and adults?

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The dual systems model has been used to explain the peak of risk-taking during adolescence (Steinberg, 2014). Although previous studies converged in showing that adolescents are hypersensitive to rewards in the presence of their peers, less is known about the direct influence of peer evaluation on adolescents' inhibitory control abilities. The aim of the present study is to examine whether hot, i.e., affectively charged contexts, and cool, i.e., affectively neutral contexts, inhibitory control abilities decrease under social pressures among adolescents and adults. Sixty-seven 13- to 14-year-old adolescents and forty-six 19- to 29-year-old adults completed two Stroop-like tasks under either a social pressure condition, i.e., in the presence of a peer evaluator, or in the control condition, i.e., task performed alone. In the Cool Stroop task, participants had to inhibit reading the color-words to identify the ink color they were printed in. In the Hot Stroop task participants had to denominate the emotional expression conveyed by faces from the NimStim database while ignoring the emotion-word displayed underneath. Findings revealed that social pressure decreases hot but not cool inhibitory control abilities among adolescents and decreases cool but not hot inhibitory control abilities among adults. The present findings expand our understanding of the influence of the socio-emotional context on hot inhibitory control during adolescence.

1-D-28 Alexithymia is associated with neural reactivity to masked emotional faces in adolescents who self-harm

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Alexithymia, a personality trait describing the inability to identify, describe, or attend to emotions, is associated with difficulties labeling brief emotional facial expressions. Elevated alexithymia has been consistently observed in youth who engage in non-suicidal self-injury (NSSI), the intentional destruction of one's own body tissue without suicidal intent. Little is known about how alexithymia subcomponents relate to the automatic neural processing of emotional facial expressions. To investigate the functional correlates of alexithymic traits while viewing masked emotional faces, we evaluated neural reactivity in 26 adolescent females with NSSI and 19 age-matched healthy controls (HC). We examined whole-brain activation to fear vs. happy faces masked with neutral faces (controlling for age, IQ, and depression severity; cluster correction: voxelwise threshold $p < .005$, cluster threshold $p < .05$), and assessed correlations between activity and subcomponents of alexithymia: difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and externally-oriented thinking (EOT). In the HC group, EOT was negatively related to right frontal orbital cortex activation. In the NSSI group, EOT was positively correlated with activation in right frontal pole, inferior frontal gyrus, anterior cingulate, precuneus, temporal gyrus, bilateral lateral occipital cortex, and left cerebellum. There were no findings for DDF or DIF. Results suggest that adolescents who have poor introspective abilities and self-harm may be more alert to subtle negatively-valenced emotion cues.

1-D-29 Regulating Responses to Social and Appetitive Rewards Across Development

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Learning how to regulate one's responses towards rewarding stimuli is key to successful development. Prior work has found that adolescence is a time when individuals are particularly prone to risky and impulsive behavior, but are all reward environments created equal? This research examines the behavioral and neural correlates of appetitive regulation in development both across different forms of regulation (i.e. impulse control and reappraisal) and different reward environments (i.e. social and health). We collected both behavioral and fMRI data from participants across a wide developmental age range (6-25), who completed two regulatory tasks: 1) social impulse control (assessed via the affective go/no-go), and 2) appetitive reappraisal. We found that both successful performance in both tasks increased with age, but that the success in one regulatory domain was not predictive of success in the other. The brain data supported this dissociation account, finding that while both tasks involved down-regulation of the ventral striatum, individuals were more likely to recruit vlPFC--a region involved in working-memory and task switching during impulse control, and dlPFC--a region involved in abstract reasoning and executive control, during reappraisal. Taken together, these results suggest that while regulating responses toward different sources of reward gets better as individuals get older, self-control in one domain does not necessarily predict success in the other, and that individuals rely on distinct cognitive circuitry in order to accomplish these different regulatory goal.

1-D-30 Differential associations of distinct forms of childhood adversity with neurobehavioral measures of reward processing: Neurodevelopmental pathways to depression

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Childhood adversity (CA) is associated with alterations in reward processing, an important biobehavioral marker of risk and resilience to psychopathology. However, little is known about whether specific types of adversities exhibit differential associations with reward processing and white matter microstructure in regions of the brain involved in reward processing. In a developmental sample of 94 children and adolescents aged between 6 -19 years (Mean = 13.6, SD = 3.5 years), we investigated multivariate associations between three types of early life adversity□food insecurity, neglect and abuse with performance on a monetary incentive delay task. For 51 participants who completed diffusion tensor imaging, we examined associations of each type of adversity with fractional anisotropy (FA) of four white matter tracts connecting limbic and prefrontal regions and task performance. Food insecurity was associated with poor overall performance on the reward task. Abuse was associated with reductions in FA averaged across the whole brain and in the left external capsule. Food insecurity was associated with reduced FA in the left anterior limb of the internal capsule and greater FA in the left uncinate. Neglect was associated with greater FA in the left uncinated. Greater FA in the left ALIC was associated with better performance on the reward task in younger children. Different forms of CA have unique effects on neurobehavioral aspects of reward processing. This work may elucidate underlying mechanisms that link CA to specific forms of psychopathology across the lifespan.

1-D-31 Quantifying objective monetary reward value in adolescents and adults using a physical effort paradigm

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Monetary rewards are commonly used to induce differential value into an experimental context. However, it remains unclear whether the value of monetary outcomes is equivalent at different ages. The present study queries whether willingness-to-work for monetary reward is similar or different across development, isolating monetary reward valuation processes uncontaminated by subjective report biases. 47 adult participants aged 18-23 and a sample of adolescents ages 12-17 (collection ongoing) completed a task that involved exerting physical effort (hand grip) to earn monetary rewards. Participants viewed cues indicating the effort level required (low, high) and the monetary reward they could obtain ($0.05, $0.75), while we measured their physical effort using a hand dynamometer. The dynamometer acquires 3 objective indices of motivation: success (reaching threshold), response vigor (speed to threshold) and force (maximum grip). Initial analyses in adults show that this task is valid for indexing motivation for monetary rewards. Results indicated increased success, response vigor, and force for high versus low reward. For success and response vigor, effects were exaggerated during difficult trials. Thus, greater rewards increased the speed, strength, and overall success at exerting physical effort for monetary rewards. Future analyses will probe developmental differences in monetary reward motivation. This work will extend theoretical models of development for reward-seeking behavior and inform the validity of the common assumption that money is valued equivalently across ages.

1-D-32 Behavioral and neural correlates of social evaluation in adolescent girls

Laura Machlin[1], Adam Miller[1], Emily Munier[1], Margaret Sheridan[1]

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When adolescents believe they are being watched, they report greater self-conscious emotions and show heightened engagement of the medial prefrontal cortex (mPFC) relative to children and adults (Somerville, 2013). The present study examines how emotion ratings and neural activation while youth believe they are being watched predict emotional reactions to a social rejection. Adolescent girls 9-16 years old (N=32) completed fMRI scanning. Youth viewed a screen that said "System On" or "System Off." They were told they were being watched by a same-sex similar-age peer during "System On" but not "System Off". Youth rated degree of embarrassment, happiness, and rejection. Differences in BOLD response during System On > System Off were examined in whole-brain analyses with cluster-level correction in FSL ($z>2.3$, $p<0.05$). Following the task, youth were told the peer decided not to meet them after watching them and reading their bio. Youth then completed emotion ratings. Participants showed significantly greater engagement of the mPFC during System On > System Off, a region involved in self-conscious emotions. Embarrassment ($p<0.05$) and rejection ($p<0.01$) ratings were higher following social rejection compared to being watched. Higher rejection ratings were positively associated with scores on the Children's Rejection Sensitivity Questionnaire ($p<0.05$). Results suggest that adolescents report stronger emotions following social rejection, potentially related to mPFC activation, and that their experience of rejection predicts rejection sensitivity in real world settings.

1-D-33 The effects of a target interpersonal rejection on emotion regulation in typically developing girls: A pilot study

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Emotion dysregulation is common across psychological disorders; yet, the effects of targeted interpersonal rejections on emotion regulation are understudied. Here, we examine emotion regulation before and after an interpersonal rejection. Before an fMRI scan, typically developing girls (N=33; ages 8-16, M=12.2) selected a same-sex peer from pictures to interact with. Youth then participated in a well-known emotion regulation task (Ochsner et al). Halfway through the task, youth were told this peer would be watching them for a period of time; next, all youth were told that the peer did not want to meet after seeing them and reading their bio. Youth then completed the second half of the task. Most (91%) believed they were being watched by the peer. Youth reported higher feelings of rejection after interpersonal rejection, ($t(28)=5.03, p<.001$). On the emotion regulation task, mean affect ratings immediately after the rejection were higher than before the rejection ($t(30)=-2.22, p<.05$). Affect ratings to looking at negative stimuli were higher immediately after (vs. before) the rejection ($t(30)=-1.72, p<.10$), but regulate trials were not impacted by peer rejection. Whole brain activation was consistent with previous reports, with robust activation in dorsolateral prefrontal and anterior cingulate cortex for regulate > look trials. Results suggest that typically developing youth have stronger emotional reactions to stimuli following interpersonal rejection but are able to regulate emotions even after an upsetting interpersonal rejection when provided regulation strategies.

1-D-34 These violent delights have violent ends: Neural correlates of aggression selectivity in delinquent youth based on differential motivations

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While aggression tends to decrease with age, a small number of individuals continue to engage in high rates of delinquent behavior. Most developmental neuroscience inquiries have examined aggression unidimensionally, focusing on disturbances in empathy, impulsivity, and emotion regulation. However, a growing body of literature has focused on interactions between situational and motivational factors, highlighting the need for specificity in predicting aggression. We examined how divergent antisocial motivations may uniquely predict aggression in an adolescent sample engaged in high rates of delinquency (n=24; 12 female, 13.1-17.7 years). During an fMRI scan, participants made either fair or unfair choices (either self-interested or vindictive) while playing with confederates in a modified Dictator Game. Using HLM, we examined how antisocial traits (psychopathy, sadism) interacted with situational (self-interested, vindictive) and confederate (bully, victim) cues, revealing differential effects of psychopathy and sadism. Psychopathy related to higher rates of self-interested relative to vindictive aggression, suggesting unfair behaviors were primarily instrumental; meanwhile, sadism was related to aggression across situations, suggesting such behavior was more opportunistic. These findings are explored in relation to neural processing in social, affective, and salience monitoring brain regions. Our results provide evidence of the need to focus on specific motivations for delinquent actions and coincides with a rising call to expand explanatory models of antisocial behavior.

1-D-35 Developmental change in four-choice reversal learning coincides with puberty onset

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Cognitive flexibility is an important component of executive functioning that guides goal-directed behavior. Most studies in human subjects show age-related improvements in cognitive flexibility during set-shifting and rule-reversal tasks, with adult like performance emerging at age 10 to 15 (Crone et al., 2006; Huizing et al., 2007). These developmental increases in cognitive flexibility are supported by maturation of prefrontal regions, which may be driven by changes in pubertal hormones (Piekarski et al. 2017). However, recent research suggests that in specific contexts, pre-pubertal juvenile rodents may show more flexible goal-directed behavior relative to adults (Johnson & Wilbrecht, 2011). In the current study, we examined the effects of puberty on developmental changes in cognitive flexibility from ages 6-30 (N=56) using a positively reinforced 4-choice reversal task. This task was adapted from a rodent study, which found that change in reversal learning was driven by pubertal hormones (Piekarski et al, 2017). We found that the pre-pubertal group made more perseverative errors ($F(2,52)=5.04$, $p0<.01$) and took more trials to learn reversal ($F(52,2)=3.29$, $p<.05$) relative to both the pubertal group and adults, whose performance did not differ. Although the younger participants did not out-perform adults, the current results extend prior literature to suggest that the non-linear developmental change in flexible goal-directed behavior coincides with pubertal change, such that adult-like performance emerges at puberty onset.

1-F-36 Using multiple learning paradigms to characterize brain networks supporting adolescent learning

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Developmental researchers are increasingly recognizing the potentially adaptive functions of adolescent-specific changes in corticostriatal brain networks. Nevertheless, to date the research on the learning implications of these changes remains limited. In the present study, we aim to characterize the relationships between patterns of neural responses to feedback during a declarative association learning task, performance on a probabilistic learning task, and academic achievement. We used fMRI to scan adolescents (ages 11-16, n=28) and adults (ages 23-30, n=24), and examined responses to feedback during a word association learning task. We have previously demonstrated that adolescents and adults show strikingly similar responses to learning feedback in a network involving the striatum, medial prefrontal cortex, and posterior cingulate cortex, with subtle differences emerging in subcortical regions such as the hippocampus and amygdala. We also collected performance on a probabilistic learning task, academic records and self-reported academic achievement, attitudes, and motivation. In the present study, we will probe the relationships between neural activation in this network and multiple forms of learning.

1-F-38 Developmental experience of food insecurity impairs cognitive flexibility and alters dopamine release in the striatum in adulthood

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In the United States, 17 percent of the households with children experience food insecurity, which is defined as uncertain access to food. Epidemiological studies have found that food insecurity is associated with obesity, poor school performance, altered cognitive development, and greater risks of developing substance abuse, yet it is hard to isolate food insecurity from other variables associated with poverty in human subjects. We hypothesized that experience of food insecurity during development may have prolonged effects on brain development and behavior through differential development of the dopaminergic system. We developed a mouse model of food insecurity by limiting food and delivering variable amounts of food daily in developing mice during a 20 day postweaning and early pubertal period. We find that adult male mice (P61-70) that experienced food insecurity (FI) from P21-40 show deficits in cognitive flexibility in a 4-choice foraging reversal task compared to constant food restricted (FR) and ad libitum (AL) fed controls. Using Fast-Scan Cyclic Voltammetry (FSCV) to measure dopamine release in slices of the adult striatum from FI and AL groups, we find that there are significant decreases in evoked dopamine release in FI mice in the dorsolateral striatum, a region associated with sensorimotor learning and habit formation. We postulate that exposure to scarcity and uncertainty during development alters the cumulative lifetime activity of dopamine neurons and has downstream effects on reward and decision-making systems.

1-F-39 9-Month-Olds Use Higher-Order Contexts to Organize Working Memory Representations in the A-Not-B Task

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[1]Brown University

Rationale: Typical accounts of the A-Not-B task attribute infants' perseverative errors to PFC immaturity (Diamond, 1985), to failures of working memory (Munakata & Yerys, 2001), or to immature motor reaching (Thelen & Smith, 1998). A recent view of PFC function in infancy focuses on the role of the PFC in using higher-order contexts to organize working memory (Werchan, Collins, Frank, & Amso, 2016). We thus tested whether using higher-order contexts, in the form of multiple experimenters, helps infants organize working memory in the A-Not-B task. Method: 9-month-olds participated in a Typical Control (n=21) or in three Context conditions (n=63) that associated each hiding location with a unique context. In each condition, a toy was hidden repeatedly in the same location, which was then reversed. In the Context conditions, a new experimenter hid the toy on the reversal trials, whereas the same experimenter hid the toy in the Typical Control. If infants use higher-order contexts to organize working memory, we expected to find better reversal-trial performance in the Context conditions. Results: There was no difference in repeat-trial reaching accuracy across conditions, $F(3,80)=.992$, $p=.401$. However, reversal-trial reaching accuracy was significantly better in the Context conditions relative to the Typical Control, $F(3,80)=7.02$, $p<.001$. Our results thus indicate that infants use higher-order contexts to organize working memory, and that A-Not-B errors may reflect an inability of the PFC to adapt to a change in the higher-order context associated with a lower-order rule.

1-G-40 Quantitative Assessment of Image Quality of Sparse Functional Near Infrared Spectroscopy vs High-Density Diffuse Optical Tomography

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Functional neuroimaging in childhood may provide predictive markers of outcome. However, the loud, constraining, and stationary environment of a MRI limits imaging of the pediatric population. Optical neuroimaging with functional near-infrared spectroscopy (fNIRS) provides a compelling surrogate for pediatric neuroimaging; fNIRS technology is quiet, wearable, portable, and less sensitive to subject movement. High-density diffuse optical tomography (HD-DOT), which uses many overlapping fNIRS measurements, has been shown to provide fMRI-comparable image quality. Unfortunately, the large number of fiber optics required limits wearability as compared to commonly used sparse fNIRS systems. A key question is how the number of fNIRS measurements affects image quality. To assess this question, we used a previously published data set containing subject-matched HD-DOT and fMRI. We modeled three popular sparse grids (with 103, 74, and 56 fNIRS measurements) and extracted their representative measurements from the HD-DOT data (containing 1,200 measurements). Image quality was assessed at the individual and group levels using spatial correlations between statistical maps derived from the sparse fNIRS grids or the full HD-DOT grid, and the fMRI data. For a verb generation task, the comparison of group maps obtained from the HD-DOT system and the above-listed grids yielded spatial correlation against fMRI of 0.86, 0.38, 0.52, 0.40 respectively. A full image quality assessment of brain function response maps to visual, hierarchical language, and resting state paradigms will be presented.

1-G-41 Neural correlates of observation and imitation of human and robot hand motion in Autism Spectrum Disorder

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Imitation is central to the development of social function. Children with Autism Spectrum Disorder (ASD) often exhibit early difficulties with imitation, which has been linked to aspects of social impairment, such as poor language outcomes, deficient play skills, and atypical joint attention. However, relatively little is known about the neurobiological underpinnings of this developmental process in young people. Furthermore, it is not known what aspect of imitation presents the greatest difficulty for individuals with ASD. One possible area of interest in considering imitation deficits in ASD is the ?animacy bias??or typically ocurring preference for human vs. non-human stimuli?due to reported successes with patient-robot interaction. Thus, in order to evaluate possible animacy effects on the underlying neural mechanisms of imitation, we performed functional magnetic resonance imaging (fMRI) while child and adolescent participants with ASD and controls observed and imitated human and robot hand movements. Results showed significant differences between the ASD and TD groups, particularly in brain regions involved in social processing, such as the temporo-parietal junction (TPJ). Specifically, TD participants tended to present with significantly more activity than ASD subjects in the TPJ during the robotic hand imitation condition. Similar activation of the TPJ to both human and robot stimuli in the ASD group may suggest a deficiency in the animacy bias, which may point to one underlying mechanism associated with abnormalities in imitation and social functioning.

1-G-42 Using EEG to Assay Language Processing in Minimally Verbal Children with ASD

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Up to 30% of children with autism spectrum disorder (ASD) remain minimally verbal (MV), despite intervention. Use of electroencephalography (EEG) can contribute to our understanding of the neural

mechanisms underlying language impairment in ASD, improving our ability to predict developmental trajectories and target interventions. Verbal (V) and MV (each N=15) children with ASD (ages 5-11), along with an age-matched typically developing (TD) group (N=16) participated in a semantic congruence ERP paradigm, during which pictures were displayed followed by the expected (match) or unexpected (mismatch) spoken word. Basic auditory and visual processing components (temporal and occipital N1) were present across all three groups. The mismatch condition elicited an N400 component in all groups (F=8.58, p=.006) maximal over central electrodes, with a shorter latency in the TD group (t=-3.15, p=.003). Based on visual inspection, the N400 was evident in 14/16 TD, 13/15 V ASD and 11/15 MV ASD participants. Within the MV ASD group, participants showing an N400 response had higher scores on cognitive and language measures compared to those without, although these differences were not significant given the small sample size. Findings indicate that as a group, children with ASD, including those with minimal language, showed EEG evidence of semantic processing, along with early visual and auditory processing. An absent N400 response in 4 of 15 MV participants suggests that impairments in semantic processing may underlie language impairment in some, but not all of the MV ASD group.

1-G-44 Reduced Neural Activity in the Action Observation Network in Children and Adolescents with Autism Spectrum Disorder During Observation of Social and Motor Actions

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[1]USC

Children with ASD often have motor deficits that may be related to social skills (Dziuk, 2007). To our knowledge, no study has investigated social and motor neural processing in ASD across a spectrum of social-motor stimuli. This study aims to assess neural differences in children with and without ASD while they observe a spectrum of social-motor actions and how these differences relate to social and motor skills assessed with the Social Responsiveness Scale (Constantino, 2003) and the Sensory Integration and Praxis Test (Ayres, 1988). Children and adolescents with ASD (n=11) and typically developing (TD; n=12) participants were recruited. In the scanner (3-T), participants observed three video stimuli conditions: 1) emotional expressions (i.e., Happy), 2) Non-Emotional expressions (i.e., wiggle nose) and 3) hand actions (i.e., cutting paper) in a block design. Whole brain group comparisons were made and social and motor skills were analyzed. The ASD group showed reduced activity in the bilateral IFG compared to the TD group (p= .033, f(3.68)). Groups differed behaviorally in motor (p<.02) and social skills (p<.001). Interestingly, activity in the right hemisphere inferior frontal gyrus (IFG) during the emotional face condition was negatively correlated with social skills in the ASD group (R=-.725, p=.012) and with motor skills in the TD group (R=-.746, p=.005). These data suggest an impairment in the AON which may be related to sensory-motor as well as social mapping in the IFG. Ongoing data collection and analysis will continue to investigate these findings.

1-G-45 Infant HPA Axis as a Potential Mechanism Linking Maternal Mental Health and Infant Telomere Length

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Maternal depression has been suggested to be an independent risk factor for both dysregulated hypothalamic-pituitary-adrenal axis functioning and shorter telomere length in offspring. Currently, research has yet to investigate the association between longitudinal changes in maternal depressive

symptoms and infant telomere length, and whether such changes might be mediated by changes in infant cortisol response. In 48 mother-infant dyads, we investigated whether the changes in maternal mental health, when infants were 6 to 12 months of age, predicted change in infant cortisol reactivity over this period, and if those changes predicted subsequent infant telomere length at 18 months of age. Analyses revealed that increases in maternal depressive symptoms predicted greater changes in infant cortisol reactivity from 6 to 12 months of age (β = .019, SE = .009, 95% CI [.001, .037], p = .040). Furthermore, this increase in infant cortisol reactivity was associated with shorter subsequent infant telomere length (β= -.316, SE = .128, 95% CI [-0.574, -0.057], p = .018). Additionally, we found that changes in infant cortisol reactivity significantly mediated the relationship between changes in maternal depressive symptoms and subsequent infant telomere length (effect = -.007, 95% CI [-.027, -.001]). These findings have potentially important implications for understanding the role of parental psychopathology in biological mechanisms of disease vulnerability in their offspring.

1-G-46 Neural Substrates of Gustatory Emotion Processing in Children with Williams Syndrome and 7q11.23 Duplication Syndrome

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Hemizygous deletion or duplication of roughly 25 genes at chromosomal location 7q11.23 causes Williams syndrome (WS) or 7q11.23 duplication syndrome (Dup7), respectively. WS is associated with increased empathy and social drive, while Dup7 is linked to social anxiety and a statistical association with diagnoses of autism per se. Here, we tested for associations of 7q11.23 gene dosage with neural responses to videos of faces portraying either disgusted or neutral expressions using fMRI. Nineteen children with WS (mean age=10.9±3.93; 13 girls), 29 typically-developing controls (TDs, mean age=13.3±3.4; 11 girls) and nine children with Dup7 (mean age=12.7±3.5; 4 girls) underwent fMRI while viewing videos of people drinking beverages and making neutral or disgusted facial expressions. After preprocessing with SPM5, we performed an ANOVA to identify brain regions where BOLD activation (disgust vs neutral) was significantly associated with 7q11.23 copy number ($p<0.005$ uncorrected). Activation of the right orbitofrontal cortex (OFC) and left posterior parietal cortex (PPC) was significantly associated with 7q11.23 gene dosage. For both regions, BOLD activation increased with copy number, such that WS<TD<Dup7 (p's<0.05). These results suggest that gene dosage at the 7q11.23 locus is associated with alterations in brain activation of the OFC and PPC, both of which are brain regions important for gustatory emotion processing. Future work will relate these findings to neuropsychological measures of emotional functioning and include examinations of other emotions.

1-G-48 Social anxiety severity and age influence neural responses to social feedback

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Developmental changes in brain function and peer dynamics during adolescence often coincide with increases in social anxiety (SA) symptoms. However, most imaging research compares clinically anxious to non-anxious youth collapsed across age. Thus, little is known about potential interactive effects of the

full spectrum of SA symptoms and age on brain function during peer interactions. In this study, 112 youth (8-18 years) completed a computerized social interaction task, Virtual School (Jarcho et al., 2013), during fMRI. Previous research suggests that evaluative feedback from peers is particularly salient to SA youth therefore, the task was designed so that specific "peers" provided 100% positive feedback, 100% negative feedback ("predictable"), or 50% negative and 50% positive feedback ("unpredictable"). We ran a mixed-effects model with SA symptoms and age as continuous, between-subject variables and each feedback type as a repeated, within-subject variable. Whole brain analyses ($p<.001$, $k>41$) revealed a significant SA X Age X Feedback interaction in the superior temporal gyrus, hippocampus, and caudate, regions broadly involved in social and emotional learning. Adolescents with low, but not high, SA showed developmentally-dependent responses to negative feedback. Specifically, younger adolescents showed higher activation during predictable, compared to unpredictable, negative feedback while older adolescents exhibited the opposite pattern. These results suggest that SA and age interact in determining brain activity to negative feedback from peers in adolescents.

1-G-49 The Role of the Cerebellum in Juvenile Huntington?s Disease

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Objective: To assess brain structure and connectivity in JHD patients. Methods: The Iowa Kids-JHD program enrolls children 6-18 years of age who have already received JHD clinical diagnosis. Each child completed an MRI scan. A total of 20 children with JHD (mean CAG=70) were studied. JHD subjects were compared to a large database (n=220) of control children. Structural brain measures and DTI measures were evaluated between groups. Results: JHD group had substantially reduced intracranial volumes. After controlling for the overall small size of the brain, the striatum and globus pallidus had reduced volumes in JHD. Thalamus and hippocampus were of normal size. The cerebellum was enlarged in the JHD sample. DTI measures indicated a hyper-connectivity between the cerebellum and the striatum. Finally, the size of the cerebellum and the strength of the associated white matter tracts were directly related to abnormalities in motor function (large volume and high FA associated with worse motor scores). This suggests that the enlargement and hyper-connected cerebellum is driving the hypokinetic state in the JHD subjects. Conclusions: The primary pathology of JHD extends beyond striatum. mHTT may alter the striatal development, which spurs the cerebellar development to have greater input to the indirect pathway. In Adult Onset HD this is likely compensatory. But in JHD the striatal development is so severe that the cerebellar compensation is driven too far. Instead of facilitating function, it actually inhibits motor function, manifesting in the hypokinetic state of JHD.

Day 2, Sunday September 17

2-A-51 Attention bias to threat moderates the association of poverty and anxiety with internalizing among low-income adolescents

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Growing up in poverty has been shown to jeopardize psychological adjustment in youth across multiple domains, including cognitive, behavioral, and emotional functioning. A growing body of research

suggests that neurocognitive processing potentially links poverty and youth mental health outcomes. This study extends the literature by exploring the extent to which attention bias to threat (using a dot probe paradigm) operates independently and interactively with poverty and anxiety to predict internalizing symptoms in low-income and predominately racial/ethnic minority youth (ages 13-17) participating in the Chicago School Readiness Project (CSRP). Main effects analyses indicated that anxiety and average income-to-needs ratio (INR) uniquely predicted youth's self-reported internalizing symptoms. Among youth with high levels of attention bias to threatening stimuli, higher income and higher levels of trait anxiety were associated with higher internalizing symptoms. In contrast, higher income and higher levels of trait anxiety were predictive of lower levels of internalizing symptoms for students with lower levels of biased attention to threat. These results suggest that hypervigilance to threat may be context-specific whereby in contexts of deep poverty it serves as an adaptive and protective mechanism. In contrast, hypervigilance to threat may amplify or exacerbate internalizing symptoms of sadness and worry for youth experiencing less severe economic disadvantage and for youth experiencing higher levels of trait anxiety.

2-A-52 The functional consequences of social distraction with complex scenes: alpha oscillations and development

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We previously reported the functional consequences of social distraction on spatial contextual memory and subsequent memory-guided attentional orienting in adults. Can the effects of social distraction be seen in EEG-measured neural activity? Additionally, are there developmental differences? Twenty adults and 16 children 6-10-years-old searched for targets in 80 scenes three times each. Memory precision for target location was then tested. After a break, reaction time was measured in trials in which participants covertly oriented to targets appearing in those scenes at valid (previously learned) locations or invalid (different) locations. The effect of social distraction could be detected in EEG, with preparatory lateralized alpha oscillations (8-12 Hz) in the context of memory for non-social scenes cueing attention, but no such activity in response to social scenes, mirroring poorer memory for target locations within social scenes. In developmental analyses, eye-tracking revealed greater attentional capture by social distractors for children, followed by poorer memory performance for social scenes for both children and adults. Finally, poorer explicit memory for social scenes did not translate into differences in subsequent memory-guided attention orienting for children, whereas adults showed a greater validity effect for social scenes. In conclusion, social stimuli in complex scenes influence multiple stages of processing, from initial visual search for specific targets, to later memory for target locations and orienting attention when cued by previously learned scenes.

2-A-53 Neurocognitive development in binge-drinking adolescents with and without concomitant marijuana use

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The brain and neurocognition develop during adolescence. Recent studies have reported that compared to non-drinkers, binge-drinking adolescents show deficits across a variety of neurocognitive domains. However, investigations into concomitant marijuana use have revealed both greater and lesser impairment in concomitant users compared to those who only binge drink. This study assessed the

developmental trajectories of several neurocognitive measures in 16 binge-drinking (BD), 16 concomitant binge-drinking and marijuana-using (BD+MJ), and 78 control (CON) adolescents, across 2-4 study visits. Results show that compared to BD youth, BD+MJ youth show greater age-related improvements in executive functioning (PASAT; β's≥0.20, p's<0.05) and processing efficiency (D-KEFS color naming; β=0.29, p<0.05) over adolescence; meanwhile, BD youth demonstrate decrements in processing efficiency with age, compared to CON (D-KEFS word reading; β=0.33, p<0.01). While BD+MJ youth demonstrate deficits in working memory at age 14, prior to use (SOPT times & errors; β's≥0.12, p's<0.05), they show greater age-related improvements in these measures over time (β's≥0.43, p's<0.05), such that by age 17, performance no longer differs from BD and CON youth. BD+MJ youth show a decline in verbal memory across age compared to CON youth (RAVLT; β=0.37, p<0.01). Together, these results suggest that alcohol and marijuana use have differing and interactive influences on the development of neurocognition during adolescence, warranting exploration into the mechanisms of these substances in the developing brain.

2-A-54 Inhibiting reward-related responses requires greater frontal control than inhibiting prepotent responses alone.

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The interaction of reward-response and inhibitory control regions has been implicated in adolescent (e.g. Somerville & Casey, 2010) and adult (e.g. Zamir & Robbins, 2015) risky behaviors; however, the mechanisms through which reward disrupts inhibitory control are not yet well understood. This study aimed to directly test inhibitory control in competition with reward response in typical adults. Participants (N=41, 18y-25y) completed the conditioned appetitive response inhibition task (CARIT) while undergoing fMRI scanning. The CARIT consisted of two stages. First, reward was manipulated in a monetary incentive delay(MID) task. Participants received money for responses to rewarded but not neutral stimuli. Second, the previously rewarded(PR) and previously neutral(PN) MID stimuli served as no-go stimuli in a go/no-go task. fMRI data were pre-processed and analyzed using FSL v5.0. Behaviorally, participants committed significantly more false alarms to PR than to PN stimuli (p<.05), reflecting a reward-related disruption in inhibitory control. A full-volume comparison of correctly withheld PR trials to correctly withheld PN trials revealed significantly more activity in bilateral inferior frontal gyri and right caudate for PR than for PN stimuli, FWE corrected p<.05. Our results show that reward-linked stimuli are more likely to lead to failures in inhibitory control and require greater recruitment of frontal control areas to inhibit responses. A follow-up study investigated reward-biased attention in adolescents as one potential mechanism for disruption of frontal control.

2-A-55 Positive, but not negative, parenting in early childhood predicts both hippocampal volume and episodic memory ability in middle childhood

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Early childhood experiences associated with parenting are critical for healthy development. Research has linked severe, early maltreatment to differences in brain volume as well as a range of behavioral outcomes in children (Nelson et al., 2011). However, researchers have only recently begun to examine the role typical variations in caregiving experiences (both positive and negative) have on the developing brain and subsequent behavior (Bernier et al., 2016). Research points to the hippocampus as being a

main region impacted by the stress of early caregiving experiences (Luby et al., 2012). The present study extends this research by investigating a link between variations in parenting, hippocampal volume, and episodic memory (EM) ability, a type of memory reliant on the hippocampus, in a sample of children (N=59) overselected for maternal depression history. Observational measures of parenting were assessed at 3-5 years (Time 1). Behavioral measures of EM and structural MRI scans were conducted when children were 5-10 years (Time 2). Results indicate that positive parenting significantly predicts hippocampal head volume ($t(57)=2.66$, $p<.01$) and scores on a composite measure of EM ($t(58)=2.04$, $p<.05$). Mediation will be explored to further examine associations between these constructs. No significant associations were observed with indices of negative parenting. These results provide support for the influence of positive parenting, within the typical range, on development and suggest a possible neural mechanism through which these experiences of caregiving impact memory.

2-A-56 Overlapping regions of error-related activity across three tasks in children

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A meta-analysis of the adult literature suggests there is a set of error-related regions within task control networks that extends beyond the dorsal anterior cingulate (Neta et al., 2015). The current study investigated whether a similar set of error-related regions exist in typically developing children ages 8-13 years across three different tasks collected for two different projects: a reading comprehension study and an executive function study of twins (n=136, mean age=10.06). One twin from each pair was randomly selected to be in the analysis. Participants for the reading comprehension project completed an fMRI visit including a sentence comprehension task and a stop signal inhibition task, while twin study participants completed the stop signal task and a cued switching task. Regions of overlap during error trials on the stop signal (n=122), switching (n=54), and sentence comprehension (n=74) tasks were investigated through whole brain analyses of incorrect trials relative to baseline. Overlapping regions were then compared to error-related task control regions from adult literature. Child error networks had high correspondence to adult networks in several fronto-parietal and cingulo-opercular control regions, including bilateral parietal, left frontal, bilateral anterior insula, and dorsal anterior cingulate. Preliminary results suggest a relatively mature organization of brain error activity is in place in middle childhood. Subsequent analyses investigate the relationship between error-related activation, task performance, and a parental measure of inattention.

2-A-57 Interactive effects of alcohol consumption and peer presence on connectivity between the nucleus accumbens and the response inhibition network.

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Young adults often engage in risk-taking while in the presence of peers and under the influence of alcohol. Although studies have indicated the peer impacts on risk taking are mediated through activation of reward circuitry, (e.g., Chein et al., 2011), less is known about peer effects on brain connectivity. Furthermore, little is known about how peers and alcohol interact to affect cognition. 48 youth underwent fMRI while performing an emotional Go/No-Go, and were randomly assigned to

complete the task under the influence of alcohol or placebo. Participants completed the task alone and while under supposed peer observation. We conducted a functional connectivity analysis for each G/NG run using a seed in the nucleus accumbens (NAcc). To examine state-based changes as a result of our experimental manipulation, NAcc-connectivity maps were compared in a 2(peer v. alone)X 2(alcohol v. placebo) design. In all conditions, the NAcc showed positive functional connectivity with the ventromedial prefrontal cortex and temporal pole and negative connectivity with regions implicated in inhibition, including dorsomedial prefrontal cortex, dorsolateral prefrontal cortex (dlPFC), and the intraparietal sulcus (IPS). For participants in the alcohol condition, but not the placebo condition, peer presence was associated with greater negative connectivity between the NAcc and the response inhibition network (dlPFC, IPS). Our findings suggest that peers influence brain systems involved in risky decision-making by altering communication between regions implicated in reward and inhibition

2-A-58 Electrophysiological marker underlying behavioral inhibition, attentional disengagement, and anxiety in children

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The temperament behavioral inhibition (BI) is characterized by high fear toward novelty, potentiates risk for anxiety (Perez-Edgar & Fox, 2005), and may show difficulty disengaging from threat (Van Bockstaele et al., 2014). Event-related potential studies (ERP) indicate that an augmented P3, a marker of differential allocation of attention (Rich et al., 2005), has been related to invalid targets in at-risk children (Perez-Edgar et al., 2006; Pollak et al., 2003). The current study examines electrophysiological markers that may influence disengagement, BI, and anxiety. 137 children (9-12 years) were screened for BI. ERP measures were collected during an affective spatial cueing task (Posner, 1980) using angry and neutral faces. The validity effect was computed by subtracting RTs to angry valid (same cue-target location) from angry invalid (different location) trials. An attentional difference ERP wave was computed using target-locked ERPs (angry invalid-angry valid). Parents reported child anxiety using SCARED (Birmaher et al., 1999). An augmented P3 was associated with greater difficulty in threat disengagement for BI children, $\beta=0.09$, $p<0.01$, 95% CI [0.03, 0.16]. Children with an enhanced P3 and greater difficulty disengaging from threat exhibited greater anxiety $\beta=0.01$, $p<0.01$, 95% CI [0.00, 0.01]. We demonstrated that the P3, a higher-order cognitive marker of attentional allocation, may reflect links between temperament, attention, and anxiety.

2-B-59 Age and neural maturation predict changes in temporal discounting in the transition to adolescence

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How one values waiting for a larger reward, compared to receiving an immediate, yet smaller, reward, changes in the transition between childhood and adolescence. While previous research has emphasized the relationship between this preference and maturation as assessed by chronological age, this behavior might also relate to changes in cortico-subcortical circuitry between the ventral valuation network and the dorsal control network. In this study, we examined how age and functional connectivity between these networks predict discounting behavior between late childhood and early adolescence. Temporal

discounting behavior was measured using a validated task involving monetary compensation. We used mixed-effects modeling to assess the contributions of age and connectivity strength to predict discounting behavior. We first identified relevant connections in a longitudinal sample of 64 individuals who completed both MRI scans and behavioral assessments 2-3 times (7-15 years; 137 scans), and replicated these effects in a separate, cross-sectional, sample of 84 individuals (7-13 years). Both samples showed an increase in preference for larger, later rewards with age. Connectivity strength between cortical-subcortical and cortico-cortical connections accounted for further variance not explained by age. Controlling for age, increased connectivity between the dorsal control network was related to preference for larger, later rewards. These results suggest that individual differences in functional neural architecture account for behavioral changes typically associated with age.

2-B-60 Examining Differences in Healthy Weight vs. Overweight Adolescents in Reward Sensitivity and Cognitive Control

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Research studying reward sensitivity in adolescents have utilized monetary incentives, with a limited number of studies using addition types (e.g. food), and few studies have examined different types of rewards in the same paradigm. How the brain responds to rewards has been linked to weight gain and obesity in adults, but this has not been examined in adolescence. Here, we use behavioral tasks and fMRI to examine differences in reward type, cognitive control (inhibitory control, risky decision-making), and differences by weight status (healthy weight (HW) vs. overweight (OW)). Seventy participants (35 HW) completed an incentivized (money, food, neutral) Go/NoGo task and the Iowa Gambling Task. A subset of participants (N=30) performed a card-guessing task with three reward anticipation conditions (food, money, neutral). We measured BOLD response with fMRI to assess brain activation in a priori defined reward and cognitive control regions. Our preliminary imaging results indicate a differential response to the anticipation of food vs. neutral in the striatum and food vs. money in HW vs. OW adolescents. In HW adolescents, there was greater activation in anticipation of money vs. neutral in the right medial frontal gyrus (BA10/11). Preliminary results of the Go/NoGo task suggest a speed accuracy trade-off. Participants made more errors but had faster reaction times in the neutral condition relative to both rewarded conditions. Additional analyses in all tasks will be presented. Understanding the neurobiological risk factors for obesity are crucial for prevention efforts.

2-B-61 Incorporating the social context in neurocognitive models of adolescent risk-taking: A neuroimaging meta-analysis

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Adolescence is a developmental period characterized by heightened social-affective sensitivity. This is paralleled by tremendous maturational changes in the adolescent brain and an increase in health-risk behaviors. Prominent developmental neuroscience models suggest that a maturational imbalance between hyperactive affective systems (ventral striatum (VS) and protracted development of cognitive control systems (prefrontal cortex (PFC) may underlie adolescent risk-taking. Given that risk-taking tends to take place in a social context, a limitation of this framework is the narrow focus on affective and cognitive control regions without considering brain regions that process social information (d)mPFC, TPJ, and STS). We employed a meta-analytic Multilevel peak Kernel Density Analysis (MKDA) approach to

test the hypothesis that affective, cognitive control, and social brain regions support adolescent decision-making in social contexts. MKDA summarizes the spatial overlap of peak coordinates across studies to reveal voxels that show a consistent increase in brain activity during a specific category of psychological events (Wager et al., 2007). We included N = 17 fMRI studies in a wide adolescent age range (10-22 years old) that used tasks with a social context, which encompassed social influence, social evaluation and social decision-making. Results indicated that the neural reference space for adolescent decision-making in a social context consists of dmPFC, IFG, insula and VS. These findings provide an empirical basis to refine current models of adolescent risk-taking.

2-C-62 Influences of Sex and Pubertal Status on Structural Brain Development in Typically-Developing Children

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Neuroimaging studies show both age- and sex-specific trajectories of neurostructural development that may coincide with the pubertal transition and subsequent rise in sex hormones. Yet, little is known about the effects of puberty per se on brain structure. Here, we measured gray matter volume (GMV) and cortical thickness (CT) both pre- and post-pubertal onset as defined by clinician-rated pubertal stage (PS). Participants (N=80) were categorized as prepubertal (PS1, N=48, 8.7±0.3yrs, 18 girls) and pubertal (PS2-5, N=32, 13.0±0.7yrs, 15 girls). Multi-echo MPRAGE scans were acquired at 3T and processed using 1) SPM12's DARTEL pipeline to compute normalized Jacobian-modulated GMV controlling for total brain volume and 2) Freesurfer's surface-based pipeline to compute CT. Data were analyzed in voxelwise 2x2 ANOVAs with sex and pubertal group as variables. Relative to the prepubertal group, the pubertal group showed 1) decreased GMV in the fusiform gyrus, precuneus, and paracentral lobule, and 2) decreased CT in the prefrontal cortex (PFC), sensorimotor cortex, and dorsal/ventral visual processing streams (p's<0.05, FDR-corrected). Sex-by-pubertal group interactions showed that across puberty 1) boys decreased, while girls increased, insula GMV (p<0.05, FDR-corrected) and 2) girls, but not boys, decreased CT in the medial PFC, and both dorsal and rostral anterior cingulate cortex (p's<.001, uncorrected). Our data suggest that GMV and CT may decrease after pubertal onset in both sexes, but regions within the insula and PFC show sex-specific trajectories across puberty.

2-C-64 Relations Between Autobiographical Memory and Hippocampal Subregion Volume in Early Childhood

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Autobiographical memory is a form of episodic memory involving recall of personally significant life events. Previous research has documented developmental changes in autobiographical memory during early childhood (e.g., Bauer, 2007). Development of neural structures supporting memory have been proposed to underlie these changes. However, this hypothesis has yet to be investigated empirically during early childhood. The goal of this study was to address this gap. Participants aged 4-8 years underwent a structural magnetic resonance imaging scan as well as an autobiographical interview. Hippocampal subregion volumes (i.e., head, body and tail) were calculated using Freesurfer v5.0 and by

manually identifying standard anatomical boundaries on T1-weighted images. Autobiographical interviews were coded using the Narrative Coherence Coding Scheme (Reese et al. 2011), which yields indices of Chronology (temporal ordering), Context (time and location) and Theme (event meaning and resolution). Preliminary results from 60 participants suggest, after controlling for age and IQ, measures of Theme correlated with left hippocampal head volume, $r(60) = .272$, $p. < .05$, whereas measures of Chronology correlated with right hippocampal tail volume, $r(60) = .288$, $p < .05$. These results are consistent with current theories regarding specialization along the longitudinal axis of the hippocampus with broader, more general representations associated with the anterior subregion (head) and more precise, detailed representations associated with the posterior subregion (tail) (Poppenk et al. 2013).

2-C-65 Emotion discrimination of facial expressions in 5-month-old infants: an fNIRS study.

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Infants' ability to discriminate between emotional facial expressions is crucial for the acquisition of important social information at a preverbal age. This ability develops rapidly over the first year of life. Recently, a Near-Infrared Spectroscopy study (NIRS; Nakato et al., 2011) demonstrated that in 7-month-olds the superior temporal sulcus responded stronger to emotional faces than objects, although this response did not differentiate between the type of emotion (i.e., angry and happy faces). The present study uses fNIRS to investigate, with a higher-intensity channel array, whether 5-month-old infants (N=17) first can discriminate emotional faces (fearful or happy) from non-faces (i.e., still images of houses). Second, we ask whether their brains also differentiate between the two types of facial expressions. Preliminary results suggest that indeed infants this young process emotional faces differently than non-face stimuli, but moreover, different brain areas respond differently to our emotions of interest. While fearful faces elicited significant increases from baseline in oxyHb from two occipital channels in 5 to 10s after stimulus onset ($t(16)=2.59$, $p<.02$; $t(16)=2.54$, $p=.022$), happy expressions evoked a response from one fronto-temporal channel between 0 to 5s post stimulus onset ($t(13)=2.50$, $p=0.026$). These outcomes not only support previous evidence that 5-month-olds can discriminate between different emotions, but furthermore suggest that viewing (less familiar) fearful faces requires more visual processing than viewing (more familiar) happy faces.

2-C-66 Maturation of major white matter tracts during childhood and adolescence: A longitudinal study with up to 11 time points

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In the present longitudinal study, we characterized maturational trajectories for 11 major white matter fiber tracts during childhood and adolescence with unprecedented time resolution. Ninety-three children and adolescents aged 7-19 years (Mean=12.5; SD=2.39; 38 boys) underwent diffusion-weighted brain imaging at two to 11 occasions with 6 months' intervals for the first ten occasions and 1-year interval for the 11th occasion (727 data points). Fiber tracts of interest were extracted with ExploreDTI using the semi-automated ALISA method. Generalized additive mixed models with nonparametric spline functions modelled age and sex effects on fiber tract fractional anisotropy (FA) and mean diffusivity (MD). Most tracts showed a linear increase in FA over the covered age-span. However, for some tracts, e.g. corticospinal tract and fornix, FA followed a nonlinear trajectory that plateaued around 12.5 years

of age. Tract MD generally showed a nonlinear decrease that leveled off towards the end of the covered age span. Young males generally had higher tract MD than young females, while MD tended to level off at a younger age in females than in males. Sex differences in tract FA did not follow a specific pattern. Our observation of considerable intra-subject variability in fiber tract FA and MD underscores the necessity of longitudinal studies with large numbers of data points to model maturational trajectories with greater assurance. Importantly, our high time resolution data may allow us to identify individual patterns of fiber tract maturation.

2-C-67 Homotopic resting state functional connectivity correlates with visuospatial abilities in school-age children

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Inter-hemispheric integration is a fundamental brain process which is inherent to brain functional lateralization, and during childhood strengthens language and visuospatial abilities. This study focuses on characterizing the relevance of functional homotopy for cognition in school-age children. Sample consists in 48 typically developing children (6-10 years old, 28 girls), who underwent a resting state fMRI scan (TR=2s; 150 volumes) and a child's neuropsychological battery that includes visual memory, attention, and spatial tasks. After standard preprocessing and coregistration into a symmetrical template, five eigen time series from CSF and WM plus movement-affected volumes (relative RMS > 0.25mm) were regressed out. 5 subjects with less than 120 non-affected volumes were excluded from further analysis. For each subject, Pearson correlation between the time series of every pair of contralateral voxels was computed. A voxelwise GLM was used to identify linear effects with behavioral data, using head motion RMS as covariate. Significance was tested with a 5000 permutation test, and defined as $P < 0.05$ (FWE corrected). Homotopy of the superior parietal gyrus showed a positive effect with visual attention performance, and the lingual gyrus showed a negative effect with visual memory. This study showed that even at rest, inter-hemispheric connectivity patterns of occipital and parietal areas reflect the performance in visuospatial tasks. These results support the use of resting state homotopic functional connectivity as a biomarker of cognitive development during childhood.

2-C-68 Real-time visual head motion feedback and movie watching reduce head motion during MRI scanning in children under 11 years old

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Structural and functional MRI (fMRI) scans are highly susceptible to head motion artifacts. Even submillimeter movements can systematically distort functional connectivity, morphometric, and diffusion imaging results. Therefore, methods that reduce head motion are critical for improving MRI quality, especially in high movement subjects such as children and neuropsychiatric patients. While there are a number of approaches thought to help subjects hold still, the empirical evidence for the efficacy of these strategies is limited. Here, we experimentally tested the effects of viewing movies and/or receiving real-time visual feedback about framewise displacement (FD) of the head in 24 children (10 female; 5-15 years old). Participants completed 6 fMRI runs during which they viewed a fixation cross or a cartoon movie clip. On 4 of the runs they also received real-time visual feedback about head

motion (FD). Results demonstrated that FD was significantly reduced during movies compared to fixation and when receiving feedback compared to receiving no feedback. However, these results depended largely on age, such that the effects were driven by the younger children. Children older than 10 years showed no significant effect of movie watching or FD feedback. Thus, we demonstrated that presenting movies and/or providing real-time feedback during MRI acquisition reduces head motion in children 5-10 years, but not necessarily in older children. These results have important implications for future developmental neuroimaging studies and clinical MRIs in pediatric populations.

2-C-69 Development of subcortical volumes across adolescence in males and females: A multisample study of longitudinal changes

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Developmental patterns of subcortical brain volumes in males and females are inconsistent across studies. To resolve these discrepancies, we used FreeSurfer and generalized additive modeling to analyze magnetic resonance imaging data in parallel from three independent longitudinal samples: Pittsburgh (PIT; USA), Neurocognitive Development (NCD; Norway), and Orygen Adolescent Development Study (OADS; Australia). We aimed to characterize sex specific subcortical volume trajectories over the age-span 8-22 years. Volume estimates in each sex overlapped across samples for the thalamus, caudate, putamen, hippocampus, and amygdala, whereas volumes were less consistent across samples for the pallidum and nucleus accumbens (NAc). In males, thalamus showed increasing volume until mid-adolescence, whereas females showed no change in two samples and an inverse-U trajectory in NCD. For the caudate and putamen, decreases were seen for both sexes and all samples, except PIT boys. Pallidum trajectories varied by sample, with males and females in OADS having smaller volumes in childhood, but catching up with the other samples by adulthood. NAc showed linear decreases for all female samples, but no changes for males. Slight curvilinear hippocampal growth was seen in all samples. For the amygdala, females showed early increases followed by little change, whereas males displayed steady increases in volumes. Our results help to clarify sex specific patterns in subcortical brain changes across adolescence, and highlight region-specific variations in congruency of developmental trajectories.

2-C-70 Adolescent surface area pre- and post marijuana and alcohol initiation

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Changes in gray matter volume and thickness have been associated with adolescent alcohol and marijuana use but little is known about the impact of these substances on surface area. A prospective study found marijuana may be related to cortical thinning (Jacobus et al., 2016). The present study expands on this to examine the impact of alcohol and marijuana on surface area before and after use initiation. Scans for 69 youth were obtained at baseline (ages 12-14; before substance use) and at 6-8 year follow-up (ages 18-21). Participants were classified into three groups based on substance use: alcohol use initiators (ALC, n=23), alcohol and marijuana use initiators (ALC+MJ, n=23) and individuals that did not initiate either substance regularly (CON, n=23). The cortex was segmented into 34 regions in each hemisphere, and surface area for each region was extracted. Significant Group × Time interactions

on surface area were identified in bilateral medial orbitofrontal cortex, and right caudal middle frontal, entorhinal, and insula cortices (ps < .05). The ALC group generally showed greater decline in surface area over 6-8 years than the ALC+MJ and CON groups. Similar to our previous work (Jacobus et al., 2016), these findings suggest that alcohol use initiation may contribute to developmental alterations in surface area. Surface area may be a useful intermediate phenotype for exploring the mechanisms underlying the effects of substance use on cognition. This project was supported by R01 AA13419 (Tapert), T32 AA013525 (Riley), and KL2TR001444 (Jacobus).

2-C-71 Functional network organization of the social brain in childhood and adolescence.

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Research on the neural substrates of social cognition has found a distributed set of regions, including temporoparietal and medial prefrontal structures; termed the ?social brain network.? Theoretical and empirical work on social brain development has proposed that these regions undergo significant remodeling during adolescence. However, while this system of regions has often been referred to as a network, previous studies have not demonstrated formal network relationships between these regions during social processes, nor have they demonstrated an overall network structure for the social brain. As such, we examined the functional network organization of the ?social brain network? in a sample of 50 youths (ages 8-17) during a social evaluation task. Using connectivity analyses, we found that while regions of the putative social brain network share strong functional relationships with one another, they also share reliable connections to regions outside the proposed network (e.g. striatum and lateral PFC). Graph-based analyses revealed two main modules within the social brain: a temporoparietal and a sensory/affective module, with medial-frontal regions appearing to bridge the two main clusters, albeit weakly. Contrary to our hypotheses, no developmental effects were seen in graph-bases analyses, suggesting that the basic architecture of a social brain ?network" may already be established by the late childhood. Additionally, results highlight a need to test questions related to social cognition at a network level and emphasize functional relationships between regions.

2-C-72 Chronically elevated prenatal cytokine exposure changes rodent offspring behavior and functional connectivity network structure

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In utero exposure to inflammatory cytokines and in particular elevated interlukin-6 (IL-6) is a significant risk factor for neurodevelopmental disorders including autism spectrum disorder (ASD). Resting state functional connectivity (rs-fcMRI) abnormalities have been identified in ASD and associations have been found between mothers with elevated IL-6 blood levels and offspring brain connectivity. The current work uses a rodent model to test the causal mechanisms of IL-6 exposure and behavioral and neural phenotypes associated with developmental disorders. Sprague-Dawley rats were implanted with osmotic pumps delivering either saline or a daily dose 4.98 ug/kg IL-6 over the course of 40 days. This dose was designed to mimic chronic inflammatory states throughout pregnancy. Offspring were given a battery of behavioral tests and rsfc-MRI imaging both early (postnatal day 25) and late (PD 50) in development. Here, we find that IL-6 exposed offspring show a robust anxiety phenotype on both the open field and light dark behavioral tests. Finally, to serve a translational tool, we discuss atypical

network structure in IL-6 exposed rats, which seems to be most impacted during early adolescence and in many networks normalizes into adulthood. Overall, this work sheds light on the underlying mechanisms associated maternal inflammation and the role of IL-6 as risk factor for developing phenotypes seen in human disorders.

2-C-73 Developmental outcomes of early adverse care: elevated cortisol and altered Amygdala functional connectivity

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Early life stress, including adverse caregiving, is a major risk factor for psychopathology. How maltreatment affects neurobehavioral development is not well understood and challenging to disentangle from heritable factors. This study used a nonhuman primate model of maternal maltreatment (MALT), wherein abuse/rejection co-occur with brain development and limbic maturation during infancy, leading to socioemotional alterations and elevated stress hormones. To unravel experience from inheritance we used cross-fostering with random assignment to control/maltreating foster mothers. This study focuses on alterations underlying behavioral and neuroendocrine outcomes: amygdala (AMYG) functional connectivity (FC) and HPA axis activity from infancy to juvenile period. We collected resting state fMRI scans to examine AMYG FC between MALT (n=13: 6 F, 7 M) and Control (n=13: 7 F, 6 M). We reported higher hair cortisol accumulation and weaker prefrontal cortex-AMYG FC in MALT but here examine AMYG FC to other regions using voxel-wise AMYG seed group level analysis. Stronger positive FC in MALT was found with superior temporal gyrus and cerebellum. Stronger negative FC in MALT was found with locus coeruleus, laterodorsal tegmental area, parabrachial complex and AMYG ($p<0.005$ cluster threshold >2 voxels uncorrected). MALT Morning plasma and hair cortisol was elevated at 6 mos. and associated with stronger AMYG FC in above regions at 18 mos. This suggests chronic high levels of cortisol in MALT predicts later stronger FC and perhaps altered socioemotional processing, especially of fear.

2-C-74 Multimodal structural neuroimaging markers of ADHD symptoms.

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Introduction: Neuroimaging studies of ADHD have been inconsistent with effects attributed to different tissue types distributed across the brain. Image modalities are typically analyzed in isolation, telling only a part of a larger story. Advanced statistical analysis now allows us to model patterns of covariation across multiple modalities to better characterize the neuroanatomical correlates of ADHD symptoms in a data-driven way. Methods: Multimodal imaging data and multi-informant cognitive and clinical data were collected for 78 diagnostically-confirmed children with ADHD and 82 controls. We combined linked independent component analysis and canonical correlation analysis to identify multivariate relationships between clinical and cognitive factors and multimodal imaging markers derived from tissue volume, cortical thickness and surface area, fractional anisotropy and mean diffusivity. Results: We found four novel brain patterns, each independently associated with clinical and cognitive data. The first two patterns represent overall brain size and development respectively. The third was associated with increased hyperactivity and greater likelihood to being medicated and male. This pattern was associated

with stressful life events, a lower quality of life and time spent in neonatal intensive care. Parents were less educated and had a less consistent, and angrier parenting style. The final pattern was associated with poor academic attainment and lower parental education. We validated our observations, finding that the third imaging marker significantly predicted hype

2-D-75 Specialization of Lateral Prefrontal Cortical Activity Underlies Successful Emotion Regulation in Youth

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The acquisition of emotion regulation is a key developmental milestone. Recent imaging studies show that differences in lateral prefrontal activation undergird successful emotion regulation across age. However, other age-related changes in neurophysiology, such as specialization, have oft been overlooked. To examine age-related changes in neural specialization, we collected fMRI data on 38 youths (ages 8-17) as they completed an emotion regulation task, and borrowed an analytical approach from economics. Participants were instructed to regulate emotional responses to negative images or to respond naturally to negative and neutral images on a trial-by-trial basis. First, we extracted multivariate patterns from lateral prefrontal ROIs for each task condition (regulation/negative, respond/negative, and respond/neutral). Next, we computed a Gini coefficient for condition in each ROI. Gini coefficients are typically used to measure wealth inequality in a nation, but here we used them to index the specialization of brain activation in an ROI for a given psychological state. Regression analyses were conducted with Gini coefficients as predictors and emotion regulation success (percent decrease in self-reported affect on regulate/negative versus respond/negative trials) as the outcome. Results showed that specialization (i.e., higher Gini coefficients) in dorsolateral prefrontal cortex was the strongest predictor of emotion regulation success. This suggests that lateral prefrontal specialization contributes to individual differences in emotion regulation capacity among youth.

2-D-76 Corticostriatal circuit development constrains goal directed behavior through adolescence

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When pursuing high value goals, mature individuals typically titrate cognitive effort according to environmental demands. However, it remains unclear whether adolescents similarly integrate value-based goals to boost cognitive effort and selectively enhance goal directed behavior. We used a novel value-contingent cognitive control task during fMRI to assess how stakes-- the value of a prospective outcome-- modulate flexible goal directed behavior and underlying neurocognitive processes. 88 participants aged 13-21 underwent fMRI scanning while performing an incentivized go/no-go task that included intermixed low and high stakes conditions. Participants first viewed a cue indicating the stakes of a block, high (win $1.00/lose $0.50) or low (win $0.20/lose $0.10). Next, participants viewed a series of trials--go's that required a button press and no-go's that required withholding a response. While adults enhanced performance during high stakes, adolescents' performance remained the same during low and high stakes conditions. The developmental emergence of value-contingent performance was mediated by connectivity between the ventral striatum and ventrolateral prefrontal cortex that was selectively increased during high stakes with age. These findings indicate that adolescents do not capitalize on high stakes prospects to improve performance, resulting from ongoing maturation of

corticostriatal circuit integration. We propose that late development of corticostriatal connectivity sets the stage for successful goal directed cognitive control.

2-D-77 The Fusiform Face Area shows distinct patterns of fMRI activity to black vs. white faces in different emotional contexts.

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Recent high-profile police shootings of African Americans raise questions regarding the factors underlying such events. While the answer to this complex question is multifactorial, the effects of emotional context on race perception may be an important factor. Prior work has demonstrated behavioral and brain-based differences between own- vs. other-race face perception. Here, we hypothesized that emotional context would influence the differential processing of own- vs. other-race faces. Using an emotional go/no-go fMRI task in two independent groups of healthy African American (AF) and Caucasian (CAU) young adults, this study explored the effects of race and emotional context (neutral, threat, positive) on face perception. Behaviorally, both AF and CAU subjects committed more false alarms to black faces, particularly in threat contexts. The fMRI analysis identified activity in the fusiform face area (FFA) sensitive to interactions between participant race, stimulus race, and emotional context. In both AF and CAU subjects, own-race faces elicited greater or equivalent activity in neutral/positive contexts. In threat contexts, the own-race effect was reversed, exclusively in CAU subjects. Higher FFA activity predicted less false alarms in neutral/positive contexts and more false alarms in threat contexts. These results indicate that emotional context is an important factor that influences race perception. The current findings, juxtaposed with similar prior findings, beg the question regarding the developmental trajectory of differential perception of own vs. other race faces.

2-D-78 The development of self-protective biases: Adolescents internalize and adults externalize evaluative social feedback

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Adolescence is a phase of the lifespan marked by sensitivity to peer rejection. While adults have been shown to enact self-protective processes that buffer self-esteem from socio-evaluative threat like peer rejection, it is unclear whether teens are able to draw upon the same defenses. The current study examines how social evaluation is integrated into updated views of the self and others across development. 107 participants aged 10-23 completed a mutual social evaluation task where participants received supposedly real accepting and rejecting feedback from age-matched peers. We acquired measures of a) participants' expectancies of being liked using implicit and explicit measures, b) changes in self-esteem, c) changes in peer rating, and d) memory for evaluation received. Results demonstrated that early adolescents uniquely internalize social feedback, using it to "downgrade" their self-esteem but maintain their ratings of peers. By contrast, based on identical social feedback, adults experience a boost in self-esteem while also "downgrading" ratings of the rejecting peers, consistent with the idea that adults use self-protective biases to enhance self-views and attribute rejection to external sources.

Future analyses will probe whether neurodevelopmental shifts in corticolimbic functioning, a circuit involved in feedback-based learning, underlie these age-related differences in processing of social evaluation. The results demonstrate how equivalent social feedback experiences exert distinct effects on internalized and externalized evaluations across development.

2-D-79 Characteristics of contra-hedonic decision-making vary across development: Evidence from a valenced choice task

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People display a counterintuitive willingness to pursue contra-hedonic states. Little is known about how this tendency emerges or relates to decision-making in childhood and adolescence. The present study aimed to characterize changes in contra-hedonic choice across development. 192 participants aged 4-25 completed a binary choice task with three conditions: negative vs positive (matched on arousal), negative vs neutral, and positive versus neutral. Two images were presented; participants selected one image to view in a larger format for up to 10s. Dependent measures included choices as a function of image valence, choice reaction time, and subsequent looking time. Generally, negative images were selected over positive images 28.3% of the time and over neutral images 42.4% of the time. Contra-hedonic selections were associated with slower choice reaction times, especially in adolescents. When a negative image was chosen, participants spent more time viewing it than a positive or neutral image. The tendency to select negative images peaked in early childhood and decreased during adolescence compared with adulthood. In contrast, there was little age-related change in tendency to choose neutral or negative over positive images, implying that negativity, not emotional arousal, is driving these effects. Taken together, these findings suggest that children are particularly drawn to negatively valenced images, a choice bias that reduces during adolescence. Subjective experience of negative states could drive contra-hedonic decision-making differently across development.

2-D-80 How valuable is social feedback to adolescents and adults? Objective quantification of social motivation using a physical effort paradigm

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Research has shown that adolescents place more importance on peer approval compared to other age groups. While prior work suggests that adolescents are especially vigilant of and preoccupied by peer evaluation, it is unclear whether adolescents are also more willing to incur a physical cost to receive social feedback. The present study aims to evaluate developmental changes in motivation to receive social feedback from peers and the degree to which this motivation is shaped by feedback expectancy (positive or negative) and peer desirability (high or low rating). 47 adult participants aged 18-23 and a sample of adolescents 12-17 years (collection is ongoing) completed a mutual social evaluation task in which participants a) rated the likeability of 60 photographs of same-aged peers b) predicted whether peers would like their picture, and c) squeezed a hand dynamometer past a specified threshold to find out whether the peer liked or disliked the participant's picture. The dynamometer acquires 3 objective indices of motivation: success (reaching threshold), response vigor (speed to threshold) and force (maximum grip). Initial analyses in adults demonstrate that this task is valid in indexing social motivation. Participants achieved the effort threshold more often and demonstrated increased force and response vigor for highly desirable peers compared to less desirable peers. Thus, the peer

desirability increased participants' motivation to find out whether the peer reciprocated. Future analyses will probe developmental differences in social motivation for self-relevant feedback

2-D-81 Ongoing violence exposure in late childhood predicts increased amygdala reactivity to threat

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Background: Early life stress (ELS) is a primary risk factor for many mental and physical health problems. Previous studies have shown that ELS predicts greater arousal responses to threat, including increased amygdala and sympathetic autonomic activity. Much of this research has been conducted in populations in which stress exposure occurs during a specific developmental phase, e.g., early institutional care. Here we investigated effects of chronic exposure to community violence. Methods: 48 children (Mage=10.9, 24 girls) were recruited from a large public hospital serving neighborhoods with high levels of violence. Children participated in fMRI, viewing fearful and neutral face stimuli, and completed the Violence Exposure Scale for Children. We focused on ages 8-12, when reports of trauma exposure have been shown to peak. Results: Children reported approximately 10 separate violence exposure events [M(SD)=9.85(6.42)], with no effect of age or gender on exposure frequency. Violence exposure frequency predicted greater left amygdala reactivity to both fearful (β=.46, p=.01) and neutral faces (β=.56, p=.001) relative to baseline. Conclusions: Findings replicate previous studies showing links between ELS and amygdala reactivity to fearful faces. Interestingly, however, we found a larger effect size for the relationship between violence exposure and reactivity to neutral faces. Children who are chronically exposed to violence may activate threat neurocircuitry to neutral as well as typically-threatening social cues as an adaptation to unpredictable environmental threat.

2-D-82 Rejection distress coupled with reduced attention to and neural processing of social reward relates to internalizing symptoms

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High levels of rejection distress are related to depression in children (Silk et al., 2014). One way of mitigating rejection distress may be attending to positive cues (DeWall et al., 2011) including social reward (DeWall et al., 2009); however, children at risk for depression exhibit reduced neural processing of (Monk et al. 2008) as well as attention away from (Joorman et al., 2007) social reward. For children with less attunement to social reward, greater rejection distress may potentiate internalizing symptoms, a precursor to depression (Weeks et al., 2016). 57 children-to-date (Mage = 5.92) viewed pictures of "peers" and sorted them into groups--wished to or did not wish to play with. The "peers" provided feedback either accepting or rejecting the child's bid. Children rated their feelings to feedback (1 = sad; 4 = happy). For analysis, we focused on feelings during rejection. Children completed a dot-probe task using happy faces while EEG data were recorded. Attention bias to social reward was calculated by subtracting mean RT for congruent trials from mean RT for incongruent trials (Morales et al., 2015). The P2, a potential marker of social reward salience (Flores et al., 2015), was selected to assess neural processing. For children exhibiting reduced neural processing of, as well as attention away from, social reward, rejection distress potentiated internalizing symptoms (p<.01).The findings indicate that rejection distress, coupled with social reward processing, may be important for differentiating those children at greatest risk for internalizing symptom.

2-D-83 A 4-year Longitudinal Analysis of whole-brain Activation to Emotional Faces in Late Adolescent Girls and Associations with Emotion Regulation Skills

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The development of higher cognitive skills, especially the ability to cognitively reappraise emotional experiences is sought to depend on the maturation of the prefrontal cortex (PFC). In this study we sought to characterize whole brain longitudinal activation patterns during an emotional face processing task in adolescent girls and to test whether changes in cognitive reappraisal would be associated with activation changes during the task. Analyses included 34 girls from a subsample of the longitudinal Pittsburgh Girls Study who participated in a MRI scan yearly from age 16 to age 20. Participants viewed affective facial expressions and rated either their own emotional state or a non-emotional feature. Longitudinal modelling of fMRI data was conducted using the sandwich estimator toolbox (Guillaume et al., 2014) for SPM12. Cognitive reappraisal was assessed with the Emotion Regulation Questionnaire (Gross & John, 2003). Across all four waves robust activation in frontal, temporal and parietal regions were observed ($p<0.01$, FDR-corrected). No significant differences between years were found and activation did not change with age suggesting that the task despite repeated exposure reliably activated a similar network. Cognitive reappraisal scores across the four years were associated with activation in the right dorsolateral PFC (dlPFC). The current study highlights changes in activation patterns as a function of reappraisal skills in late adolescent girls suggesting that a region in the right dlPFC may be indicative of a more mature response patterns.

2-F-84 Can playing memory games improve executive function skills?

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Executive functions (EF) refer to a set of cognitive skills that are crucial for everyday and academic life, and they are predictive for scholastic achievement. Therefore, understanding the development of EF is essential for both developmental scientists and educators. We are interested in testing whether repeated exposures to games designed to target EF would improve specific EF skills as well as performance in related cognitive domains . In this intervention study, we focused on kindergartners from economically disadvantaged backgrounds given that they are particularly vulnerable to deficits in EF. Children played the training games for 10 sessions in a classroom setting using computer tablets. Preliminary analyses on the training data suggests that children improved on the EF game, but after five training sessions, they seemed to have reached their motivational or attentional capacity. Analyses on individual differences that might predict learning, as well as generalizing effects are currently underway.

2-F-85 Safety signal learning as a novel method of fear reduction in adolescents and young adults

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Adolescence is a peak time for the onset of anxiety disorders, which affect as many as 1 in 10 youth (Kessler et al., 2005). Despite known developmental changes in the neural circuitry supporting fear extinction, interventions for anxious youth are primarily based on principles studied in adulthood (Lee et al., 2014). Here we investigated the efficacy of safety signal learning in healthy adolescents and adults, which has been shown to effectively reduce anxiety-like behavior in animal models (Christianson et al., 2012). Galvanic skin response (GSR) was collected from 17 subjects (ages 17-30) during a developmentally-adapted safety signal task. This task included a block testing the pairing of the safety signal with the conditioned stimulus (CS+), and an extinction block, a standard method of fear reduction. Conditioned stimuli consisted of geometric shapes and the unconditioned stimulus was an aversive noise (CS+: 50% reinforcement rate). A repeated measures ANOVA revealed a significant effect of condition on GSR ($F(3,48) = 14.33$, $p < .001$). Participants' GSR to the safety signal paired with the CS+ was significantly lower than GSR to the CS +alone ($t(16) = -3.94$, $p = .001$). Moreover, GSR did not differ between the condition in which the safety signal was paired with the CS+ and the CS+ alone during the extinction phase ($t(16) = -.24$, $p = .817$). These findings provide initial evidence that safety signal learning can reduce fear in healthy adolescents and adults and highlight the potential for novel interventions that target the biological state of the developing brain.

2-F-86 THE REGIONAL HOMOGENEITY (REHO) OF RESTING-STATE FMRI SIGNAL, A BIOMARKER OF THE RECEPTIVITY TO INHIBITORY CONTROL TRAINING?

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Executive functions, including inhibitory control (IC), is critical for academic and professional success. The development of these functions during childhood and adolescence is underlain by the high neuroplasticity of the prefrontal cortex during this developmental period. Recent researches suggest that short term cognitive training may improve their efficiency, particularly at adolescence. In the current study, we searched for a biomarker of the receptivity to IC training. 16 healthy adolescents (16,92±0,53 y.o. ; 4 males) were recruited from high schools in Paris, France. Each participant undertook 20 IC training sessions on electronic tablet, 15 min per day and 5 days a week for a month. Pre- and a post-test sessions included a battery of cognitive tests (outside the MRI) and a multimodal MRI acquisition. Analyses focused on the regional homogeneity (ReHo) of BOLD signal at rest which reflects local brain metabolism. Whole-brain voxel-wise statistical analyses revealed correlations in several regions of IC neural network (including left anterior cingulate, left orbitofrontal cortex, right insula, right SMA, bilateral precuneus and bilateral superior frontal areas) between ReHo at baseline and 1) CI efficiency at baseline and 2) the CI improvement between the post and pre-tests. Our findings suggest that ReHo is not only a state-marker of IC efficiency but also of the receptivity to IC training.

2-F-87 Emergence of the neural network underlying phonological processing from the pre-reading to the emergent reading stage: a longitudinal study.

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Previous neuroimaging studies of reading development have revealed structural brain changes accompanying reading acquisition. How the corresponding functional network evolves in the pediatric brain, however, is largely unknown. Here, for the first time, we characterized the emergence of the phonological processing network in 28 children over three stages (pre-reading, beginning readers, emergent readers) longitudinally. Across these three time points, decreases in neural activation in the left inferior parietal cortex were observed during an auditory phonological processing task, suggesting a specialization process in response to reading instruction/experience. Furthermore, using the inferior parietal cortex as the seed, a functional network, consisting of the left inferior frontal, left lingual and right angular gyri was identified. The connection strength in this network co-developed with the growth of phonological skills. More specifically, children with above-average phonological gains showed a significant developmental increase in connection strength in this network longitudinally while children with below-average gains exhibited the opposite trajectory. Finally, connection strength in this network at the pre-reading level significantly predicted reading performance at the emergent reading stage. Our findings highlight the importance of the early emerging phonological processing network for reading development, providing direct evidence for the Interactive Specialization Model and neurodevelopmental models of reading.

2-G-88 Longitudinal analysis of depression risk factors in a large sample of adolescent girls screened for high depressive symptoms

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The ABC model of the emergence of gender differences in adolescent depression (DEP) states that affective (e.g. peer susceptibility), biological (e.g. reward-related neural activation) and cognitive (e.g. rumination) factors interact with negative life events (e.g. peer victimization) to increase risk for DEP in girls. We examined whether these factors predicted change in DEP symptoms longitudinally in a sample of girls screened for high DEP symptoms (n=182). All data were collected at 4 visits (average ages 16, 17, 18, 19 years). Girls completed a guessing task during functional magnetic resonance imaging (fMRI) that activates reward circuitry. A medial prefrontal cortex (mPFC) region of interest analysis was used to determine brain activation across the sample. Significant values during reward outcome (voxel $p<0.05$, FWE) were included in multi-level analyses, along with ABC risk factor measures. Between-subject variance in DEP symptoms was predicted by greater rumination ($b=1.79$, $p<0.001$) and lower mPFC activation ($b=-2.85$, $p=0.01$), but not peer susceptibility ($b=-0.01$, $p=0.96$). Although DEP symptoms only varied across time at a statistical trend level ($\chi2(102)=126.19$, $p=0.052$), peer victimization predicted an increase in DEP symptoms ($b=0.29$, $p=0.04$). Results indicate that concurrent DEP is higher in adolescent girls who exhibit cognitive and biological vulnerability, whereas increasing DEP severity is evident in those who experience negative life events. Thus, different domains of risk might be relevant to severity and course of DEP at different developmental points.

2-G-89 Hyperconnectivity of voice processing brain networks in females with autism

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Autism spectrum disorders (ASD) are poorly understood in females. Criteria for diagnosing ASD have been developed using data primarily from males, and females may have characteristics that help them

compensate for and mask symptoms of ASD. Autism is characterized by a lack of engagement with social cues, a primary of which is speech. We have a model of human voice processing composed of the core voice processing system, anchored in the superior temporal sulcus (STS), and an extended voice processing network, encompassing reward and affective areas. Previous research in our lab has shown that children with ASD show underconnectivity between core and extended voice processing networks; however, it is unknown whether this connectivity varies across genders. 15 females and 15 males with high-functioning ASD (8-16 y/o) underwent resting-state fMRI scans. Functional connectivity analyses were used to examine between-group differences in connectivity for STS (core voice processing network) seeds. Compared to males with ASD, females with ASD demonstrated increased connectivity between nodes of the core voice processing network and a wide array of brain systems, including reward and affect processing regions (nucleus accumbens, orbitofrontal cortex, amygdala), canonical language processing regions (middle temporal cortex, inferior frontal gyrus), and key nodes of the salience network (dorsal anterior cingulate, anterior insula). These results provide initial indication that females and males with ASD may in fact utilize different brain mechanisms for processing social cues.

2-G-90 Depressive Symptomatology and Brain Network Architecture in Adolescent Girls

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Research points to continuity of psychopathology, where depressed girls often remain depressed in adulthood (Bardone et al., 1996). Brain connectomics may provide crucial insight to the emergence and maintenance of such disorders. We examined the relationship between girls' depressive symptoms in adolescence and neural network topology in early adulthood, using Diffusion Tensor Imaging (DTI). We hypothesized that increased depression early on will be associated with restricted network connectivity, reflected by higher average path length and decreased node strength. In a subsample of 115 girls from the Pittsburgh Girls Study, depression symptoms were assessed using the Adolescent Symptom Inventory (Gadow & Sprafkin, 1999) at ages 16-18, and whole brain networks were reconstructed using a DTI scan at 18. Atlas-based brain regions (AAL atlas) were used as network nodes (n= 94) and tractography streamline counts as weighted and directed edges. Connectivity matrices were submitted to graph theoretical analyses of clustering, node strength, and path length in relation to depressive symptoms. As expected, depressive symptomatology at age 16 was significantly associated with symptoms at age 18 ($p<.0001$). Depressive symptoms were positively correlated with fiber-weighted average path length ($p=.032$). As well, greater depressive symptoms were predictive of lower overall node strength ($p=.02$) and decreased clustering ($p=.0025$). Depression in adolescence may confer risk at the level of brain structural networks, which may contribute to lasting vulnerability for psychopathology.

2-G-91 Imaging Brain Function in Children with Autism Spectrum Disorder with Diffuse Optical Tomography

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Autism Spectrum Disorder (ASD), defined by deficits in social functioning, communication, and restricted interests/repetitive behaviors is a serious psychiatric disorder of childhood. Previous neuroimaging studies using task-based functional magnetic resonance imaging (fMRI) have identified specific brain regions that exhibit significantly different responses during processing of language paradigms or socially-relevant stimuli in participants with ASD than in typically developing controls. However, the loud and

constraining environment of MRI-based neuroimaging severely limits studies on auditory processing and language generation and especially direct within-room social interactions. MRI is also a challenging setting for sensitive participants, such as school-aged and, in particular, young children or those severely affected with ASD. Diffuse Optical Tomography (DOT) provides a silent and wearable technology ideally suited to naturalistic investigations of language and social communication processing in school-aged children with ASD. Feasibility of DOT-based neuroimaging in school-aged children with (n=20, age range 9-15 yrs) and without ASD (n=10, age range 8-15 yrs) was established by assessing (1) the time in the imaging system, (2) raw data quality metrics, (3) maps of brain function in response to language and biological motion tasks. In summary, this study establishes initial feasibility to apply DOT in research on school-aged participants with ASD.

2-G-92 Sensory Over-Responsivity in Youth Adopted From Foster Care

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Youth with early life stress (ELS) such as those adopted from international institutions are at greater risk for sensory over-responsivity (SOR; Wilbarger, 2010), extreme sensitivity to stimuli such as loud noises or being touched. Both SOR and ELS have are related to altered amygdala function (Green, 2015; Tottenham, 2011) which may contribute to the high rates of SOR in youth with ELS. However, SOR is rarely identified and treated in youth adopted from foster care (AFC) in the USA, so research on SOR in this population is necessary to improve intervention and to increase understanding of how stress impacts early sensory neurodevelopment. This study aimed to identify SOR and its relation to psychiatric symptoms in AFC youth. Participants were 29 adopted children ages 3-16 years with a history of foster care. Children were removed from birth parents between 0-60 mos (M=8.7). Parents completed the Short Sensory Profile (SSP), Sensory Checklist (SenSOR), and Child Behavioral Checklist (CBCL). 93% showed sensory processing difficulties on the SSP, most commonly auditory filtering (AF; 86%) and tactile sensitivity (64%). Similar to what has been found in other populations, SOR total score was highly correlated with CBCL anxiety ($r=.39$; $p<.05$). AF and visual/auditory sensitivity were correlated with CBCL total problems ($r=.48$; $p<.05$) and CBCL PTSD symptoms ($r=.57$; $p<.05$). Child age, age of removal, and age of placement were not correlated with SOR. Results show that SOR is a severe problem for AFC youth and future studies will the neurobiological basis of SOR in AFC youth.

2-G-93 Distress tolerance and anxiety across development: Interactions with age and sex

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Risk for anxiety disorders increases during development, and low distress tolerance (DT) may be a risk factor for related symptoms. In early adolescence, low DT has been associated with internalizing symptoms in females (Daughters et al., 2009) and anxiety in both sexes (Cummings et al., 2013). However, age-related differences in associations between DT, sex, and anxiety have been understudied. Participants from the Nathan Kline Institute Rockland Sample (n=111, ages 8-17) completed the Behavioral Indicator of Resilience to Distress task and were grouped into high and low DT based on task completion. Anxiety symptoms were assessed using the Multidimensional Anxiety Scale for Children. A hierarchical linear regression did not reveal interactions between age, DT, and sex on anxiety symptoms in 8-17 year-olds. Given evidence of a DT x sex interaction on internalizing symptoms in 9-13 year-olds

(Daughters et al., 2009), we tested whether DT was related to anxiety in this age range (n=58). A significant DT x age x sex interaction on anxiety emerged. Contrary to previous evidence, there was an interaction between age and DT in male but not female participants. Specifically, males with high DT showed a trending age-related decrease in anxiety. These findings suggest that DT is associated with age-related changes in anxiety but only in males and especially during the transition to adolescence. Future studies should aim to clarify the nature of this relationship and to identify who might be buffered against anxiety by high DT during this key developmental stage.

2-G-94 Atypical neural function during affective theory of mind: a developmental mechanism linking violence exposure and externalizing psychopathology

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Children who experience interpersonal violence are at markedly elevated risk of perpetrating violence later in development. This is concerning, given that one-third of American youth have been exposed to violence by the time they reach adolescence. Although atypical emotional processing has long been proposed as a determinant of psychopathology following violence exposure, scant research has examined aspects of social cognition as potential mechanisms in the cycle of violence. To that end this study examined the impact of interpersonal violence exposure on the development of cognitive and affective theory of mind (TOM), and their neural bases, as a mechanism linking interpersonal violence exposure and aggressive behavior. Using fMRI, we assessed behavioral and neural responses during cartoon vignettes requiring cognitive ToM, affective ToM or physical feature comprehension (control) in 50 adolescents (14-19 years, 25 with violence exposure). Interpersonal violence exposure predicted slower reaction time (RT) during the affective, but not cognitive, condition of the TOM task. Slower affective TOM RT was also associated with externalizing psychopathology. We found a variety of group differences associated with both violence exposure and externalizing during affective TOM in functional recruitment of brain areas involved in social cognitive processes, including tempoparietal junction, temporal poles, and ventromedial PFC. Results highlight the importance of considering social cognitive processes in models of the developmental consequences of violence exposure in children.

2-G-95 Socio-economic status and the neonatal brain

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Socio-economic status (SES) is a consistent predictor of developmental outcomes. We aim to investigate whether maternal SES during pregnancy impacts brain structure in very preterm (VPT) babies. We studied 307 VPT babies (mean gestational age 29 weeks). SES was measured with the Index of Multiple Deprivation (IMD) determined by parents' postcode. Clinical data included gestational age at birth, sex, days of mechanical ventilation, parenteral nutrition and a diagnosis of intrauterine growth retardation (IUGR). Mothers completed the State-Trait Anxiety Inventory at 3, 12, 20 months after delivery and the mean of the trait scores was used as a measure of stable aspects of "anxiety proneness". T2 images of babies were acquired postnatally at term equivalent age using a 3T scanner. All images were non-linearly registered to an age-appropriate template and Jacobian values (JV) were calculated, giving an index of local tissue volume changes. A GLM was created using sex and IUGR as fixed factors and all other variables as covariates. Mean JV for 96 grey matter regions were used as dependent variables. SES had a significant effect on mean JV ($F(96,202)=1.514$, $p=.008$, Wilk's $\Lambda=0.582$). Lower SES was

significantly associated with increased volume of bilateral hippocampi, amygdalae and left parahippocampal gyrus, after removing the effect of possible confounders (FDR-corrected, p<.05). SES is associated in the neonatal brain with larger volume of areas known to be sensitive to environmental stress and later involved in socio-emotional processing and higher-order cognitive functions.

2-G-96 Developmental changes in evidence accumulation and decision thresholds in borderline personality

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Emotion dysregulation is a core area of impairment in borderline personality disorder (BPD; Linehan, 1993; Lieb et al., 2004), marked by rapid changes in emotion, often in response to interpersonal events. To understand the basis of emotion dysregulation in BPD, previous experimental research has examined emotion perception using affect identification and interference paradigms (Domes et al., 2006; Fertuck et al., 2009; Daros et al., 2013). Nevertheless, prior research has not examined these emotion processing changes during adolescence, an age of vulnerability for the onset of BPD. In this study, 92 participants (50 BPD, 42 matched controls) between the ages of 13 and 30 participated in an emotional stroop task in which the goal was to identify the emotion of a face and inhibit an overlying emotion word. To characterize developmental and clinical differences in decision processes, we fit response times and trial accuracy using hierarchical drift diffusion modeling (HDDM; Wiecki, Sofer & Frank, 2013). We found that age was associated with faster emotional processing. Those with BPD accumulated information slower than controls in the congruent happy condition and faster than controls in the congruent fear condition. These results extend previous findings of hyper-attunement to negative emotions in BPD. Finally, age exacerbates the tendency for the BPD patients to perceive social threats. Based off of previous research examining neural correlates of DDM, it is plausible that older BPD patients show enhanced activation in the Salience Network for emotionally laden stimuli.

2-G-97 Neural responses to peer interactions in adolescents with early life adversity: an investigation of social exclusion and over-inclusion

Nandita Vijayakumar[1], Theresa Cheng[1], John Flournoy[1], Shannon Peake, Jessica Flannery[1], Arian Mobasser[1], Sarah Alberti[1], Philip Fisher[1], Jennifer Pfeifer[1]

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Minimal research has examined how early life stressors influence brain functioning associated with social processes, and most of these studies have focused on responses to negative social experiences. We investigated how early life stressors affect adolescents neural responses to both positive and negative social experiences using an adapted version of Cyberball, a virtual ball-throwing paradigm. Specifically, we compared neural activation associated with conditions of over-inclusion and exclusion between a sample of adolescents in foster care (N = 54, aged 11-17 years) and non-separated controls (N = 70, aged 11-18 years). We employed two runs with an event-related design, and used parametric modulators to investigate the effect of increasing number of consecutive trials of exclusion and inclusion. While comparison of the exclusion condition did not reveal significant differences in activation between the two groups, the foster care sample exhibited less dorsal anterior cingulate activation during over-inclusion relative to controls. Moreover, when comparing exclusion relative to over-inclusion, the foster care sample exhibited greater activation of the precuneus, temporo-parietal junction, superior parietal, dorsolateral prefrontal and parahippocampal cortices. These regions have

been implicated in social cognitive processes, memory, and emotional and attentional regulation. Findings suggest that early life adversity may be associated with greater sensitivity to negative peer interactions, characterized by changes in neural processes underlying socioemotional functioning.

2-G-98 Motor performance relates to resting state-functional connectivity MRI in term- and preterm-born children

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While survival rates for preterm infants have increased, developmental outcomes remain a concern. We performed concurrent neuroimaging and neurodevelopmental assessments of 124 children, including 58 very preterm (VPT; mean birth gestational age=28 wks, scan age=12.3 yrs) and 66 term control (TC; mean birth gestational age=39 wks, scan age=12.2 yrs) children. Resting state-functional MRI data were acquired on a 3T GE scanner (TR/TE=2500/35ms; voxels 3.75×3.75×4mm^3). Data were motion scrubbed (FD<.2mm) with 5 minutes of low-motion data required. Motor performance was assessed using the Movement ABC (MABC) which measures balance, manual dexterity, and aiming/catching. Total MABC and all subscale scores were lower in the VPT group ($p<0.05$). Associations between MABC scales and functional connectivity (fc) measures were assessed within and between groups using permutations of correlation values, enrichment, and McNemar statistics. Commonalities and differences in relationships between fc measures and total and subscale MABC scores were observed across VPT and TC groups. Notably, of the subscales, balance scores were positively correlated with subcortical network fc in both groups, suggesting an integral role for this network in motor function. TC children demonstrated stronger correlations between balance subscale scores and cerebellar network fc than VPT children. In contrast, VPT children demonstrated stronger correlations between balance and visual network fc. These results delineate brain-behavior relationships that may underlie motor impairments common in VPT children.

Day 3, Monday September 18

3-A-100 Common BOLD activity over three executive function tasks in middle childhood

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Performance on executive function (EF) tasks indicates that skills like switching, updating, and inhibition are dissociable but also reflect a common underlying ability. In the current study, we investigated brain function as a biological mechanism supporting the "unity and diversity" of EFs in childhood. We examined the extent to which brain signals were unique versus consistent across three EF tasks collected in a sample of 117 participants (57 females, age M=10.17) that were part of a larger twin study. fMRI data were obtained while participants completed tasks designed to tap inhibition, switching, and working memory-updating processes. Whole-brain analyses converged upon significant cross-task activation in a diffuse network of fronto-parietal and cingulo-opercular regions, namely bilateral anterior insula, inferior parietal lobule, precentral gyri, and dorsal anterior cingulate. To further examine cross-task overlap in EF signals, we applied 13 a priori regions of interest (ROIs) drawn from studies of adult task control. Half of the adult ROIs coincided with regions showing significant activation across all tasks,

suggesting that a common network for EF is largely in place by middle childhood. However, ROI activity differentially related to age and performance measures across the three tasks. Preliminary twin comparisons also revealed differences in the extent to which genetic factors contribute to ROI engagement. In addition to informing models of disorders of EF, this study reveals sources of variation in EF processing among typically developing children.

3-A-101 Connectome-based predictive modeling: The impact of brain state and sex in a developmental cohort

Abigail Greene[1], Siyuan Gao[1], Dustin Scheinost[1], R. Todd Constable[1]

[1]Yale University

Robust individual differences in resting-state functional connectivity (FC) have been found to predict behavior (e.g., Finn et al., 2015). We apply connectome-based predictive modeling (Shen et al., 2017) to fMRI data from the Philadelphia Neurodevelopmental Cohort (PNC; n = 571), obtained while subjects were resting or performing tasks, and find that predictive models of fluid intelligence (gF) built using task data perform better, and that the best task for gF prediction varies by sex. PNC subjects completed emotion identification (EI) and working memory (WM) tasks, as well as a rest run, in the scanner. Both tasks yield better predictions of gF than does rest, as measured by the correlation between predicted and true gF (tasks: $r = 0.32 - 0.35$, all $p < 0.001$; rest: $r = 0.20$, $p < 0.05$). Dividing the sample by sex reveals that the EI-based network best predicts gF in females (EI, $r = 0.37$; WM, $r = 0.19$), while the WM-based network best predicts gF in males (WM, $r = 0.35$; EI, $r = 0.25$). We explore the evolution of this sex difference over development and demonstrate that it continues into adulthood, as evidenced by parallel analyses using data from the Human Connectome Project (n = 493). Spatial distribution of PNC networks is largely consistent with known morphometric and functional sex differences. These results suggest that distinct neural networks, best perturbed by different tasks, come to underlie fluid intelligence in males and females, and thus that specific tasks may amplify individual differences in FC and better characterize brain-behavior relationships.

3-A-102 Introducing the Human Connectome Project - Development: General Overview

Laurel Kordyban[1], Deanna Barch[2], Susan Bookheimer[3], Randy Buckner[1], Gregory Burgess[2], Mirella Dapretto[3], Michael Harms[2], Cynthia Hernke[2], Stephen Smith[4], Kathleen Thomas[5], David Van Essen[2], Essa Yacoub[5], Leah Somerville[1]

[1]Harvard University, [2]Washington University, [3]UCLA, [4]University of Oxford, [5]University of Minnesota

The Human Connectome Project - Development is a large multimodal imaging study aiming to chart age-related changes in brain network properties including metrics of connectivity, network integrity, response properties during tasks, and behavior. In addition, this project will support development of new, optimized analysis protocols and data will be publicly released to maximize the use of the dataset for the scientific community. Data collection is currently underway at four sites--Washington University, the University of Minnesota, UCLA, and Harvard University. The complete dataset will consist of 1,350 typically developing 5 to 21 year olds. The sample will be equal parts male and female and representative of socioeconomic and racial diversity in the United States. Multimodal MR imaging is optimized for measures of structural and functional brain connectivity and includes T1, T2, diffusion, and resting state scans, arterial spin labeling, and fMRI tasks. The out-of-scanner battery includes cognitive, health-related, and clinical measures. Biological samples will be assayed for hormonal concentrations and genetic analyses. The study includes a focused longitudinal study of puberty, in which up to 240

children will be tracked through puberty with two follow-up sessions, 15 months apart. This poster will showcase elements of the study's design and analysis plan and update on progress made during the first 6 months of data acquisition. Companion posters will provide more information about the task fMRI component and the out-of-scanner biological and cognitive assessments.

3-A-103 Infant brain responses to social sounds: a longitudinal fNIRS study

Nicole McDonald[1], Katherine Perdue[2], Jeffrey Eilbott[3], Harlan Fichtenholtz[4], Amy Ahn[5], Megan Braconnier[3], Carla Wall[6], Courtney Paisley[7], Frederick Shic[5], Kevin Pelphrey[8]

[1]UCLA, [2]Boston Children's Hospital, [3]Yale School of Medicine, [4]Keene State College, [5]Seattle Children's Hospital, University of Washington, [6]University of South Carolina, [7]University of Alabama, [8]George Washington University, Children's National Health Sy

We examined brain responses to different types of human vocalizations in 38 infants at ages 3 and 6 mos using functional near-infrared spectroscopy. Changes in oxy-Hb concentration were measured in 12 channels (ch) placed over inferior frontal-temporal regions in the right (RH) and left hemisphere (LH; 24 chs total) for 3 conditions: infant-directed speech (IDS; non-native language), human communicative vocalizations (HCM; e.g., laugh), human non-communicative vocalizations (HNC; e.g., cough). Infants heard 5 10-s trials for each condition (12-s silent baseline). A silent non-social video played throughout to maintain infant attention. Data were processed using HOMER2 (time window: 10-15 s post-stim; FDR-corrected p<.05=significant). In response to IDS, infants had significant activation in 1 LH inferior frontal and 1 RH superior temporal ch at 3 mos and in 1 RH inferior frontal ch at 6 mos. Bilateral activation was observed in several chs at 3 mos (HCM: 6 LH & 6 R chs; HNC: 4 LH & 4 RH chs) and 6 mos (HCM: 2 LH & 2 RH chs; HNC: 2 LH & 7 RH chs). Infants with more LH and RH activation to HCM at 3 mos had more LH and RH activation to IDS at 6 mos (rs=.37-.56). Likewise, infants with more LH activation to HNC at 3 mos had more LH activation to IDS at 6 mos (r=.39). Results suggest that brain responses to IDS during early infancy are more focal, while other types of vocalizations are associated with more widespread bilateral temporal activation that becomes more focal in the LH by 6 mos. Also, early brain responses to non-speech vocalizations may predict later response to IDS.

3-A-104 Cortical temporal hierarchy and social-cognitive comprehension in middle childhood

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Successful social interaction requires integrating information over multiple timescales. For example, in order to fully represent a social partner?s mental state one must integrate a change in facial expression with its context and one?s history with the partner. Previous work using naturalistic viewing fMRI in adults has mapped an organization of neural systems that respond to information at different timescales. For example, sensory cortices respond equally to information presented at short and long timescales (i.e. scrambled and intact movies), whereas association cortices (e.g. default mode) respond more to the intact movie. However, no study has examined cortical temporal hierarchy or the relationship between timescale processing and social-cognitive comprehension during development. We collected fMRI data while children (N=24, 6-13 years old) watched two episodes (intact and scrambled) of a television show. We target middle childhood as it is a time of expanding social roles, social-cognitive abilities, and neural specialization. To measure social-cognitive comprehension, we asked post-scan mental (i.e. character thoughts and intentions) and non-mental questions. To examine cortical response

to differing timescales, we used inter-subject synchrony analyses. The intact movie resulted in better social-cognitive compared to general comprehension. Also, regions sensitive to long timescales in adults exhibited greater neural synchrony for the intact movie. Using ecologically valid methods, we highlight the role of timescale processing in social-cognitive development.

3-A-105 Socioeconomic status and brain structure and function across development: Implications for Academic Achievement

Maya Rosen[1], Margaret Sheridan[2], Kelly Sambrook[1], Andrew Meltzoff[1], Katie McLaughlin[1]

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Growing evidence suggests that childhood socioeconomic status (SES) influences neural development, which may contribute to well-documented SES-related disparities in academic achievement. Here, we investigate the associations of childhood SES with cortical structure, white matter microstructure, and neural function during a working memory (WM) task across development. The sample included 66 children and adolescents (age 6-19). Higher SES was associated with higher academic achievement, WM performance, and cognitive stimulation in the home environment. Although SES was unrelated to cortical thickness, children raised in more cognitively stimulating environments had greater cortical thickness in the frontoparietal network. Higher family income-to-need ratio was associated with greater fractional anisotropy (FA) in the right and left superior longitudinal fasciculi (SLF). Greater FA in left SLF, in turn, was associated with higher academic achievement. Additionally, higher income-to-needs was associated with greater BOLD activation across many regions in the prefrontal cortex during WM; greater activation in these regions was associated with better task performance and higher academic achievement. Together, cognitive stimulation, WM performance, prefrontal activation during WM, and FA in the left SLF significantly mediated the association between SES and academic achievement. Taken together, these findings highlight potential neural, cognitive, and environmental mechanisms linking SES with academic achievement.

3-A-106 Neural and behavioral development of direct versus reflected self-evaluations in adolescence

Renske van der Cruijsen[1], Sabine Peters[1], Eveline Crone[1]

[1]Leiden University

Adolescents are very preoccupied with the opinions of their peers, and reflected self-evaluations play a large role in the construction of the self-concept. To date, no prior studies investigated the developmental patterns of the neural correlates of direct and reflected self-evaluations across the whole age range of adolescence. In this study, 150 adolescents (80 girls) between 11 and 21 years old participated in an fMRI study in which they performed direct and reflected self-evaluations. In both tasks, participants evaluated 60 trait sentences describing positive and negative traits in the academic, physical and prosocial domain. Participants answered the question: 'does this trait describe me?' (direct) or 'do my peers think this trait describes me?' (reflected), on a scale of 1 (not at all) to 4 (completely). Behavioral results showed that adolescents evaluated themselves differently on the direct versus the reflected task, but only in the youngest age groups (11-12 and 13-14 years). We examined brain activation for (1) direct- and (2) reflected self-evaluations versus a control task. These contrasts resulted in largely overlapping brain activations in mPFC, left DLPFC, PCC, right TPJ and SMA, from which ROIs were extracted. Left DLPFC activation was weakest in 11-12-year-olds, and strongest in 19-21-year-olds. MPFC activation increased linearly with age and was stronger for reflected versus direct self-evaluations

only in 11-12-year-olds. The results suggest that the perceived opinion of others about the self become adopted in one's self-concept during adolescence.

3-A-99 Stress System Genes and Cognitive Development in Childhood

Clancy Blair[1]

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Glucocorticoid receptor (GR) genes have been shown in numerous analyses to interact with early life stress (ELS) measured in infancy and early childhood to predict mental health outcomes in young adulthood. In a longitudinal population-based sample of children (N=1292) followed from birth in predominantly rural and low-income communities in North Carolina and Pennsylvania USA, I found that a number of variants of GR genes known to be associated with the activity of the HPA axis and circulating levels of cortisol interact with ELS to predict cognitive and academic outcomes in early and middle childhood. Analyses of an FKBP5 haplotype and of individual polymorphisms of CRHR1 and NR3C1 interact with violence in the home to predict executive function ability and reading outcomes in the early elementary grades.

3-B-107 Feelings about the future: The effect of perceived stability on decision making in college students across US and China

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This generation has grown up during a period of economic and geopolitical turbulence causing greater levels of uncertainty. How might such instability impact their economic choices? We first addressed this question by examining how temporal discounting changes in response to positive or negative future descriptions. Participants read short vignettes that primed them to feel either secure (Positive) or unsure (Negative) about the economic, political, and environmental future. Temporal discounting was assessed before and after the primes, and the change was compared across the two prime groups. Personality scales assessing impulsive tendencies were collected. We found a significantly greater increase in temporal discounting in the negatively primed vs. the positively primed group, specifically in individuals with low impulsive tendencies. In the second experiment, we examined how real-world perceptions of stability may influence decision making cross-culturally. College students from the U.S. and China, differing in the rate of recent economic growth, completed temporal discounting and the Zimbardo Time Perspective Inventory to examine how a future-oriented time perspectives affect economic choices. We found a significantly greater temporal discounting in Chinese compared to American students. Interestingly, a future-oriented perspective was associated with greater discounting in Chinese subjects and smaller discounting in Americans. Collectively these studies highlight how economic decision-making is significantly influenced by people's perception of their future prospects.

3-B-108 The relationship between impulsivity and peer problems across adolescence.

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Background: The Stop Signal Task (SST) has been used in multiple studies to measure response inhibition and is known to be related to ADHD symptoms in children and adults. However, very few studies have looked at SST across adolescent development, or investigated the relationship between SST performance and adolescent peer problems. We hypothesize that the stop signal reaction time (SSRT), a reliable measure of response inhibition, will be related to peer problems in adolescence; and further that this relationship will change across the teen years. Methods: Using data from the IMAGEN study, SST performance was examined in 660 participants at age 14 and age 18. Youth self-report of emotional problems including peer problems and inattention/hyperactivity were analyzed from the Strengths and Difficulties Questionnaire self-report (SDQ) at both time points. Results: Performance on the SST was highly correlated between ages; as were scores on the SDQ. SSRT was significantly correlated with peer problems at age 14, but not age 18. Age 18 SSRT was correlated with inattention/hyperactivity problems but not peer problems. Conclusions: These findings demonstrate a change in the relationship between performance on the SST and clinical symptoms from age 14 to 18. This may reflect developmental changes in behavior, and/or in the factors affecting peer problems and acceptance. These findings underscore the importance of treating impulsivity in younger adolescents as this may improve peer relationships, which serve as a major protective factor for later pathology.

3-B-109 Adolescents and adults learn differently from description and experience

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Adolescents are prone to heightened risk taking, and recent research suggests that the way in which risk information is learned is important in understanding when teens are particularly likely to take risks. The present study tested how adolescents (N=30) and adults (N=30) make decisions from description (DFD) and sampling experience (DFE) with decision alternatives, to gain insight into age differences in decision making by information source. We also measured eye movement patterns to better understand decision processing, and heart rate variability to index affective arousal as a potential moderator of learning and decision making. Patterns of choice behavior indicated key differences in weighting of risk information by age in DFD and DFE. Specifically, while adults' choices suggested systematic overweighting of rare outcomes in DFD, adolescents did not exhibit this bias. Further, in DFD, adolescents spent more time looking at probabilities than values, while adults showed the opposite pattern. Conversely, in DFE, both adolescents and adults made choices consistent with underweighting rare outcomes, but this pattern was enhanced in teens, even after controlling for sampling bias. Relative to adults, adolescents also showed a larger change in heart rate variability measures associated with arousal during DFE. Results suggest that adolescents may have trouble effectively utilizing descriptive information about risk, but can adapt choices readily based on information acquired through experience, perhaps as a result of heightened affective arousal elicited during learning.

3-B-110 Friendly and Unfriendly Social Interactions Affect Subsequent Trust Behavior in Adolescents

Hester Sijtsma[1], Nikki Lee[1], Nienke Van Atteveldt[1], Lydia Krabbendam[1]

[1]Vrije Universiteit Amsterdam

One of the challenges that adolescents face is navigating a complex social world in which you need to learn to use social cues to know who you can trust. Interactive paradigms such as the trust game have shown that trust increases throughout adolescence. The current fMRI study used this paradigm to

examine if adolescents adapt their levels of trust based on friendly or unfriendly social interactions with a fellow player prior to the experiment. A trust game was administered to 19 adolescents (M age=16.95, SD=0.61; 84% female). Before playing the trust game, participants played three introductory rounds to get to know the other player. Participants then played the trust game with a partner they were primed to think had treated them unfairly, and a partner they believed had treated them fairly. In reality both partners were equally trustworthy throughout the game. Behavioral analyses showed that participants' initial investments varied based on their beliefs about the other player. Participants invested significantly less money on the first trial with the untrustworthy partner compared to the trustworthy partner. Throughout the game there was no change in trust behavior towards the trustworthy partner. Concerning the unfriendly partner, adolescents were able to quickly and flexibly adapt their trust behavior, and significantly increased their investment after the initial trial. Thus they interacted in a similar way with both partners, showing that they adjusted their prior beliefs based on experience. Results of the fMRI analyses will be presented at the conference.

3-C-112 Mapping network-level coupling of structural and functional connectivity during adolescence

Graham Baum[1], Rastko Ciric[1], Cedric Xia[1], David Roalf[1], Richard Betzel[1], Tyler Moore[1], Russell Shinohara[1], Philip Cook[1], Mark Elliot[1], Kosha Ruparel[1], Christos Davatzikos[1], Raquel Gur[1], Ruben Gur[1], Danielle Bassett[1], Theodore Satterthwaite[1]

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The co-evolution of structural and functional brain connectivity during childhood and adolescence remains poorly understood, despite its potential relevance for both the development of cognitive function and vulnerability to neuropsychiatric disorders. Here, we leveraged intrinsic functional connectivity (FC) and diffusion tensor imaging data acquired as a part of the Philadelphia Neurodevelopmental Cohort (n=834, ages 8-23 years), a large community-based study of brain development. Structure-function coupling was measured by the within-subject correlation between FA-weighted structural connectivity (SC) and FC. When imposing a functional network partition on subject SC matrices, we found that within-module structure-function coupling increased significantly with age while controlling for subject sex, in-scanner head motion, and total network strength ($p<0.0001$). Overall between-module coupling did not change significantly with age ($p>0.05$). Age-related increases in within-module coupling were observed in the visual, somatomotor and dorsal and ventral attention networks (FDR $q<0.05$). Notably, higher structure-function coupling within the ventral attention network was associated with higher overall accuracy ($p=0.009$) and reduced variability in within-subject performance on the Penn Computerized Cognitive Battery ($p=0.007$). Together, these findings delineate a novel pattern of adolescent brain development whereby the targeted development of structure-function coupling within brain modules supports cognitive performance in adolescence.

3-C-113 Relations between working memory and cortical thickness in anterior cingulate cortex and dorsolateral prefrontal cortex in early childhood

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Although research shows that working memory improves during early childhood, it remains relatively unclear how cortical regions, known to support this ability in adults, relate to changes in children. Measures of cortical thickness may be useful in investigating this association, as age-related changes in

cortical thickness are thought to result from pruning of inefficient synaptic connections and increased myelination, which may support improvements in cognitive abilities (Sowell et al., 2004). However, only limited research has investigated how cortical thickness relates to working memory abilities in childhood (cf. Kharitonova et al., 2013). The present study investigates relations between cortical thickness in regions of interest related to working memory, including anterior cingulate cortex (ACC) and dorsolateral prefrontal cortex (DLPFC), and performance on a forward digit span task. 108 children, ages 5-8 years, completed digit span and a structural MRI scan. Results indicated a significant association between thickness in ACC and DLPFC and performance on digit span, such that those with a thinner cortex recalled more items than those with a thicker cortex in the specified regions. Results of a mediation analysis indicated a significant indirect effect of age on digit span performance through ACC thickness, b = 0.01, SE=0.01, CI [0.002, 0.019]. This effect was not observed for DLPFC thickness. These results suggest that even in early childhood, there are associations between working memory abilities and thickness in cortical areas known to support working memory.

3-C-114 Earlier and atypical structural connectivity following early caregiver deprivation

Chelsea Harmon[1], Laurel Gabard-Durnam[2], Dylan Gee[3], Bonnie Goff, Dominic Fareri[4], Christina Caldera[5], Jessica Flannery[6], Eva Telzer[7], Kathryn Humphreys[8], Nim Tottenham[1]

[1]Columbia University, [2]Harvard University, [3]Yale University, [4]Adelphi University, [5]UCLA, [6]U Oregon, [7]Duke University, [8]Stanford University

Early parental deprivation has been associated with neurological and behavioral differences across development. For example, children with a history of previous institutional care (PI) followed by international adoption are at heightened risk for developing internalizing problems such as depression and anxiety disorders. Functional magnetic resonance imaging studies have suggested that these behavioral differences are attributable to accelerated development in neural circuits. The current study used diffusion tensor imaging (DTI) to examine the development of structural connectivity, providing an index of white matter (WM) integrity, which animal studies suggest marks the relative maturity of functional connections. DTI was collected in children and adolescents (6-16 years old) with or without a history of PI followed by international adoption. Results indicate a main effect of age and of early caregiving on whole brain fractional anisotropy (FA) values, but only a main effect of early caregiving on radial diffusivity (RD). Specifically, FA, but not RD, increased linearly with age across both caregiving groups, whereas both FA and RD values were elevated in the PI youth. Taken together, these patterns suggest that FA and RD are affected in different ways by early adversity. Moreover, higher global FA in the PI group was more associated with greater anxiety. These results suggest that early life parental deprivation is associated with earlier WM integrity, although this might be indicative of compromises to the associated myelination due to accelerated neural development.

3-C-115 Resting state brain network differences in youth adopted from international orphanages

Max Herzberg[1], Kelly Jedd McKenzie[1], Ruskin Hunt[1], Megan Gunnar[1], Kathleen Thomas[1]

[1]University of Minnesota

Early orphanage care is characterized by social deprivation and is considered a significant disruption to normative early development (Zeanah et al., 2009). Post-institutionalized (PI) youth adopted into the U.S. as children exhibit differences in brain structure (Hodel et al., 2015). Further, a small number of

studies have reported differences in resting state networks following early life stress (e.g. Philip et al., 2013). Resting state functional connectivity data from 41 PI and 42 non-adopted (NA) adolescents were analyzed using graph theory to investigate group differences in graph topology as well as differences in efficiency, transitivity, and small-worldness across the whole brain and within sub-networks. A set of 160 previously identified ROIs, each assigned to one of six sub-networks, was used to identify graph nodes (Dosenbach et al., 2010). The resulting networks exhibited small world structure, though graphs became connected at slightly higher costs ($20 < K < 30$) than in the adult literature. Small group differences in graph topology were observed in fronto-parietal regions using three measures of centrality. Despite similar topology, the groups differed in sub-network efficiency. PI youth exhibited significantly lower efficiency in the cingulo-opercular network compared to NA youth (permutation test $p < .01$). These results are consistent with literature suggesting that PI youth struggle with executive function tasks, as the cingulo-opercular network has been suggested to aid in set-maintenance (Merz et al., 2016; Dosenbach et al., 2008).

3-C-116 Development of emotional processing is linked to maturational changes in left-right cingulum asymmetry during adolescence.

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Adolescence is a time of profound changes in social-interactions and cognitive functions, which are mirrored by ongoing brain maturation. Here we investigated the link between longitudinal performance changes on a face emotional go/nogo task and longitudinal changes in fronto-limbic white matter microstructure. We hypothesized that mean reaction times (RT) towards negative faces would decrease with age and would be linked to maturational changes in left-right microstructural asymmetry of cingulum, uncinate fasciculus, and the white matter underlying the ventromedial prefrontal cortex. Seventy-four children and adolescents aged 9 to 16 years (Mean=12.4 years; SD=2.4 years, 28 boys) performed an emotional go/nogo task and underwent diffusion-weighted brain imaging at two to five occasions with 6 months? intervals (304 data points). Fractional anisotropy (FA) was used as a measure of white matter microstructure. Linear mixed effect modelling revealed no main effect of asymmetry on mean RT, but a significant age-by-cingulum FA asymmetry interaction. Regional FA increased in left and right cingulum FA with age. At young age, fast and slow performers showed a similar asymmetry in FA with higher FA values in the left relative to right cingulum. This asymmetry became less pronounced with increasing age in fast but not slow performers, mainly due to a higher increase in right relative to left cingulum FA. Our results link the speed of visual emotional processing to an attenuation of microstructural asymmetry in a major limbic pathway during brain maturation.

3-C-117 The Relationship Between Child Adversity, Anxiety Symptoms and White Matter Integrity

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Chronic activation of the stress response during childhood has been proposed to cause long-term maladaptive changes to the structure of stress response systems, resulting in chronic mental illness. This

study helps us to understand how maltreatment in children is associated with differences in white matter integrity and how these factors relate to anxiety symptoms in children. Using Diffusional Kurtosis Imaging data, we examined 106 participants, aged 7-16. Approximately half of the participants were recruited through the Department for Children and Families, and had experienced at least one out-of-home placement following a verified instance of abuse or neglect. Associations between white matter integrity, environmental stressors, and anxiety symptoms were assessed. This study found that specific anxiety symptoms associated with Post-Traumatic Stress Disorder were associated with FA reductions. In addition, levels of general adversity and intrafamilial violence were both associated with Fractional Anisotropy reductions. Understanding the mechanisms by which early adversity is linked to long-term psychiatric outcomes is the first step in designing interventions for this vulnerable population.

3-C-118 Salience network connectivity and risk-taking behavior in high school and college students

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Functional connectivity in resting state networks (RSNs) differ between age groups. However, few studies consider how major life transitions, such as the transition to college during late adolescence, may impact RSN development and ultimately behavior. As adolescence is a time marked by increased risk-taking, here we examined RSN correlates of risk-taking and how they may differ across this life transition. Resting-state fMRI data were collected in 28 adolescents (11 male, Mean Age = 16.9 years) in high school and 26 young adults (10 male, Mean Age = 19.8) in college. Because we were interested in both age-related effects and changes attributable to social environments, we compared RSNs both with and without age as a covariate. Importantly, significant group differences were observed in the Salience Network (SN) only after age was regressed out, suggesting that developmental life stage, and not age, was the key modulator of changes in connectivity. Specifically, high school students showed greater connectivity in the SN between the right anterior insula (AI) and the right temporal pole, as well as between the right AI and the right paracingulate gyrus. In both regions, greater connectivity in this group was correlated with more risk taking and increased perceived benefits of risk taking on the CARE-R. These findings indicate that environmental changes taking place during the transition from late adolescence to early adulthood significantly impact the development of network connectivity above and beyond any effect of age and that SN relates to risk-taking in adolescence.

3-C-119 Filtering artificial motion caused by magnetic field distortions from cardiopulmonary function

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Motion can be particularly problematic in fMRI studies of brain development. Accurate measurements of subject movement are critical to improving the signal-to-noise ratio (SNR). Thoracic movement due to cardiopulmonary function causes motion and physiological changes that obscure the BOLD signal. This movement also distorts the magnetic field in the phase encoding direction (PE-axis) causing a shift in spatial localization, which propagates as artificial motion in that direction during post-processing. Simultaneous multi-slice (SMS) EPIs acquire smaller voxels, shorter TRs, and have higher motion sensitivity than traditional scanning. While real movement is correlated with the global brain signal and

should be removed, "artificial" movement is independent of any change in the BOLD signal and removal of good frames because of this motion artifact ultimately decreases the SNR. Here we show power spectra analyses of the motion traces reveal peaks along the PE-axis associated with heart and respiration rate. Furthermore, we demonstrate that this artifact can "mix" into other directions besides the PE-axis if head position moves during scanning. We then test a band-stop filter to remove this artifact from the motion trace and experiment with A) general filters in all movement directions, B) general filters in only the PE-axis, and C) specific filters that are based on a participant's own physiological data. Our results indicate more accurate movement measurements in SMS EPIs, which is critical for developmental studies where motion can be particularly problematic.

3-C-120 The influence of maternal diet on macaque offspring structural brain volume and behavior.

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SIGNIFICANCE: The prenatal environment is fundamental for healthy offspring development. A poor maternal diet and obesity during gestation have been shown to increase the risk for subsequent psychiatric disorders in offspring. In humans it is difficult to dissociate the effects of maternal diet versus metabolic state on offspring development. Non-human primates allow for controlled experimental design while still retaining the ability to study complex behaviors and brain structures. OBJECTIVE: Investigate the influence of a maternal high-fat diet (HFD) and metabolic state on Japanese macaque offspring structural brain development and anxiety-like behavior. METHOD: Behavioral assessment and MRI scans were conducted in juvenile offspring at 11-months of age. Anxiety-like behaviors were characterized using the human intruder and novel object tests. Maternal metabolic state was determined prior to and during the third trimester of pregnancy. Subcortical volumes (Hippocampus, Amygdala and the Nucleus Accumbens) were predicted via maternal metabolic and diet states as well as offspring anxiety-like behavior using linear regression. RESULTS: A maternal HFD lead to reduced nucleus accumbens and hippocampal volumes in offspring. However, measures of maternal metabolic state prior to and during pregnancy were not predictive of 11-month subcortical volumes. Finally, increased offspring anxiety-like behavior predicted a decrease in their hippocampal volumes. These findings provide new insights into diet specific effects associated with offspring brain-behavior relationships.

3-C-121 Association between Family Environments and Modularity on Structural Brain Networks in Late Childhood

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The impact of adverse family environment on brain development is well established. However, little attention has been given to the influence of normative parenting behaviors. Such influence is likely to be pronounced during periods of rapid brain reorganization, such as late childhood. The aim of the current study was to investigate the association between normative parenting and the organization of modules in structural brain networks in late childhood. Data were collected from a cross-sectional sample of 163 mother-child dyads (76 male children, M age 8.4 years, SD 0.3 years) recruited from across Melbourne, Australia. Parenting behaviors were measured from two observed lab-based interaction tasks, completed by dyads that were video recorded and subsequently coded. T1 weighted images were

acquired from children in a 3T TIM Trio Siemens scanner and processed using FreeSurfer to extract regional cortical thicknesses. Structural brain networks were based on structural covariance (SC) of cortical thickness using sparse regularized methods. Children were grouped based on the distributions of the parenting variables and SC networks were determined for each group. Analyses showed significant associations between observed parenting variables and modular topology. Moderate levels of negative and warm maternal behavior were associated with greater network modularity, whereas higher levels of maternal communication were associated with greater modularity. These results suggest that parenting may affect structural brain networks in late childhood.

3-C-122 Physical environment relates to socioeconomic disparities in cortical structure and reading achievement in adolescents

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Economic disadvantage in youth has been related to cognitive and achievement disparities that are paralleled by differences in cortical structures implicated in higher cognition. The environmental mechanisms that explain the links between socioeconomic status (SES) and cortical structure remain to be identified. The physical home environments (PHYS) in which adolescents reside have the potential to influence opportunities for enrichment and interactions among household members, which could impact brain development and cognition. Youth of lower SES are more likely to experience poorer quality homes, which have been related to worse cognitive functioning. Thus, PHYS may be an unexplored factor contributing to SES disparities in cortical structure and achievement. The goal of this study was to examine the extent to which adolescents' PHYS (assessed via in-home interviews) mediated the links between SES (measured by maternal education and income-to-needs ratio) and cortical structure in regions relevant for reading and math achievement. Data from 56 adolescents (27 females; 14-18 years, M = 16.83 years) indicated that PHYS mediated the link between SES and adolescents' reading achievement as well as the links between SES and cortical surface area in prefrontal regions. SES and PHYS evinced independent effects on cortical thickness. These results suggest that physical environmental factors may be an untapped resource that can inform development of appropriate interventions to reduce socioeconomic disparities in brain development and achievement.

3-C-123 Heritability of neural reactions to social exclusion in middle childhood

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Observing social exclusion can be a distressing experience for children that can be followed by concerns for self-inclusion, as well as prosocial behavior to help others in distress. Behavioral studies have shown that observed social exclusion elicits prosocial compensating behavior, but little is known about heritability of this behavior. To distinguish between self-concerns and other-concerns when observing social exclusion in childhood in a twin sample (N=512), we used a four-player Prosocial Cyberball Game in which participants (aged 7-9) could toss a ball to three other players. When one player was excluded by two other players, participants showed consistent prosocial compensating behavior in response to this exclusion by tossing the ball more often to the excluded player. In a sub-sample (N = 283) we studied neural reactions to social exclusion. We found activity in social perception related areas (mPFC, IFG, and subACC) for the experience of exclusion, and activity in reward and salience related areas (striatum, insula, and ACC) for the experience of inclusion. Further, we found that activity in mPFC and

right IFG was best explained by genetic and unique environmental factors, whereas activity in left IFG and right insula was best explained by shared and unique environmental factors. Activity in other regions was best explained by unique environmental factors and measurement error. This suggests that reactions to social exclusion are both heritable and driven by shared environmental factors, providing new opportunities for interventions aimed at parenting.

3-D-124 Development of reward learning behavior and striatal activation through adolescence

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Reward processing undergoes significant developmental change during adolescence, as individuals exhibit heightened sensitivity to reward producing events. We used a rewarded map exploration task to assess age-related changes in reward learning during an fMRI scan (n=139, 69 female, ages 12-30). Behavioral data was characterized with a reinforcement learning (RL) model, and subjects were classified as "learners" and "non-learners" based on the ability of the RL model to predict their responses better than a null model using randomized responses. Overall, we found a significant age-related increase in the ability of subjects to learn reward contingencies based on a post-task map evaluation (inverse age p=0.04; p=0.02 among learners). This was accompanied by an overall increase in proportion of optimal responses made during the task, and a trend level increase in RL model learning rates with age (p=0.057), which plateaued in the early 20's. fMRI activation revealed a quadratic effect of age on striatal reward responses (p=0.05). Sex effects indicated that males tended to show clear quadratic age effects, while females showed more continuous declines in BOLD responses over the age range tested (e.g., age^2*sex interaction, p=0.018 in putamen, p=0.017 in caudate). Application of the RL trial-wise estimates showed that BOLD responses were dominated by the prediction error (PE), compared to expectation, response, and that PE responses showed trend level age effects among learners (p=0.07).

3-D-125 How does social pressure influence creativity in children and adults ?

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[1]Lapsydé

Creativity defined as the ability to think of something truly new (i.e., original, unexpected), and appropriate (i.e., useful, adaptive concerning task constraints) is a fundamental process that influences many areas of our daily life and is important for instance for education and scientific reasoning. Considerable efforts have been devoted at identifying the influence of social contexts (e.g., effect of the presence of peers or adults) in the domains of reasoning and decision making, but surprisingly there are to date few study that have examined whether social contexts may facilitate (or constrain) creative ideation and whether the effect of social contexts on creativity change with age. This study aimed at examining how social pressure (i.e. an adult evaluator) affect the ability to generate creative ideas to a problem in children and adults. 54 children (m = 11.5, SD = 0.4), and 48 young adults (m = 20.3, SD = 1.19) were asked to perform a creative task that involves designing a method to drop a hen's egg from a height of 10 meters (32 feet) to ensure that it does not break. Participants completed the creative task under either a social pressure condition, i.e., in the presence of an adult evaluator, or in the control condition, i.e., task performed alone. Results showed that the presence of adults decreases fluency and originality in children whereas social scrutiny have a stimulation effect among adults. The present

findings expand our understanding of the influence of the social context on creative ideation in children and adults.

3-D-126 Neurodevelopmental trajectories of self and social evaluation across adolescence

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Adolescence is a formative period for identity development and is characterized by heightened sensitivity to social information. While the neural networks involved in social cognition (SC) and self-referential processing (SR) are well characterized, few studies have investigated how these networks develop over time. To that end, we examined data from a 6-year longitudinal fMRI study in which children performed a self-evaluation task at 10, 13, and 16. Participants listened to short phrases in the social or academic domain and judged whether or not it described themselves or a familiar fictional other. To assess developmental effects on neural activity associated with self and social evaluation, we parcellated the brain and selected 30 parcels that support SR or SC as ROIs; the remaining 166 parcels were "control" regions. We used multilevel modeling with crossed random effects (subjects and parcels) to predict mean activity within each parcel. First-level fixed effects included target (self or other), domain (social or academic), and the linear and quadratic effects of age. Parcel classification (SR, SC, or control) was included as a second-level fixed effect. Preliminary results showed positive linear effects within SC parcels across all conditions, whereas within SR parcels, positive slopes were observed only for self-evaluations. While academic self-evaluations showed a modest linear trend, social self-evaluations showed a strong quadratic trend. Together these results suggest important heterogeneity in developmental trajectories within these networks across adolescence.

3-D-127 Children's emotion regulation abilities predict functional connectivity and cognitive control

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Learning to form adaptive responses during emotional arousal is critical to a child's development. Acquisition of these emotion regulation (ER) skills requires concurrent maturation of cognitive control abilities. However, it is unknown how cognitive control systems influence ER in the developing brain. We investigated neural mechanisms of ER and cognitive control in 36 children, ages 10-11, using a reappraisal task during fMRI acquisition. Children viewed negatively valenced images and were asked to either notice their feelings (aversive condition), or reframe their experience in a positive way (reappraisal condition). Subsequent ratings for each image were collected using a scale of 1 (okay) to 4 (very bad). Participants also completed a measure of cognitive control, the Stop Signal Task (SST). Neuroimaging results showed increased activity in dACC and insula during the aversive condition, while reappraisal showed increased activity in left DLPFC, consistent with models of prefrontal control over emotion-generative regions. Children who successfully lowered subjective ratings during reappraisal (effective reappraisers) showed increased connectivity between emotion-generative and cognitive control regions, whereas ineffective reappraisers showed increased connectivity within emotion-generative regions. Effective reappraisers also performed significantly better on the SST and showed

reduced connectivity between core nodes of the default mode network. Taken together, these findings suggest that children's reappraisal capacity mirrors their cognitive control ability.

3-D-128 Emotional Go/No-Go in the field: Applying a lab-based standard measure of emotional regulation to a high-poverty adolescent population

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A burgeoning body of literature suggests that emotional regulation may be a pathway through which poverty affects socioemotional development and later mental health outcomes in adolescence. One widely used measure of emotion regulation is the emotional go/no-go paradigm --a task that has been almost exclusively used in lab-based settings, thus leaving higher-risk children from disadvantaged backgrounds underrepresented in the literature. To address this gap, the Chicago School Readiness Project administered the measure on laptops to 460 low-income adolescents (M age =15 SD =.92) in 126 Chicago public schools. Analyses estimating mean differences using t-tests show that CSRP youth had significantly lower miss rates and were quicker to react in happy than in sad or angry "go" trials, and that false alarm rates were significantly higher in response to angry and sad than to happy faces in "no-go" trials. False alarm rates in "no-go" negative emotion trials were positively associated with impulsivity, dysregulation, externalizing symptoms, experiences being bullied, and violence exposure. Although limited to behavioral data, these findings highlight the feasibility of using emotional go/no-go among low-income teens in the field. Future analyses will leverage CSRP's longitudinal design to explore the stability and validity of this important dimension of emotion regulation, with the potential to reveal changes in neurocognitive control skills under emotionally difficult conditions and to better understand relations between poverty-related stressors and behavioral dysregulation.

3-D-129 Increased sensitivity to negative stimuli in adolescent rhesus macaques

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Vulnerability to mood disorders in adolescence is linked to dramatic physical and neurobehavioral changes, but remedial solutions remain elusive (Giedd et al., 2009). Emotional dysregulation is a promising marker of vulnerability, measured by fear learning and pupillary response to stimuli (Jovanovic et al., 2015; Silk et al., 2007). To longitudinally track the same markers in a nonhuman primate model, three monkeys were trained in the fear potentiated startle (FPS) paradigm at 13, 18, 24 mo. and pupillary dilation (PD) was measured while they viewed positive and negative videos of unknown monkeys at 18, 22, 26, and 36 mo. For the FPS task, animals learned to discriminate between a fear (AX) and a safe (BX-) cue and then received a probe test including both conditioned cues. Although the Age X Cue interaction did not reach significance the effect size was large ($F_{4,8}=1.42$, $p=.31$, $n^2=.41$). Separate analyses at each age revealed that subjects discriminated the fear from the safe cues at 13 and 18 months ($F_{2,4}=3.41$, $p=.14$, $n^2=.63$; $F_{2,4}=13.19$, $p=.02$, $n^2=.87$, respectively), but not at 24 months, due to an increase in reactivity to the safe cue with age. For the viewing task, PD significantly increased with age for both types of stimuli ($F_{3,6}=6.91$, $p=.02$, $n^2=.78$). Together, these results suggest significant age-related increases in reactivity to emotional stimuli during adolescent macaque development. Thus, like humans, monkeys displayed an emotional dysregulation during adolescence and may provide a useful model to investigate the neurobiological basis of this dysregulation.

3-D-130 Whole-brain structural connectivity relates to intrinsic motivation in children born extremely preterm

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Intrinsic motivation is essential for academic success, as well as cognitive growth and organization. Limited work has examined the neuroanatomical underpinnings of intrinsic motivation, particularly in early childhood. This study applied graph theory to investigate whole-brain structural connectivity networks associated with intrinsic motivation in an at-risk group of children. Fifty-four extremely preterm (<28 weeks' gestational age) or extremely low birthweight children (<1000g) underwent T1 and diffusion weighted imaging. Connectivity graphs comprising of 162 cortical and subcortical nodes were created using constrained spherical deconvolution-based tractography and Freesurfer parcellation based on the Destrieux atlas scheme. Networks were thresholded to a uniform 30% edge density to allow comparison between individuals. Connectivity measures were analysed in association with self-reported aspects of intrinsic motivation for school learning (mastery, challenge and interest). Results indicated that reduced characteristic path length (measuring network integration) was associated with a greater desire to master school learning. Similarly, a higher clustering coefficient (measuring network segregation) was associated with greater mastery in these children. Findings suggest that better organisation of whole-brain structural networks may be particularly important for supporting the development of mastery in at-risk children during early childhood.

3-D-132 Nucleus Accumbens Activation Relates to Marginalized Individuals Response to 2016 US Presidential Election

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Over 876 hate crimes were reported in the first 10 days after the 2016 US presidential election. These crimes were perpetrated against historically marginalized groups. Trauma research indicates dampened response in reward-related circuitry in the brain may be a phenotype of vulnerability to long-term negative outcomes. We explored subjective distress following the election, social support, and neural response to identify whether manifestations of acute traumatic events extend to shifts in political climate. Data for 60 adults (40 marginalized, 20 control; 18-30yrs) were collected within 4 months of the election. Marginalized status was defined as self-reported negative response to the election and identification with at least one marginalized group (gender, sexual orientation, ethnicity, religion, immigration). Participants performed the monetary incentive delay (MID) task in the scanner to probe reward circuitry. ROI analyses were performed using the bilateral nucleus accumbens (Buchel et al. 2017) on two contrasts: win vs no-win feedback and anticipation of reward vs loss. For marginalized individuals, but not control, dampened NAcc activation to feedback was related to greater election distress, p=.018, and greater NAcc activation during anticipation was related to higher satisfaction with community support, p=.007. NAcc activation moderated the link between election distress and depressive symptoms for marginalized individuals, p=.048. Results will make a novel contribution to our understanding of how political events shape neural processes and psychosocial adjustment.

3-F-133 Mapping Non-Response to Math Intervention: A resting state MRI study of First Graders

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Early math intervention research has focused largely on supporting the growth of whole number knowledge as a critical foundation for future math attainment (Dyson et al, '13; Fuchs et al., '05; Gersten et al., '15). A number of research efforts indicate positive impacts on math outcomes for students at risk in the early elementary grades (Clarke et al., '16; Clarke et al., '14). Despite the growing number of effective programs, there remains a subset of those who do not respond to these targeted interventions (Fuchs & Vaughn, '12). If the needs of all learners are to be met, additional research is needed to find mechanisms to increase the efficacy of interventions and decrease non-responsiveness (Miller et al, '14). Our aim is to identify patterns of performance on math constructs, resting state fMRI, and achievement outcomes for on-track learners, at-risk controls, responders, and non-responders within the context of an RCT of a research validated math intervention for first grade students. Baseline scans were completed on 46 kids (21 intervention). Follow-up scans are nearing completion. Our processing pipeline includes using AROMA to correct for motion artifact prior to group ICA and dual regression using FSL to examine group differences and changes in math ability across groups. Gaining insight into math development and the learning needs of the non-responders offers the opportunity to refine and expand the tools, materials, and services educators utilize to ensure all learners have access to the field of math and related STEM fields as they advance in their schooling

3-F-134 Twice as nice: Learning benefits from valence and action in adolescence

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Adolescence is a time of life rich with learning experiences. Previous research suggests that during adolescence differential sensitivity to valence impacts the capacity to learn from reinforcement such that adolescents ultimately learn better from positive than negative feedback. A proposed mechanism of this bias is the development-typical change in the dopamine system. In adults, the dopamine system has been linked to action driven learning and reinforcement learning. Furthermore, adults demonstrate enhancements in learning when action is coupled with positive feedback, and when action-inhibition is coupled with punishment, showing a general benefit from congruency. But it is unknown how action and valence interact to support learning in adolescence. To address this question, we employed a 2x2 factorial probabilistic learning paradigm where 12-17 year old adolescent participants learned to execute or withhold a button press (action factor) to either gain reward or avoid punishment (valence factor). Results showed that adolescents learned in each of the action-by-valence conditions but not equivalently. We did not find an overall effect of learning from positive over negative feedback, but rather only when positive feedback was paired with active action. Surprisingly, adolescents were only marginally better at learning action-inhibition coupled with negative feedback than positive feedback. Together, these results suggest that active and positive learning, not simply congruent action-by-valence conditions, may optimize learning in adolescents.

3-F-135 Neural Markers for Reading Gains in Children with Reading Difficulties

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Functional magnetic resonance imaging (fMRI) was used to examine brain differences in 3rd-5th grade struggling readers before and after reading remediation. In the fall pre-remediation period, 46 struggling readers performed an in-scanner reading comprehension task and an out-of-scanner battery of neuropsychological and reading measures. A group of 23 struggling readers (some overlapping) performed the in-scanner measures in the spring, post-intervention, while the entire group of struggling readers repeated the out-of-scanner test battery. Gain scores in reading calculated from pre-post testing were used to sort struggling readers scanned in the fall into future improvers and future non-improvers. Before remediation, differences between future improvers and future non-improvers were seen in bilateral ventral fusiform and a right frontal task-control region ($t(34.92) = 2.28$, $p = 0.03$). After reading instruction, improvers and non-improvers had activation differences in the left and right caudate ($t(21) = 2.39$, $p = .027$, $t(17.06) = 2.28$, $p = .036$). For individuals with data from both scan periods ($n = 16$), change in activation from pre-post in an applied left visual word form area region correlated with gain in reading score ($r(14) = 0.57$, $p = 0.019$). Taken together, these findings suggest that recruitment of reading and task control regions before remediation, as well as change in activation within these regions post-remediation, may be important neural markers for reading gains in middle childhood struggling readers.

3-F-136 Title: Mindfulness Intervention is Associated with Working Memory Training Gains in School-Aged Children

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Working memory training (WMT holds great promise for targeted intervention in childhood populations where deficits in this foundational cognitive skill have known impact on later academic success. In this pilot study, we examined whether participation in a Parent-Child Mindfulness Based Training (PC-MBT) intervention prior to children's participation in WMT would improve subsequent gains in WM capacity. Methods: Target participants (n=19) included typically developing children 8-10 years old, all of whom completed 6-weeks of WMT using a computerized, adaptive, program (Cogmed RM). Nearly half of these children (n=11) also completed the PC-MBT with their parents prior to the WMT program. Cognitive assessments (AWMA, CANTAB) were collected at 3 timepoints: baseline (SV0); 7 weeks later, at pre-WMT(SV1); and 7 weeks later, after WMT (SV2). Improvements in WM were examined by group post training. Results: Children who participated in the PC-MBT intervention prior to WMT showed significantly greater gains on a visual spatial WM task (CANTAB's Spatial Span, total span length) after WMT compared to control children ($t=3.57$, $Beta=2.91$, $p<0.01$). Conclusion: The feasibility of adhering to a rigorous 14 week training intervention that included both mindfulness and WMT was confirmed. In addition, we were able to detect greater improvements in WMT outcomes in those children who completed PC-MBT prior to WMT, suggesting that emotion regulation strategies may have an impact on children's WMT experience and related outcomes.

3-G-137 Ecologically Valid Neural Predictors of Social Anxiety Disorder In Youths

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Although unpredictable peer interactions are highly salient and provoke anxiety in youths, the neural mechanisms of uncertainty processing have largely been probed in non-social contexts using the error-related negativity (ERN), an index of threat sensitivity. We tested relations between the ERN and neural response to unpredictable social interactions in an fMRI-based Virtual School task, and their relations with social anxiety symptoms. In an ongoing study, prior to scanning, 11-14 year olds (N=12) learned their Virtual School classmates had reputations for being nice, mean, or unpredictable. While scanning, participants anticipate social evaluation from each peer prior to receiving 50% positive/ negative evaluation from unpredictable peers, and 100% positive/ negative evaluation from nice/ mean peers, respectively. Larger ERN amplitudes were associated with greater brain activity in the right dorsal anterior cingulate (1, 2, 38; $p<0.005$; ke=38 voxels; $r= -.898$, $p<.001$), while anticipating unpredictable evaluation, and greater activity in the left superior temporal gyrus (STG; -65, -4, 4; $p<.005$; ke=53; $r=.525$, $p=.080$) during receipt of negative-vs-positive evaluation from unpredictable peers. Using linear regression, the ERN, STG activation, and their interaction significantly predicted greater fear of negative evaluation, social awareness, anxiety symptoms, and school avoidance ($R2's>.431$, $p's<.05$). Threat sensitivity and neural response to unpredictable social interactions together provide clinically-meaningful prognostic targets for anxiety-based intervention in youths

3-G-138 Mechanisms of stressor controllability across human development: A novel developmentally-informed paradigm

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Rodent and initial human adult studies suggest that exposure to controllable stress may sensitize frontostriatal-amygdala circuitry to promote more adaptive biobehavioral reactivity to subsequent stressors (Amat et al., 2006; Boeke et al., 2017). Dynamic changes in human frontostriatal-amygdala circuitry from childhood to adulthood suggest that the impact of controllable stress exposure may vary across development (Gee et al., 2013; Heller et al., 2016). As part of a broader study of neural correlates of stressor controllability (SC) following trauma exposure across development, this pilot study examined behavioral correlates of SC. Participants (n = 35; mean age = 19.87, range = 14-29 years) completed two novel tasks optimized to be developmentally-appropriate and representative of SC tasks used in animal studies. At time 1 (T1), participants completed the controllable or uncontrollable stress condition of a SC task. At time 2 (T2), participants completed the uncontrollable stress condition of a distinct task. Participants exposed to controllable stress at T1 reported significantly lower stress ratings to the aversive stimulus at T2, suggesting that exposure to controllable stress promotes reduced reactivity to subsequent stress. This study provides initial validation of a novel SC task for use in human developmental samples that has the potential to advance knowledge of the neurobiological correlates of both short- and long-term effects of SC across development and post-trauma. We expect to have skin conductance response and neuroimaging data to present at the Congress.

3-G-139 Developmental changes in resting-state functional connectivity in borderline personality disorder: A network analysis approach

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Borderline Personality Disorder (BPD) is a mental disorder associated with self-harm, unstable interpersonal relationships, and rapidly changing emotions, with symptoms often emerging in adolescence. In this study, we used graph theory analyses of resting-state fMRI data to characterize functional connectivity differences in a sample of adolescents and young adults with BPD symptoms. Participants were 88 individuals ages 13-30 with and without BPD symptoms. Connectivity matrices were derived from temporal correlations among regions defined by a 264-region brain parcellation. Graph analyses focused on nodal statistics, including degree and betweenness centrality. To test group differences that were robust to graph density, we analyzed principal components of centrality that integrated across 1-20% densities. BPD participants had elevated betweenness centrality in the left ACC, middle cingulate, precuneus, and right putamen, inferior parietal lobule, insula, and middle cingulate. BPD patients also exhibited significantly increased between-network connectivity in the right sgACC and left precentral gyrus. Within-network connectivity in DMN regions including the precuneus, middle cingulate, and right middle frontal gyrus was higher in BPD participants. Results converge around a) developmental differences in network integration in the DMN (specifically hyperconnectivity), and b) increased connectivity in the cingulate cortex, including increases in between-module connectivity in the sgACC, indicative of greater limbic influence on functionally distinct brain networks.

3-G-140 Longitudinal associations of childhood executive function deficits, resting state functional connectivity, and ADHD/MDD symptoms across school age.

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Measures of executive function (EF) distinguish children with ADHD from control children, but less work has examined relationships to depression or brain network organization. This study examined whether early childhood EF predicted a new onset or worsening of ADHD and/or depression in children, and how EF related to functional connectivity of brain networks thought to be important for executive function. Participants were 247 children, ages 3-6 at recruitment, from a study of emotion development. The BRIEF Global Executive Composite (BRIEF-GEC) was used as the measure of EF in early childhood to predict subsequent ADHD and MDD diagnoses and symptoms across school age. Resting state fMRI network analyses examined global network efficiency in four networks and six 'hub' seed regions were used to examine seed-based connectivity. Correlations between ADHD/MDD symptoms and connectivity metrics predicted by BRIEF-GEC were examined. Early childhood BRIEF-GEC predicted worsening and new onsets of ADHD and depression across school age. Increasing EF deficits predicted increased global efficiency in the salience network and connectivity with four regions for the left dorsal anterior cingulate hub and one region with the insula hub at school age. Altered connectivity was also related to ADHD and depression. Follow-up longitudinal work is examining whether EF deficits are related to functional connectivity of these brain networks and ADHD and/or MDD symptoms across four scan visits. These results will help clarify the temporal evolution of these relationships throughout childhood.

3-G-141 Child Trauma Disrupts Hippocampus-Dependent Associative Learning in the Presence of Threat

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Children exposed to trauma consistently exhibit heightened attention to threat. This may interfere with other forms of information processing in the presence of threat cues. Little research exists on this topic. We examined associative learning of visual stimuli with and without threat present in children with and without trauma exposure. Children (n=60; 8-19 years, 30 with violence exposure) completed a Paired Associates Learning task. During fMRI scanning, participants learned face-object pairs where faces were either neutral, happy, or angry. Outside the scanner, participants completed a memory test for face-object pairs. The hippocampus was recruited during encoding; greater hippocampal volume and activation predicted better associative memory. Children exposed to violence had poor memory of face-object pairs only for trials involving angry faces and reduced hippocampal activation during encoding. Trauma exposure appears to disrupt hippocampus-dependent associative learning in the presence of threat cues. The primary mechanism underlying this learning deficit is likely narrowing of attention on threat cues at the expense of processing non-threatening information. An inability to process and integrate information present during a traumatic event may contribute to overgeneralized and incomplete trauma memories, generalization of fear to cues resembling those present during the trauma, hyperarousal to trauma cues in safe contexts, and re-experiencing aspects of the trauma at other times and places.

3-G-142 Childhood adversity and prefrontal-amygdala functional connectivity during emotion regulation: Specificity to abuse but not other adversities

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Adverse experiences in childhood have been associated with a pattern of increased negative coupling between the ventromedial prefrontal cortex (vmPFC) and amygdala in both children and adults (Gee et al., 2013; Birn et al. 2014), but associations with specific exposures (eg. abuse vs neglect) have not been explored. We collected fMRI data on 62 adolescents aged 13-20 (mean=17, sd=1.44) during an emotion regulation task. Negative functional connectivity between vmPFC and amygdala was more negative during exposure to negative vs neutral emotionally valenced images. Functional connectivity between vmPFC and amygdala was more strongly negative in adolescents exposed to physical, sexual, or emotional abuse, but not in those exposed to community violence, neglect, or low parental education. These findings held after adjusting for amygdala reactivity. This may indicate that increased inhibitory signal from vmPFC to amygdala is a specific adaptation to growing up in an environment characterized by threat.

3-G-143 Neural correlates of peer victimization in youth at highest risk for social anxiety confer resilience for development of social anxiety symptoms 2-years later

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Social anxiety (SA) disorder typically emerges in adolescence, potentially due to a normative increase in desire for peer acceptance. Isolating neural mechanisms of risk for SA may provide novel targets for early interventions. At age 11, 53 longitudinally assessed participants completed the current study. Participants, classified as high or low social reticence (SR) based on maternal report and observations at ages 2, 3, 4, 5, and 7, were further categorized by current peer victimization (PV). This resulted in four groups: low SR/no PV (N=10), low SR/PV (N=13), high SR/no PV (N=10), and high SR/PV (N=17). Participants completed the fMRI Virtual School paradigm which models brain function during real-time interactions with "Other Students" who are 'nice', 'unpredictable, or 'bullies'. High SR/PV youth had greater activity in medial prefrontal cortex (mPFC) and posterior cingulate cortex (PCC) when anticipating feedback from bullies vs. other peers. However, since groups had equally low levels of SA, it is unclear if this activation pattern reflects risk or resilience to SA. Thus, brain function was used to predict SA symptoms 2 years later. At age 13, SA symptoms increased with the number of risk factors expressed: low SR/no PV (1.71±2.06), low SR/PV (2.00±2.18), high SR/no PV (2.89±2.93), and high SR/ PV (4.92±3.64). Furthermore, heightened engagement in mPFC and PCC while anticipating feedback from bullies was associated with less severe SA symptoms 2 years later (r's < -45, p's <.10). This suggests neural engagement during bullying may buffer at risk youth from SA.

3-G-144 The Effect of Temporal Lobe Epilepsy on Emotion Recognition in Children

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Temporal lobe regions are involved in a host of social cognitive processes. Recent research has demonstrated that both functional brains systems and behavioral features of social cognition undergo a prolonged period of maturation throughout childhood and adolescence. Adults with temporal lobe epilepsy (TLE) are at risk for deficits in social cognitive functioning, particularly in emotion recognition (ER). However, little is known about whether TLE is associated with ER in children. We examined whether patterns of activation differed between pediatric patients with TLE and healthy controls during an emotional face recognition paradigm. Participants were presented with 90 children's faces depicting five emotional expressions (happiness, anger, fear, sadness and neutral) during functional neuroimaging. Preliminary evidence indicates that TLE is associated with marked impairment in emotion detection accuracy and impoverished BOLD response within the temporal lobes. Detection of fear faces appears to be particularly impaired in the TLE group. These preliminary data are consistent with predictions of impaired ER in children with TLE and underscore the importance of temporal lobe function in socio-emotional behavior during development. Analysis of fMRI data with a larger sample is ongoing. The current findings suggest that TLE is associated with impairments in social cognitive functioning in children. Understanding this association in a pediatric population may better explain the emergence of social and cognitive deficits in adults.

3-G-145 Abnormal Frontoparietal Praxis Network Connectivity in Children with Autism

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Children with ASD have deficits in praxis (dyspraxia), with impairment in the production of gestures with communicative purpose or action knowledge. Neurobiological basis of praxis involves a frontoparietal

network, but little evidence relates functional connectivity of this network in ASD to dyspraxia. We acquired resting state fMRI from 162 children (81 ASD, 81 typically developing (TD), 8-12 years). A praxis network (PN) was localized using ICA. Local maxima in the ICA map for PN were used in a seed-based connectivity analysis. ASD children were less accurate on gesture imitation than TD ($p < 0.0001$). Consistent with previous observations of decreased asynchrony between task-positive and default mode network (DMN) processing in ASD, we observed that right/left inferior parietal lobe (IPL) PN seeds showed increased connectivity with the posterior cingulate and medial prefrontal cortex ($p < 0.05$, FWE). In HFA, connectivity between the IPL (left or right) and the SMA were correlated with gesture accuracy. Further, accuracy was correlated with connectivity between right IPL and other canonical praxis regions. Praxis deficit in ASD might stem from reduced connectivity between the IPL and other within-network nodes. Moreover, the reduced asynchrony with DMN suggests that abnormal between-network connectivity may contribute to dyspraxia in children with ASD. These findings represent a step towards understanding the involvement of the PN during skilled behavior in ASD and how this might contribute to abnormalities in other core social and communicative behaviors.

3-G-146 Externalizing behavior problems impact task performance across executive function domains in a developmental sample

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Executive functions (EFs) are critical for academic success and mental development. In a sample of 69 children (8-18 yrs, M=12.9 yrs), we first examined differences in performance between typical (n=28) and ADHD (n=27) subgroups on 3 tasks from different EF domains. Participants performed an inhibitory stop-signal task, a working memory N-back task, and a task-switching task. Next, we probed the relationship between parent report of behavior issues on the Child Behavior Checklist (CBCL) and Conner's ADHD Scale, and performance on the same tasks in a continuous, rather than dichotomous, approach. In the typical vs. ADHD analysis, we found few differences in accuracy or response time (RT) on any task, and there was no difference between the groups in externalizing behavioral issues on the CBCL ($t=-0.73$, $p=0.47$). However, regardless of diagnosis status, we did find that greater externalizing behaviors (CBCL) related to poorer N-back accuracy (1-back, $r=-0.35$, $p<0.01$) and slower RT (1-back, $r=0.41$, $p<0.01$), as well as to poorer stop signal task accuracy during go trials ($r=-0.26$, $p=0.03$), and slower overall RT during task switching ($r=0.31$, $p=0.01$). Similar results were found for greater defiant behaviors on the Conner's. Thus, we found that testing for performance differences related to diagnosis was not as insightful as using continuous measures of attention and externalizing problems. Further, as externalizing symptom burden correlated well with performance across different tasks, this may indicate a common source of individual performance variability across these EF tasks.