



ABSTRACTS FROM THE ISDP 2020 VIRTUAL - 53RD ANNUAL MEETING OF THE INTERNATIONAL SOCIETY FOR DEVELOPMENTAL PSYCHOBIOLOGY

NEURO20

INFANTS' SELF-REGULATION IS MODERATED BY THE SYNCHRONY BETWEEN INFANTS' AND MOTHERS' CARDIAC VAGAL TONE

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It is well-established that infant-mother behavioral synchrony facilitates the development of infants' emotion regulation. Much less is known about the contributions of physiological synchrony, especially because of difficulties in continuously measuring this construct. In this study, we describe a new method for dynamically measuring vagal tone synchrony between infants and mothers, and then test whether synchrony moderates infants' behavioral and physiological responses. A total of 114 infant-mother dyads with infants between 4- to 6-months of age were tested in the Face-to-Face-Still-Face paradigm. This paradigm introduces a mild social stressor (i.e., still-face), and infants are assessed for behavioral and physiological self-regulation before, during, and following the social stressor (i.e. reunion). The results revealed that infants' distress followed the prototypical pattern of increasing during the still-face and then decreasing during reunion, but this pattern was moderated by vagal synchrony between infants and mothers as well as infants' vagal reactivity. Critically, infants displaying low vagal reactivity during social play and still-face episodes were significantly more likely to reduce their distress during the reunion episode if they displayed positive synchrony with their mothers; higher levels of positive synchrony were associated with greater reductions in distress. By contrast, infants revealing high vagal reactivity were likely to reduce their distress during the reunion episode independent of positive or negative synchrony. These results suggest that mothers displaying positive synchrony with their infants were better able to co-regulate their infants' behaviors than mothers associated with negative synchrony, especially if infants' vagal tone was less developed and less reactive.

A MULTIVARIATE APPROACH TO EXAMINING ASSOCIATION BETWEEN THE PRENATAL ENVIRONMENT, MATERNAL-PLACENTAL-FETAL BIOLOGY, AND OFFSPRING BRAIN CONNECTIVITY

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Maternal psychological stress, socioeconomic status, life history, health, and nutrition are associated with differential offspring brain outcomes. These aspects of the prenatal environment are hypothesized to influence the developing fetal brain via stress-sensitive aspects of maternal-placental-fetal biology (MPF), which we have previously shown to be associated with altered offspring brain connectivity in the neonatal period. However, previous research has centered around univariate analyses that do not consider the wide array of preconceptional and prenatal factors with potential to influence MPF biology and the developing fetal brain. We seek to add to this research by identifying potential biological pathways for environmental effects on offspring brain outcomes using canonical correlation analysis (CCA) with a high-dimensionality dataset. Drawing from a longitudinal study of maternal-fetal/infant-dyads (N=138), biological samples were collected at two timepoints during pregnancy to derive the average across pregnancy of 34 stress-sensitive biological markers. Features of maternal life history, demographics, and lifestyle were surveyed throughout pregnancy. Resting state functional connectivity MRI in neonates was examined. CCA results show a significant canonical pair demonstrating covariance between several aspects of maternal physical and mental health during pregnancy (body mass index, gestational weight gain, and perceived social standing), and MPF biology (cortisol, C-reactive protein, and macrophage inflammatory protein). Multivariate analyses examining newborn infant brain networks in relation to MPF biology are in progress as the next phase of this study. This work advances understanding of potential biological pathways through which aspects of the prenatal environment can influence offspring brain development and subsequent developmental outcomes.

STRESS22

RESILIENCE DIFFERENCES BY AGE EXPLAIN THE RELATIONSHIP BETWEEN STRESS MINDSET AND ANXIETY: A MODERATED MEDIATION ANALYSIS

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Positive beliefs about stress (stress-is-enhancing mindset) and resilience are negatively associated with anxiety. Notably, resilience increases across the lifespan, such that older adults utilize more adaptive coping tactics than younger adults. Thus, in the current study, we hypothesized that (1) resilience would mediate the effect of stress mindset on anxiety and (2) the relationship between resilience and anxiety would be moderated by age. Participants (N = 1572) completed the following surveys online: Stress Mindset Measure, 10-item Connor-Davidson Resilience Scale, and PROMIS Anxiety 4-item Short Form. Resilience partially mediated the

relationship between stress mindset and anxiety. Age moderated the association between resilience and anxiety such that the strength of the mediated effect increased with age, ranging from $\beta = -.17$; 95% CI[$-.22, -.12$] in adults 18-22 years old to $\beta = -.23$; 95% CI[$-.28, -.19$] in those aged 33-45. Results demonstrate that resilience explains part of the relationship between stress mindset and anxiety and that the negative association between resilience and anxiety is strongest for older people. The socioemotional selectivity theory as well as increased experiences with adversity as age increases might explain this effect. Results also indicate that resilience might prevent negative affect when under stress even for individuals who believe that stress is debilitating. As such, psychological interventions should focus on building resilience, especially for younger adults, to combat negative affect.

NEURO24

MORE BORED THAN BEFORE: CONTEXTUAL INFLUENCES ON NEUROPHYSIOLOGICAL CORRELATES OF BOREDOM REGULATION DURING EASY AND OPTIMAL CONDITIONS

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Boredom is a negative emotion often experienced when a situation is too easy, too challenging, or lacks meaning (Westgate & Wilson, 2018). State boredom is linked to risk behaviors such as gambling and substance use (Maio et al., 2019; Weybright et al., 2015). However, few studies have explored contextual influences on the experience of boredom. This study examines the influence of completing under challenging and optimally challenging tasks on frontal alpha asymmetry (FAA), a neural correlate of emotion regulatory processes, and the theta/beta ratio, a neural correlate of top-down attentional control.

Participants ($N = 113$) completed a decision-making task under easy and optimally challenging conditions while electroencephalography (EEG) was recorded. In this task, participants judged whether two lines would collide, or not. Condition order was randomly assigned. Participants who completed the easy task second reported significantly (all p -values $< .01$) more boredom than those who completed the optimal task second ($t(111) = -3.04$, indicating the under-stimulating task was perceived as more boring after the optimal condition). These participants also exhibited a significant decrease in FAA, $t(50) = 2.98$, suggesting participants experienced greater negative affect when the easy task was second. Participants exhibited higher theta/beta power during the optimal condition, regardless of task order, $F(1,95) = 26.98$, suggesting greater cognitive control during the challenging task. Variability in FAA and theta/beta aligned with self-reported experiences during the task, suggesting that stability in bottom-up and top-down regulatory processes improved the task experience. These results hold implications for reducing state boredom in educational and work settings.

O3-4

MATERNAL DEPRESSIVE SYMPTOMS AND INFANT NEURAL RESPONSES TO EMOTIONAL FACIAL EXPRESSIONS

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Early life adversity has tremendous effects on infant development. Specifically, maternal postpartum depression negatively impacts offspring socio-emotional development starting with infant emotion processing. Less is known about the neural processes underlying the relation between postpartum depression and infant emotion processing. The current study examines the association between infant neural correlates of emotion processing, measured by event-related potentials to facial expressions, and maternal depressive symptoms. Method: Participants were 58 mother-infant dyads (Mmother-age = 31.4 years, SD = 4.4; Minfant-age = 7.4 months, SD = .6, 45% female). Mothers completed the Edinburgh Postnatal Depression Scale as a measure of depressive symptoms and infants viewed happy, fearful, and angry faces during continuous EEG recording. Mean amplitudes for Nc, N290, and P400 components were calculated offline. Results: Infants showed larger Nc amplitudes to angry ($M = -13.7$, $SD = 8.3$) than happy faces ($M = -11.8$, $SD = 8.4$), $F(2,56)=3.2$, $p = .049$. N290 and P400 amplitudes did not differ significantly ($ps>.21$). Regression analyses revealed that maternal depressive symptoms predicted mean N290 amplitudes for fearful faces ($\beta = -.36$, $SE = 1.4$, $p = .006$), but not other components or emotions ($ps>.09$). Conclusion: The Nc is an indicator of attentional allocation whereas, the N290 reflects early structural processing of facial stimuli. Infants might process all faces regardless of emotional content in early phases of encoding and use more attentional resources to angry faces in the later stages of processing. However, infants whose mothers reported depressive symptoms may exhibit heightened sensitivity to fearful faces at an earlier stage. These findings suggest a bias to environmental threats, which may be altered by early exposure to adversity such as maternal depression.

O3-1

PREGNANT WOMEN WITH BIPOLAR DISORDER AND HISTORY OF CHILDHOOD MALTREATMENT HAVE GREATER SYMPTOMS OF DEPRESSION AND ANXIETY DESPITE TREATMENT: IMPLICATIONS FOR FETAL NEURODEVELOPMENT

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Pregnant women with bipolar disorder (BD), treated or not, are at risk for pregnancy complications. History of childhood maltreatment (CM) is a risk factor for BD and is associated with reduced treatment response among individuals with major depression. Whether the same is true for pregnant women in treatment for BD is unknown and may have implications for fetal neurodevelopment. Hypothesis: CM will be associated with greater symptoms among pregnant women in treatment for BD and lead to adverse fetal outcomes. METHOD N = 82 pregnant women with BD from the Women's Mental Health Program at Emory University School of Medicine receiving treatment from perinatal psychiatrists (90.14% prescribed psychotropic

medication). Symptoms for cluster analysis from HRSD, HRSA, BDI, EPDS, CGI, and MRS. CM from CTQ. Stroop stress paradigm for fetal heart rate (FHR) and movement (FM). Fetal outcomes: FHR reactivity, coupling (correlation FHR and FM), birth weight (BW), gestational age at birth. Analyses: CM mediated by depression and anxiety to predict fetal outcomes, stratified by sex. RESULTS Clusters: 81.7% euthymic; 18.3% depressed/anxious. The depressed/anxious group endorsed greater CM (86.7%) versus euthymic group (41.8%; $p < .01$). CM mediated by depression and anxiety predicted decreased fetal coupling ($p < .05$) and increased FHR reactivity ($p < .05$) in males. CM mediated by depression predicted shorter gestation in females ($p < .05$), and lower BW overall ($p < .05$). DISCUSSION Despite treatment, pregnant women with BD and CM history maintain greater symptoms of depression and anxiety, which is associated with adverse fetal neurodevelopment.

STRESS1

CORTISOL REACTIVITY AS A BIOMARKER FOR ANXIETY: EXPLORING A MODIFIED STRESS PARADIGM

Lisa Badanes, Metropolitan State University of Denver

Early adversity and current life stress are both robustly linked to the development of psychopathology, increased symptoms of anxiety (Poole et al., 2017). Much of the mechanistic research linking stress and health has focused on the enduring effects on regulatory systems like the HPA-axis, with both hyper and hypo responsivity of cortisol documented (Burke et al., 2005). Utilizing a sample of college students with high rates of reported adverse childhood experiences, the current study sought to a) examine the effectiveness of a modified, ecologically valid, version of the Trier Social Stress Test (Kirchbaum et al., 1993), and b) to examine salivary cortisol as biomarker for anxiety.

Two hundred and thirty-two participants (M age = 23, 60% white, 62 % female) completed a checklist of twenty-three possible life stressors within the past 6-months, as well as the GAD-7 (Spitzer et al., 2006). After acclimating to the laboratory, they prepared and presented a five-minute speech about a recent life stressor. Three saliva samples were taken 20-minutes apart to assess physiologic stress reactivity.

Females reported significantly more anxiety than males. A linear regression predicting anxiety symptoms including gender, current life stress, cortisol reactivity (area under the curve with respect to increase), and an interaction term accounted for 14% of the variance in anxiety. Gender and current life stress were both significant predictors of anxiety. Further, cortisol reactivity moderated the effect of current life stress on anxiety symptoms (see Figure 1). Discussion will focus on this modified stress paradigm and the biomarker of cortisol.

COG17

ESTROUS CYCLE-DEPENDENT EFFECTS OF A TROPOMYOSIN RECEPTOR KINASE B (TrkB) AGONIST ON FEAR EXTINCTION IN FEMALE ADOLESCENT RATS

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Fear extinction, a laboratory model for exposure therapy, is modulated by endogenous levels of estradiol in adult female rodents and women, with extinction retention enhanced when extinction training occurs in a high-estradiol phase (e.g., proestrus) relative to a low-estradiol phase (e.g., metestrus). We recently demonstrated a similar effect of estrous cycle in adolescent rats. However, the underlying mechanisms of this effect, especially in adolescence, remain unclear. A possible mechanism for enhanced extinction during proestrus is Brain-Derived Neurotrophic Factor (BDNF). Brain BDNF expression and activation of its high-affinity receptor, tropomyosin receptor kinase B (TrkB), co-vary with estradiol levels across the estrous cycle. Here, we investigated whether enhancing activation of TrkB during extinction rescues extinction retention deficits in adolescent female rats. Animals received 3 noise-shock pairings, extinction training, and an extinction retention test ~24h apart. 7,8-Dihydroxyflavone (7,8-DHF), a potent TrkB agonist, or vehicle was administered i.p. before extinction. In rats undergoing extinction training during metestrus, relative to vehicle, those given 7,8-DHF had lower levels of freezing at the extinction retention test, comparable to rats extinguished during proestrus. However, the augmentation of extinction retention by 7,8-DHF was estrous cycle-dependent. That is, 7,8-DHF did not enhance extinction retention in rats receiving extinction during proestrus that had relatively high levels of freezing at the extinction retention test following stronger fear conditioning procedures (five noise-shock pairings). Neither estrous cycle nor 7,8-DHF influenced renewal of fear. These findings suggest a potential approach to augment extinction during low-estradiol phases of the estrous cycle.

STRESS12

DREADD MEDIATED ACTIVATION OF PARVALBUMIN CELLS DURING POSTNATAL DEVELOPMENT: EFFECT ON MOOD RELATED BEHAVIOURS

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Early life stresses (ELS) have been implicated in adult onset of psychiatric disorders such as anxiety, depression, schizophrenia, etc. The Early life window is crucial for the functional development of the nervous system and is highly sensitive to neuromodulatory systems like Serotonin. Several lines of evidence, across preclinical and clinical post-mortem studies on subjects that have undergone ELS, indicate that an altered cortical Gq signalling downstream of the Serotonin receptor 5HT2A drives the onset of anxiety like behaviours in adulthood. The same has been corroborated in pharmacological models such as Post-natal fluoxetine and Chemogenetic upregulation of Gq signalling in forebrain excitatory neurons. While majority of the 5HT2A receptors are present on principle excitatory neurons of the cortex, it is also expressed in the inhibitory Parvalbumin interneurons. Interestingly, perturbations in Parvalbumin interneurons signalling via 5HT2A has been implicated in various disorders such as

Schizophrenia. We were, therefore, interested in exploring the effects of an early life perturbation of Gq signalling, exclusively in the Parvalbumin interneurons. In this study, we chemogenetically drive Gq signalling in Parvalbumin cells using DREADDs in the postnatal window P2-P14 and carry out a battery of behaviour experiments to study anxiety and despair like behaviours in adulthood. We observe a mild, task specific anxiolysis with broad postnatal increase in Gq signalling in Parvalbumin cells and no effect on despair like behaviours. This study could indicate potential differences in cell type based regulation during development and opens up room for investigating circuit specificity for such cell type based regulation.

SOC18

ASSOCIATION BETWEEN NEONATAL HYPOGLYCEMIA, PARENTING STRESS, AND SOCIAL-EMOTIONAL DEVELOPMENT IN INFANTS

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Gestational diabetes mellitus (GDM) and perinatal maternal stress are independently associated with adverse neurodevelopmental outcomes in offspring, including increased risk for social-emotional problems. A potential consequence of GDM is the occurrence of hypoglycemic episodes during a neonate's first hours of life, which has been associated with brain abnormalities and impaired neurodevelopment. Several studies have established a bidirectional association between GDM and maternal stress, however few studies have investigated their combined effect on offspring neurobehavioral development. We examined the relationship between neonatal glucose levels, maternal parenting stress at 6-months, and social-emotional development at 6-months of age in low-risk infants born to gestational diabetic mothers and healthy controls (n=34). Infants were 37-40 weeks gestational age at birth ($M=39.43 \pm 0.89$ weeks; n=13 female; 91% Hispanic or Latino). Neonatal glucose levels were obtained between 1.5 and 8.5 hours postnatally ($M=4.35 \pm 1.33$). Maternal parenting stress was measured by the Parenting Stress Index (PSI) and social-emotional development was measured by the Ages & Stages Questionnaire: Social-Emotional, Second Edition (ASQ:SE-2) at 6-months of age ($M=6.43 \pm 0.4$ months). When controlling for timing of postnatal glucose levels, gestational age at birth, sex, and race/ethnicity, both lower neonatal glucose levels and higher levels of parenting stress were associated with poorer social-emotional outcomes at 6-months of age ($F(1,29) = 4.56$, $p < .01$). Understanding this association is important in the context of an increase in the incidence of GDM over the past years and especially in underrepresented minority groups who are at the greatest risk for GDM and increased psychosocial stress.

S1-4

EARLY LIFE ADVERSITY DECREASES FEAR EXPRESSION IN PRE-ADOLESCENCE BY ACCELERATING AMYGDALAR PARVALBUMIN CELL DEVELOPMENT

Kevin Bath, Brown University

Resource insecurity represents a significant form of adversity and can be a potent source of stress. Early life adversity (ELA), in the form of resource insecurity during childhood, has been associated with increased risk for developing stress-related disorders later in life, including major depressive disorder and anxiety. Although the link between ELA and increased risk for psychopathology has been well established, the developmental mechanisms remain unclear. Using a mouse model of resource insecurity, limited bedding and nesting materials (LB), we tested the effects of LB on the development of fear learning and on key neuronal structures involved in emotional regulation, the medial prefrontal cortex (mPFC) and basolateral amygdala (BLA). LB delayed the ability of peri-weanling mice (21 days of age) to express, but not form, an auditory conditioned fear memory. LB disrupted typical fear circuit development, accelerating parvalbumin positive (PV+) inhibitory interneuron maturation in the BLA and delaying the maturation of connections between the mPFC and BLA. The decreased fear expression in LB reared mice during early development was rescued through optogenetic inactivation of PV+ cells in the BLA. Together our data demonstrate that LB has profound effects on mPFC and BLA development, decreasing threat-associated behavior expression, but not learning early in life. The current results provide a rodent model to probe the neural underpinnings of transiently blunted emotional reactivity in early life, and the emergence of fear-associated memories and pathology later in development.

NEURO5

SEX DIFFERENCES IN EEG COHERENCE ACROSS INFANCY AND EARLY CHILDHOOD

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Sex differences in brain functional connectivity and risk for developmental delays and developmental psychopathology (Xia et al., 2018) have led to increased interest in sex differences in early brain development (Ernst et al., 2019; Wheelock et al., 2019). An efficient way to assess early brain connectivity in awake infants and young children is via EEG coherence related to the strength and number of synaptic connections, reflecting the level of connectivity between two EEG recording sites. In older children, girls exhibit higher right hemisphere coherence (Marosi et al., 1993). In very young children, however, sex differences are rarely the focus of brain functional connectivity investigation. We focused on EEG coherence recorded during a quiet video and examined infant/child alpha frequency band (6-9 Hz) for a group of children longitudinally at ages 5m (n=374), 10m (n=348), 24m (n=236), 36m (n=255), and 48m (n=235). Girls had greater left hemisphere fronto-frontal and fronto-parietal, as well as greater right hemisphere fronto-parietal coherence during infancy (5m, 10m, p's [NIH grant HD049878])

SOC30

POVERTY, PARENTAL PROTECTIVE FACTORS, AND THE HOME LEARNING ENVIRONMENT OF TODDLERS: AN APPLICATION OF THE FAMILY STRESS MODEL

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Background: Family poverty and the home learning environment (HLE) have significant impacts on children's cognitive and academic outcomes. The family stress model posits that poverty influences child outcomes through parental economic hardship, economic pressure, psychological distress, and behaviour. There is evidence of the model's utility in explaining the investments parents make in their children's learning, but it is not yet known whether it may be used to predict the HLE of toddlers. Parental self-efficacy and social support may play a role in disrupting the negative effects of poverty-related depression on the HLE.

Purpose: To examine relationships between parental economic hardship (low income), economic pressure (financial difficulty), depression, parental self-efficacy, social support, and the HLE (shared book reading and story-telling frequency) of toddlers.

Methods: Logistic regression was used to perform secondary analysis of data from 423 Canadian parents of children ages 14-24 months who participated in the Toddler Development Instrument Phase 2 Pilot Study.

Findings: Economic hardship and economic pressure were independently negatively associated with the HLE; parental depression was negatively associated with the HLE and mediated the impact of economic pressure on the HLE; parental self-efficacy was positively associated with the HLE, but social support was not, and neither moderated the association between parental depression and the HLE.

Conclusion: The family stress model predicted those families providing a higher quality HLE for toddlers, but did not predict families providing a poorer quality HLE. Practitioners and policy makers should focus attention on factors found to influence the HLE of toddlers.

COG16

THE GLOBAL PRECEDENCE EFFECT THROUGHOUT CHILDHOOD

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The Global Precedence Effect (GPE) describes a visual phenomenon in which adults are biased to perceive the global aspect of an image before processing local details. Developmental research shows evidence of a local bias during early childhood that becomes global with age. However, research also suggests that a global bias may be present at birth as infants may be unable to see local details due to poor acuity. These studies suggest the GPE may undergo two separate switchover periods: a global bias in infancy to a local bias in children, then a global bias seen in adulthood.

The current study investigates the influence of instructions on the emergence of the GPE in 3-9 year-old children. Children were shown pairs of global shapes made up of local shapes and had

to classify pairs as identical or differing on either the global or local level. After 25 identification trials, all children were given a visual instructional sequence clarifying the local and global differences between stimuli pairs followed by 25 more identification trials.

Preliminary results show 4-year-olds display a local bias, 9-year-olds display a global bias and the performance of 6-year olds varied, driven by individual differences. After the instructional sequence, 4 and 6 year old children displayed a more malleable bias. Data analysis for 3-year olds is currently underway. Whether or not 3-year-olds display a local or global bias will provide further insight into the developmental trajectory of the GPE from infancy, through childhood, to adulthood.

S3-4

LONG-LASTING CHANGES IN HEALTH AND IMMUNE OUTCOMES IN ADULTS WITH FETAL ALCOHOL SPECTRUM DISORDER

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Deficits in cognitive and executive function are well documented in children with Fetal Alcohol Spectrum Disorders (FASD); however, few studies have followed children with FASD into adulthood and almost none have investigated health outcomes. To address this gap, the current study was designed to evaluate health outcomes in adults with FASD. Study participants include adults with FASD and controls. Participants complete health questionnaires examining domains including rates of early-life adversity (ELA) and physical and mental health status. As well, blood samples are collected for a complete blood count and cytokine measurements. Preliminary results indicate that adults with FASD have elevated white blood cell counts compared to unexposed controls, and this is driven by increased neutrophils and lymphocytes. In addition, while there were no differences in autoimmune disease rates, adults with FASD report higher rates of early general symptoms of autoimmune diseases. With regards to mental health, adults with FASD have higher rates of anxiety, compared to unexposed controls. Finally, evaluation of the relationship between ELA, immune function, and mental health status indicated that adversity is a key modulator of immune and emotional dysregulation in adults with FASD. These data indicate that prenatal alcohol exposure results in life long changes in immune-related outcomes. Moreover, as inflammatory responses have been shown to play an important role in the pathophysiology of mental health problems, ongoing work aims to explore whether immune-related changes could be a driver of mental health disorders in FASD.

SOC3

AN ONLINE MINDFUL PARENTING TRAINING FOR MOTHERS RAISING TODDLERS IN A NON-CLINICAL SETTING: ASSESSMENT OF PERSONAL GOALS AND EFFECTIVENESS

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Minds; Susan Bögels, University of Amsterdam; Victor Pop, Tilburg University; Eva Potharst, UvA Minds

Background

Mindful parenting (MP) can positively affect parenting and can decrease parental stress. MP interventions show promising results, however these interventions mostly target clinical populations. MP allows parents to cope with stressful family- and parental situations, allowing for improvement in both family interrelationships and child behavior. The current study assessed a widely accessible alternative in a non-clinical setting: online MP intervention for mothers with toddlers. Aims were to assess 1) predetermined personal goals of participants and whether these goals were achieved - 2) effectiveness of the intervention.

Methods

An RCT among 157 mothers with toddlers assessing an 8-week online MP training. The study duration was 20 weeks, including a waitlist, pretest, posttest and follow-up assessment. Parental stress, parental over-reactivity, self-compassion and distress, and (change in) personal goals were assessed, as well as training evaluation.

Results

Of the 157 mothers, 73 (47%) reported elevated levels of parental stress at inclusion. Personal goals were analyzed qualitatively, establishing 4 different themes: attention (n=38), mindfulness (n=24), patience (n=64) and balance (n=31). Results showed significant improvement in personal goals posttest and follow-up. Mixed-linear model analyses showed significant improvements posttest and follow-up regarding self-compassion, parental over-reactivity and distress. Regarding parental stress, there was only an effect at posttest for parenting problems, and an effect for parental role restriction at follow-up. Levels of parental stress and theme of personal goal did not influence the effectiveness of the intervention.

Conclusions

Online MP training may be an easily accessible and valuable intervention for a wide range of parents.

NEURO46

INFLUENCES OF SOCIOECONOMIC STATUS AND STRESS ON PUBERTAL HORMONES

Austin Boroshok, University of Pennsylvania; Anne Park, University of Pennsylvania; Cassidy McDermott, University of Pennsylvania; Ursula Tooley, University of Pennsylvania; Julia Leonard, University of Pennsylvania; Lourdes Delgado Reyes, University of Pennsylvania; Allyson Mackey, University of Pennsylvania

Increasing evidence suggests that childhood adversity is associated with accelerated development. Early puberty is associated with later physical health problems, and higher hormone levels were recently linked to increased psychopathology. However, few studies have examined the influences of environmental stress on the timing of adrenarche, the first phase of puberty, or how adrenarchal hormones impact mental health.

Salivary levels of adrenarchal hormones (DHEA, DHEA-S, testosterone) were assayed from 64 children (34F) between ages 5 and 10. Parents reported their education and completed the Child Adverse Childhood Experiences scale (ACEs), the Life Events Scale (LES), and the Child Behavior Checklist (CBCL) about their child. Relationships between hormones, SES, stress, and psychopathology were examined using linear models, with sample collection time, age, and race as covariates.

Greater numbers of ACEs and stressful events were associated with higher testosterone in boys (ACEs: $t = 2.21$, $p = .03$; LES: $t = 2.53$, $p = .02$), but not in girls. Children whose parents had fewer years of education showed steeper increases in DHEA-S with age ($t = -2.03$, $p = .049$). Boys who showed steeper increases in DHEA with age had more externalizing symptoms ($t = 2.20$, $p = .049$).

These preliminary findings suggest that environmental influences on neuroendocrine events may be detectable by late adrenarche or early gonadarche, and that salivary hormones may be an early and easily assessed phenotype to identify children at risk of accelerated development and related mental health problems. Planned analyses will explore how these relationships are reflected in the brain.

S5-3

DO ,ATYPICAL, VARIATIONS IN STRESSFUL LIFE EVENTS AND STRESS PHYSIOLOGY IMPACT HIPPOCAMPAL FUNCTIONAL CONNECTIVITY IN YOUNG CHILDREN?

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Much work has highlighted the impacts of extreme early life stress (i.e., abuse, neglect, maltreatment) on the developing brain, especially on stress sensitive regions like the hippocampus. However, it is relatively unknown whether more typical variations in stressful life events (e.g., parental divorce, changing schools) might affect hippocampal development through similar mechanisms. In this talk, we will discuss how variations in stressful events and early stress physiology (i.e., cortisol levels) relate to functional development of the hippocampus in children. We will do this using two longitudinal datasets of children ranging from preschool age to middle childhood. First, we will present data from a sample of over-recruited children at risk for depression due to parental depression history. These data show that individual differences in early (3-5 years), but not concurrent (5-9 years), stress physiology (cortisol) are related to differences in functional connectivity between the hippocampus and both midcingulate cortex and precuneus. Second, we will present data from a sample of 200 typically developing 4- to 8-year-old children assessing how typical variations in stressful life events relates to hippocampal functional connectivity. Data for this study has been collected and preprocessed. Analyses are ongoing and are focused on investigating how stressful life events relate to initial functional connectivity and changes in functional connectivity over a two year period. Together, results of these studies will shed light on whether more typical variations in stressful life events impact

functional development of hippocampus during early childhood, an important period of brain development.

SOC25

THE EFFECT OF INFANT ATTENTION AND MATERNAL EDUCATION ON CHILDREN'S RECEPTIVE VOCABULARY DEVELOPMENT

Madeleine Bruce, Virginia Polytechnic Institute and State University; Martha Ann Bell, Virginia Tech; Yasuo Miyazaki, Virginia Tech

One factor shown to influence language acquisition is attention, as it has been proposed that sustained attention enables children to direct and focus their attention on language-relevant input in their environment. Nonetheless, language develops within a social context whereby children acquire word knowledge through interactions with a mature social partner. Maternal education has been linked to the quantity/quality of maternal talk during parent-child interactions, which in turn is associated with childhood vocabulary outcomes. The purpose of this study was to examine hypothesized differences in receptive vocabulary development as a function of infant sustained attention and maternal education. In this longitudinal study, data from 313 children was collected. Attention was measured at 10-months using a dynamic puppet task and receptive vocabulary was measured at 3-, 4-, 6-, and 9-years of age using the Peabody Picture Vocabulary Test (PPVT). The best-fitting multilevel growth model was a quadratic model as a function of age. Results indicated that both infant attention, $t(287) = -2.150$, $p = .032$, and maternal education, $t(287) = 4.658$, $p < 0.001$, were significant predictors of receptive vocabulary initial status, accounting for 13.7% of the variance. Moreover, infant attention, $t(287) = 4.622$, $p < 0.001$, but not maternal education, $t(287) = -0.209$, $p = .834$, significantly predicted receptive vocabulary growth, accounting for 13.5% of the variance. These findings demonstrate the importance and nature of the impact that early sustained attention skills and maternal education may play with respect to childhood language development.

NEURO29

ADOLESCENT RESTING HEART RATE PREDICTS INTERNALIZING PROBLEMS DURING THE COVID-19 PANDEMIC

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The COVID-19 pandemic poses challenges for maintaining mental health. Adolescents may be at increased risk for internalizing problems during the pandemic due to restrictions on independence and social interactions. Thus, identifying factors that predict increases in adolescents' internalizing problems can guide intervention efforts for improving mental health during future periods of isolation.

The autonomic nervous system regulates the physiological responses to stressors and is critical in

emotional and behavioral regulation. Previously, internalizing problems have been associated with higher heart rate at rest (Dietrich et al., 2007). Therefore, autonomic overarousal may be a key predictor of internalizing problems during the pandemic.

We investigated resting heart rate as a predictor of adolescent internalizing problems during the pandemic. Participants (N=107) were selected based on infant temperament as part of a larger longitudinal study. At age 15, baseline heart rate was measured using electrocardiogram in the laboratory and parents reported on adolescents' internalizing problems using the Child Behavior Checklist (Achenbach, 1994). Internalizing problems during the pandemic were measured via the Patient Health Questionnaire (Kroenke, Spitzer, Williams, 2001) and the Generalized Anxiety Disorder 7-Item Scale (Spitzer, Kroenke, Williams, Lowe, 2006). Regression analysis revealed that heart rate significantly predicted internalizing problems during the pandemic, $B = .18$, $p = .019$, even after controlling for internalizing problems at age 15, $B = .36$, $p = .017$. This suggests that autonomic overarousal may exacerbate the negative consequences of the pandemic on adolescent mental health, indicating that finding ways to mitigate overarousal may address internalizing problems in the future.

SOC23

REWARD SENSITIVITY COUNTERACTS THE EFFECTS OF INCENTIVES ON EARLY CHILDHOOD EXECUTIVE FUNCTION

Lauren Bryant, College of the Holy Cross; Kimberly Cuevas, University of Connecticut

Executive functions (EFs) are higher-order cognitive processes that are linked to numerous developmental outcomes. Motivation-EF integration has been widely studied across development, although early childhood work has traditionally used separate measures with varying demands to examine EF under motivationally-salient ("hot") or neutral ("cool") conditions. The few studies that have maintained task demands across reward conditions have produced mixed results (Beck et al., 2011; Tarullo et al., 2018) and have not examined how the effects of reward on EF may vary as a function of child reward sensitivity. In the present within-subjects study, 3.5- to 5-year-old children ($N = 93$; $Mage = 4.55$ years) completed rewarded and non-rewarded conditions of equivalent EF measures, including both Stroop (i.e., "say-the-opposite") and non-Stroop phases. Reward-based changes in accuracy and response time were calculated for each phase. Reward sensitivity was measured via two parent-report temperament scales: Reward-Responsiveness (Behavior Activation System; Blair, 2003) and Approach (Children's Behavior Questionnaire; Rothbart et al., 2001). Separate ANCOVAs (covariates: Reward-Responsiveness or Approach) on reward-based change in accuracy revealed significant Phase $\times$ Reward Sensitivity interactions ($ps \leq .02$). While rewards enhanced Stroop [$t(92) = 2.84$, $p = .006$], but not non-Stroop, accuracy, these reward-based changes negatively correlated with both indices of reward sensitivity ($rs = -.35$ and $-.23$). Thus, children with low reward sensitivity exhibited the greatest reward-based increases in Stroop accuracy. Further analysis revealed that rewards slowed responses across both phases [$t(82) = 3.61$, $p = .0004$]. The potential mediating roles of attentional control and arousal are discussed.

AMYGDALA CRF CELLS MEDIATE THE EFFECTS OF NEONATAL PAIN ON SUBSEQUENT STRESS-INDUCED TACTILE HYPERSENSITIVITY

Michael Burman, University of New England; Seth Davis, University of New England; Jared Zuke, University of New England; Russo Erica, University of New England; Mariah Berchulski, University of New England

We've adopted a rodent model of neonatal intensive care unit (NICU)-like treatments in which neonatal rats are exposed to 4 hind-paw pricks a day over postnatal days (PND) 1-7, subjected to a 3-day fear conditioning protocol on PND 24-27 and sensory tested using Von Frey and Hargreaves methods on PND 28. In the initial experiments, rats were returned to the dam between pain episodes. These subjects showed reductions in conditioned freezing and an age-dependent stress-induced tactile hypersensitivity that was strongest in juvenile rats and declined with age, when compared to control subjects. Moreover, juvenile rats that received neonatal pain spent more time on the open arms of an elevated plus maze. In a separate set of experiments, subjects were kept in an incubator between pain episodes (a maternal separation model). Here, neonatal pain subjects demonstrated an adolescent increase in conditioned freezing and a sex-dependent decrease in time spent on the open arms, but retained a modest stress-induced tactile hypersensitivity. Finally, we've begun the process of investigating the neural substrates of these phenomena. Neonatal pain appears to activate CRF expression within the central nucleus of the amygdala, but not the hypothalamus, in male rats. Female rats trend towards the opposite pattern. Moreover, antagonizing CRF receptors 1 or 2 in the amygdala prior to fear conditioning in juvenile rats reverses the otherwise observed hypersensitivity. Together these findings suggest that amygdala CRF signaling may be a critical mechanism by which neonatal pain exerts its lasting effects.

SOC12

CONCURRENT AND PROSPECTIVE ASSOCIATIONS BETWEEN FRONTOPARIETAL AND DEFAULT MODE NETWORK CONNECTIVITY AND NEGATIVE AFFECTIVITY IN INFANCY

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Mood disorders are linked to differences in frontoparietal (FPN) and default mode (DMN) brain networks. These differences may be identifiable early in development, including in the prediction of negative affect, an early individual difference precursor of mood disorder risk detectable in infancy. The present study explores concurrent and prospective associations between FPN/DMN network connectivity in infants and measures of negative affect (crying behavior and temperamental negative affectivity [NEG]).

Thirty-nine infants underwent 12-18 minutes of resting state fMRI during natural sleep (final N=32, M±SD age=4.57±0.88 weeks; 44% male; usable data=11.53±1.66 minutes). FPN and DMN intra- and internetwork connectivity was computed using adult parcellations. Parent-reported hours of crying for a one-week period were averaged and 25 of these infants' parents also reported crying behavior and NEG at age 6 months.

Using robust multiple linear regression, we found newborn FPN intra- and internetwork connectivity to each be positively associated with infant crying and NEG at six months (β s > 0.52, p s 0.070). DMN connectivity was positively associated with crying at six months (β s 0.044), but not NEG or concurrent crying (β s 0.112).

These findings point to a potential neurobiological indicator of risk for mood disorders that is present shortly after birth. Given this risk is present in early infancy (likely prior to postnatal influences), it will be important to investigate whether postnatal environmental experiences (e.g., caregiving) moderate these associations. Longitudinal mapping of caregiving, neurodevelopmental changes, and negative affectivity in children are important for understanding risk and potential for intervention.

NEURO17

MATERNAL DEPRESSION AND SENSITIVITY/RESPONSIVENESS: THEIR JOINT EFFECTS ON INFANT EEG ASYMMETRY

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Maternal depression and low quality parent-child interactions have been linked with electroencephalography (EEG) asymmetry (Sroufe, 2005; Wen et al., 2017), wherein greater relative left activation is associated with approach/preference for novel stimuli, and right activation with avoidance/negative affect. However, relations between infant brain activity, maternal depression, and sensitivity/responsiveness in interactions have not been sufficiently evaluated. In the present study, mothers with infants 6-12 months of age ($N=56$) completed the Parental Stress Inventory (PSI; Abidin, 2012) to ascertain depressive symptoms related to parenting. Exchanges between mothers and children were observed during a standardized parent-child interaction episode and coded for sensitivity and responsiveness (Gartstein et al., 2018). EEG was additionally recorded during the second episode of the repeated Still Face Paradigm (SFP; Tronick et al., 1978; Haley & Stansbury, 2003) and subsequently analyzed according to standard procedures (Bell & Cuevas, 2012). It was hypothesized that infants of mothers with higher depression scores would display greater right frontal activation during the SFP, with higher sensitivity/responsiveness serving a protective function. Thus, joint effects of maternal depression and sensitivity/responsiveness on EEG asymmetry were examined. Specifically, the interaction term of maternal depression by sensitivity/responsiveness, was considered as reflecting potential moderation by mother-infant interactions, controlling for sex, age, and baseline EEG asymmetry. Although main effects of maternal depression and sensitivity/responsiveness were not significant in predicting SFP EEG asymmetry, the interaction term of interest reached statistical significance. These findings suggest parent-child interactions are important to understanding the role of maternal depression in shaping neurodevelopmental correlates and social-emotional development.

GENETICS3

EPIGENETIC MECHANISMS AND BEHAVIORAL PLASTICITY FOLLOWING AN EARLY DEVELOPMENTAL SPINAL CORD TRANSECTION

Taylor Campbell, University of Delaware; Nicholas Collins, University of Delaware; Aimee Bozeman, Idaho State University; Alleyna Martes, Idaho State University; Tania Roth, University of Delaware; Michele Brumley, Idaho State University

Epigenetic regulation in the brain has gained much traction in recent years; however, epigenetic activity in the spinal cord is largely an unknown. To our knowledge, this study is among the first to investigate the developing epigenome in the immature spinal cord and whether this regulation is involved in spinal plasticity. Epigenetic activity in the brain underlies plasticity in this region of the central nervous system, making it a candidate mechanism likewise underlying plasticity in the developing spinal cord. To that end, the current study investigates spinal behavioral plasticity and epigenetic regulation following a low-thoracic spinal transection or sham surgery in rodents at postnatal day (P)1. Methylation status of the brain-derived neurotrophic factor (Bdnf) gene, a neurotrophin heavily involved in plasticity and sensitive to environmental factors, was examined across three exons in cervical and lumbar spinal tissue at P7, P14, P21, and P50 developmental time points. Data collection are ongoing, with preliminary results suggestive of exon-specific group differences in methylation in both cervical and lumbar tissue. This study presents novel findings in the search for mechanisms underlying behavioral plasticity in the spinal cord and a platform for future spinal epigenetic research to expand on.

COG15

A SYSTEM REVIEW AND META-ANALYSIS ON THE EFFECTS AND MODERATORS OF COMPUTER-BASED TRAINING ON CHILDREN'S EXECUTIVE FUNCTIONS

Yifei Cao, Northeast Normal University; Ting Huang, Northeast Normal University; Jipeng Huang, Northeast Normal University; Yuan Wang, Northeast Normal University

Computer-based (CB) training has attracted increasing attention from researchers. Numerous studies found CB training improved executive functions (EFs) of adults. However, it remains controversial if children can benefit from CB training, and what moderator could influence the training effects. The present meta-analysis examined the effects of CB training on children's EFs: working memory, cognitive flexibility, and inhibitory control. A thorough literature search yielded a sample of 38 studies with 219 effect sizes. Results indicated that CB training showed moderate training effects on improving children's EFs ($g = 0.39$, $k = 38$, p). We also discussed some directions for future CB training studies.

NEURO30

THEORY OF MIND PROCESSING IN EXPECTANT FATHERS: ASSOCIATIONS WITH PRENATAL OXYTOCIN AND POSTPARTUM ATTACHMENT

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Social cognition may facilitate fathers' sensitive caregiving behavior and promote father-infant bonding. We administered the Why-How Task, an fMRI task which elicits theory of mind processing, to expectant fathers (N =39) who also visited the lab during their partner's pregnancy and provided a plasma sample for oxytocin assay. When rating "Why" an action was being performed vs. "How" the action was being performed, participants showed neural activity in regions theorized to support theory of mind, including medial prefrontal cortex, right temporoparietal junction, and posterior cingulate cortex. Fathers' prenatal oxytocin levels predicted greater activation to the Why condition in regions supporting theory of mind and embodied simulation. Activation to the Why condition also predicted greater postpartum father-child attachment at three months postpartum. Theory of mind activation in the angular gyrus and supramarginal gyrus was associated both with prenatal oxytocin and with postpartum paternal attachment. In conclusion, expectant fathers' prenatal hormone levels and theory of mind processing may be associated with each other and may predict postpartum parental attachment. Fathers' propensity to engage in theory of mind processing may support their transition to parenthood.

SOC38

MODULATION OF MITOCHONDRIAL METABOLISM WITHIN LIMBIC BRAIN REGIONS FOLLOWING EARLY LIFE STRESS IN RODENTS

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Anxiety and depression are leading causes of disability that affect people across the lifespan. Early life trauma like maternal separation in rodents results in life-long alterations in anxiety and depression-like behavior, as well as accelerated aging. The molecular, cellular, structural changes evoked by early life stress that contribute to the lifetime risk for the development of psychopathology remain to be clearly elucidated. Also, the underlying mechanisms that mediate the accelerated aging associated with a life-history of early trauma remain poorly understood.

Mitochondrial metabolism plays a central role in the regulation of brain function. However, very few studies have addressed the influence of early stress on alterations in mitochondrial function. The preliminary evidence from our laboratory indicates a robust and lifelong reduction in the mitochondrial sirtuin, Sirt4, across the lifespan in rats subjected to early trauma. The influence of maternal separation in rats will be tested in various limbic circuits (i.e. prefrontal cortex, hippocampus, etc) at multiple time points across the lifespan. The preliminary experiments suggest that maternally separated rats display altered expression of mitochondrial biogenesis markers such as PGC1 α , Sirt1, TFAM in the prefrontal cortex and hippocampus of postnatal and middle-aged animals. The middle aged maternally separated rats also show decrease in ATP levels in the limbic brain regions.

The primary thrust of our project is to understand the contribution of alterations in mitochondrial

metabolism and function within limbic neurocircuits in mediating the persistent altered risk for psychopathology and accelerated aging that arise in rodent models following early life stress.

SOC19

PARENTING UNDER PRESSURE: EMOTIONAL AND BEHAVIORAL REACTIONS TO COVID-19 AMONG PARENTS AND CHILDREN

Kristen Chu, University of California, Los Angeles; Chloe Schwartz, University of California, Los Angeles; Emily Towner, University of California, Los Angeles; Bridget Callaghan, The University of California, Los Angeles

COVID-19 has placed tremendous pressure on caregivers, children, and families around the globe. While safer-at-home restrictions have resulted in parents balancing remote work-from-home with homeschooling their children, this generation of children is the first to experience social distancing and homeschooling mandates that restructure their social and educational landscape. Despite the acknowledgement that changes imposed by COVID-19 are likely impacting families, we have little information on how this pandemic is experienced within family units. Qualitative methodology, which is exploratory and richly detailed, may be particularly informative in this context. The aim of the present study was to employ thematic analysis to discover underlying themes in reflective paragraphs collected from parents and children on how COVID-19 has affected individual and family life. The study included a sample of parents ($n = 56$) and their children aged 6-17 ($n = 43$). Emergent themes among adult qualitative reports included a range of challenges, such as concern about family, dealing with added responsibilities, and fears about an uncertain future. Unexpectedly, we also discovered themes of resilience, including perspective taking, gratitude, and adjustment, suggesting that in the face of adversity parents are finding space for growth and familial fortitude. Thematic analysis of child reports is ongoing, and in the final stage, we will engage in mixed methodology to understand how highly endorsed themes in the qualitative reports map onto quantitative dimensions of mental health and parenting stress. This research helps to inform interventions aimed at diminishing the negative effects of this challenging period for future generations.

S2-2

SOCIAL BUFFERING ATTENUATES CORTICOSTERONE LEVELS AND AMYGDALA ACTIVITY FOLLOWING STRESS EXPOSURE IN JUVENILE RATS

Dragana Claflin, Wright State University; Allison Costello, Wright State University; Darci Gallimore, Wright State University; Michael Hennessy, Wright State University; Ambika Shoemaker, Wright State University; Jennifer Quinn, Miami University

Aversive conditioning procedures activate the endocrine stress response (e.g., corticosterone release) and engage fear processing neural systems via the amygdala. This activation underlies the emergence of at least one form of avoidance conditioning (Moriceau & Sullivan, 2006), though its role in development of eyeblink classical conditioning (EBCC) is unknown. The age at which EBCC first emerges (Day 17) is delayed when pups are returned to the mother and

home cage between sessions (Stanton et al., 1992). This suggests the mother may buffer corticosterone and amygdala responses in the EBCC paradigm. We observed that repeated unilateral periorbital shock, such as used during EBCC, elevated plasma corticosterone in 17-day-old rats. The corticosterone elevation was significantly reduced both 20 and 60 minutes following return to the home cage with cage-mates and mother, but social isolation in a novel environment instead prolonged CORT elevation. Activation of the central nucleus of amygdala was measured using immunohistochemical analysis of brain tissue for production of the immediate early gene *zif-268*. Greater activation of both the left and right amygdala was observed in isolated rats one hour after shock, relative to both home-cage controls and rats receiving shock but immediately returned to the social environment of the home cage. Beyond contributing to the literature on social buffering as a powerful psychological and physiological method of reducing stress and fear in young mammals, the findings also suggest that maternal buffering of corticosterone and amygdala responses may modulate developmental emergence of EBCC by reducing the aversive impact of the learning experience.

NEURO41

PARSING HETEROGENEITY IN THE EFFECTS OF EARLY-LIFE STRESS ON FRONTOLIMBIC CIRCUITRY

Emily Cohodes, Yale University ; Dylan Gee, Yale University; Paola Odriozola, Yale University ; Sarah McCauley , Yale University ; Jasmyne Pierre , Yale University ; Hopewell Rogers, Yale University ; Jeffrey Mandell, Yale University ; Sadie Zacharek, Yale University; Jason Haberman , Yale University ; Sahana Kribakaran, Yale University

Background: Delineating the effects of experiential, environmental, and timing-related dimensions of early-life stress is important for explaining heterogeneity in frontolimbic development following stress exposure (see Cohodes et al., 2020 for a review). **Specific Aims and Hypotheses:** The proposed study aims to employ a data-driven approach to examine whether the following features of early-life stress exposure are meaningfully associated with patterns of frontolimbic connectivity in adulthood: age of onset, chronicity, type, severity, caregiver involvement, and whether a stressor was characterized by controllability and/or predictability. Though this study is broadly exploratory, it is hypothesized that specific factors will interact with developmental timing of stress exposure to predict neurobiological outcomes. **Methods:** Phenotypic and neuroimaging data collection is complete (N = 120). All participants completed a systematic assessment of stress exposure and a resting-state fMRI scan and analysis is ongoing. **Analytic Approach:** For each dimension of interest (i.e., caregiver involvement in stressor), data will be aggregated to produce indices of each dimension of exposure across development. Based on this approach, each participant will have six distinct variables indexing their exposure: chronicity, type, severity, caregiver involvement, controllability, and predictability. All indices will be submitted to a random forest analysis that aims to predict distinct patterns of frontolimbic functional connectivity. **Implications:** Clear delineation of these multilevel factors that may moderate the impact of stress on neurodevelopmental outcomes is important for understanding the etiology of stress-related psychopathology and for optimizing clinical interventions that target children's developmental stage and specific profile of past stress exposure to promote resilience.

GENETICS4

LOWERING GLOBAL DNA METHYLATION IN EARLY LIFE ALTERS FUTURE BEHAVIORAL OUTCOMES

Nicholas Collins, University of Delaware; Catherine Zimmerman, University of Delaware; Tiffany Doherty, University of Delaware; Natalia Phillips, University of Delaware; Tania Roth, University of Delaware; Samantha Fern, University of Delaware

Adversity in early life, including the caregiving environment, has negative implications for future psychopathology. Using a rodent model, our lab has demonstrated that early life adversity has long lasting consequences on both behavior and the epigenome. Epigenetic modifying pharmacological agents, including histone deacetylase inhibitors, are valuable tools in demonstrating the malleability of the epigenome in relation to altering behavioral phenotypes. The present study sought to investigate whether valproic acid (VPA) can normalize aberrant DNA methylation and alter behavior later in life. Using a limited nesting and bedding paradigm outside the home cage, female Long-Evans rat pups were exposed to either nurturing care or maltreatment for 30 minutes per day during postnatal days 1-7. Immediately prior to behavioral testing, rats were given a systemic intraperitoneal injection of saline, or VPA (200mg/kg, 400mg/kg, or 600mg/kg). Rats were sacrificed at postnatal day 8, and the whole prefrontal cortex (PFC) was collected for biochemistry analysis. Results indicated that rats exposed to early life maltreatment had significantly higher methylation of the BDNF gene at exon IX compared to the nurturing group. VPA at a dose of 400mg/kg was effective in lowering global methylation in the PFC in both the maltreatment and nurturing condition. In a separate cohort grown to adulthood, there were significant changes in maternal and self-grooming behavior. These data indicate that transient changes to the epigenome during early development have long-lasting behavioral consequences.

STRESS4

EMOTIONAL DISTRESS, TARGETED REJECTION, AND ADAPTIVE IMMUNE FUNCTION IN ADOLESCENCE

Kelsey Corallo, University of Georgia; Sarah Lyle, University of Georgia; Katherine Ehrlich, University of Georgia

Emotional distress is associated with immune dysregulation in childhood (e.g., Baldwin et al., 2018; Caserta et al., 2011). Furthermore, the combination of emotional distress and acute stressors has a particularly robust negative influence on immune function (Marin et al., 2009; Schreier & Chen, 2017). We examined whether experiencing a targeted rejection (TR) moderated the association between emotional distress and antibody response to influenza vaccination in adolescence.

Adolescents (n = 148) completed two study visits. At Visit 1, we collected blood samples before adolescents received their vaccine, and adolescents completed questionnaires about their ongoing

emotional distress and participated in the semi-structured Life Stress Interview (Adrian & Hammen, 1993). One month later, adolescents provided another blood sample to assess post-vaccination antibody production. A standardized distress index was created from adolescents' depressive symptoms, loneliness, and perceived stress. Coders identified TRs ($n = 30$) from the interviews (86.7% agreement).

A significant Emotional Distress $\times$ TR interaction predicted antibody responses to the two A strains in the vaccine (Table 1). We created a standardized composite of these strains (H1N1 and H3N2), and probing the interaction revealed that emotional distress was negatively related to antibody production among adolescents who experienced a TR and, unexpectedly, positively related to antibody production among those who did not experience a TR (Figure 1).

Results support the notion that adaptive immune function may be particularly susceptible to the combined effect of acute and chronic stressors in adolescence. Short- and long-term clinical health implications of these findings will be discussed.

SOC22

IMPACT OF DISRUPTION OF THE MICROBIOME BY CAESAREAN SECTION AND PERINATAL ANTIBIOTIC TREATMENT ON COGNITIVE DEVELOPMENT: BAYLEY ASSESSMENT SCORES AT 2 YEARS OF AGE

Caitlin Cowan, University College Cork; Amy Murphy, University College Cork; Aoife Collery, University College Cork; Caitriona Long-Smith, University College Cork; Carol-Anne O'Shea, University College Cork; Eugene Dempsey, University College Cork; Tony Ryan, University College Cork; Timothy Dinan, University College Cork; John Cryan, University College Cork; Catherine Stanton, University College Cork

The neonatal period is a critical time for the establishment of healthy trajectories of development for both physical and mental health. Growing evidence suggests that the gut microbiota, or the microorganisms within our gastrointestinal tracts, might be a key factor in shaping such outcomes (Cowan, Dinan, & Cryan, 2020). In this observational study, we assessed the neurodevelopmental impact of two factors known to be key regulators of the early gut microbiome – birth by Caesarean section and neonatal antibiotic administration (Bokulich et al., 2016). Specifically, children from the Infantmet and MyNewGut cohorts ($N = 100$, 40 female) were born by spontaneous vaginal delivery or Caesarean section. Of those born by Caesarean section, some were exposed to antibiotic treatment in the first four days of life. We have previously published data demonstrating a temporal effect of these interventions on the development of the gut microbiome (Hill et al., 2017). In the present analysis, children were assessed from 24 months of age on the Bayley Scales of Infant Development, 3rd edition (Bayley-III). We did not observe evidence that Caesarean section has a detrimental effect on neurocognitive outcomes at this early stage of development. The results did, however, indicate a significant impact of neonatal antibiotic exposure, although the overall average of all groups fell within the expected Average range based on normative data. While these findings should be considered preliminary and require further testing in a larger population, they provide additional

support for the role of microbiome-modulating interventions in shaping neurodevelopmental outcomes.

STRESS14

EARLY LIFE EXPERIENCE REVEALS SEX-SPECIFIC OUTCOMES IN STRESS-INDUCED FEEDING IN ADOLESCENT MICE

Madalyn Critz, Brown University; Camila Demaestri, Brown University; Kevin Bath, Brown University

Early life adversity (ELA), in the form of abuse, neglect, or limited access to resources, has been linked to adverse health outcomes later in life. Importantly, ELA is associated with the development of disordered eating in humans. Eating disorders disproportionately affect young women, and can lead to metabolic disorder and adult obesity. Here, we test the effects of a mouse model of ELA on adolescent feeding behavior and the regulation of stress and feeding hormones. The experience of ELA resulted in hyperphagic “binge-like” feeding behavior on high-fat food in males, while females showed an overall increased susceptibility to this “binge-like” behavior. These behavioral patterns, accompanied by dysregulated feeding and stress hormone systems, indicate that ELA may have sex-specific effects on behaviors that increase the risk for developing eating disorders in adolescence through action on the development of stress systems. Understanding of the sex-specific effects of ELA on feeding behavior later in life is essential for treatment and prevention of pathological disordered eating.

COG10

DOES INFANT SUPINE HEAD ORIENTATION PREFERENCE PREDICT HAND PREFERENCE TRAJECTORIES ACROSS INFANCY?

Samantha Croney, Florida International University ; Julie Campbell, Illinois State University

Newborns often lay in the supine position with their heads facing the right or left side. Infant supine head orientation preference (SHOP) leads to visual asymmetries of the hands, where the position in which the head is facing the hands could affect eye-hand coordination, which contributes to differences in neuromotor activity. From these differences hand-use preferences develop and reflect corresponding head orientation shown in early infancy. This study demonstrates a relation between SHOP, an early neuromotor asymmetry, and hand preference, as measured by self-touch and handedness assessments throughout infancy. At 4 and 8 weeks of age, SHOP was observed by holding the infants head in mid-line for 60 seconds, and by recording behavior for 60 seconds after release in order to assess SHOP. Hand-use preference was then observed through self-touch throughout the child’s first year, using lateralized hand movements from observations at 4, 8, 12, and 16 where infants sat in a semi-upright position and reached for toys. Handedness assessments were observed at the infants 6, 7.5, 9, and 11.5-month check-ins by demonstrating handedness with initial hand preference while the child was help upright by the parent in a seated position with the first hand they initially reached with being recorded as their hand preference. Infant SHOP predicted hand preference. As z-scores for

SHOP became more lateralized, z-scores for hand preference became more lateralized. These results support the cascade theory of development which states that the development of new behavior is based on previous behaviors (Michel, 1983).

NEURO12

RESTING-STATE EEG THETA-BETA RATIO AND EXECUTIVE FUNCTION DURING INFANCY

Kimberly Cuevas, University of Connecticut; Martha Ann Bell, Virginia Tech; Zhe Wang, Texas Tech University

Co-occurring oscillatory rhythms (e.g., theta, alpha, beta) in the brain underlie neural computation, communication, and transmission of information between networks (Lopes da Silva, 2013). Resting-state (or baseline) electroencephalogram (EEG) provides information about neural oscillations and their intrinsic dynamics when individuals are awake and not involved in active processing. The theta/beta ratio has been conceptualized to reflect balancing of the brain's cognitive and motivational systems, including bottom-up subcortical excitatory input (resting-state theta activity) and top-down regulation and attentional control via cortical inhibitory input (resting-state beta; Schutter et al., 2017). Recent evidence indicates that variations in resting-state frontal theta/beta ratio are inversely related to 3- to 9-year-old children's executive functions (Perone et al., 2018). In line with anticipated maturational changes in "slower" versus "faster" rhythms, children with more beta oscillatory resting-state activity in comparison to theta activity, displayed enhanced cognitive control. Although there is a relatively large literature using the theta/beta ratio as an informative correlate of ADHD (Clarke et al., 2020), the potential functional significance of this measure has yet to be examined before 3 years of age. In the present study, we collected resting-state EEG in a group of 8-month-olds ($n = 43$) and calculated the ratio between theta (2-5 Hz) and beta (10-13 Hz) power. Medial frontal theta-beta ratio was negatively correlated with infant executive function, as measured by the looking A-not-B task. These findings highlight the importance of considering the interrelations between multiple neural rhythms during early development in general, and the potential value of the theta-beta ratio.

O4-3

A CAUSAL INFERENCE APPROACH FOR EXAMINING THE TIMING AND CHRONICITY OF POVERTY-RELATED ADVERSITY ON CHILD STRESS RESPONSIVITY

Meriah DeJoseph, University of Minnesota; Isabella Stallworthy, University of Minnesota; Eric Finegood, Northwestern University; Cybele Raver, NYU; Clancy Blair, NYU; Daniel Berry, Institute of Child Development, University of Minnesota

The many environmental exposures often associated with childhood poverty are theorized to alter stress response systems through the process of biological embedding. However, extant research remains mixed due to limitations with study design and the ways in which traditional statistical approaches examine the dosage and timing effects of poverty. The current study aims

to fill this gap by presenting findings from a home-based Trier Social Stress Test (TSST-H) among a prospective, population-based longitudinal sample of children (N = 1,292; M age = 13.2 yrs; 48% female; 45% African American) in rural low-income communities. Separate growth mixture models of salivary cortisol, alpha amylase, respiratory sinus arrhythmia, and blood pressure revealed individual differences in reactivity. To examine the extent to which the type, timing, and chronicity of poverty-related adversity (i.e. material deprivation, sociocognitive resources, psychosocial threat) predicts patterns of reactivity, we applied a causal inference approach—marginal structural models—to empirically isolate the timing effects of each exposure while controlling for time-varying and time invariant confounding variables. We found evidence for dosage effects of adversity, such that chronic or exposure at 1-2 developmental time periods resulted in greater blunting patterns compared to no exposure. Evidence for possible sensitive periods also emerged across various stress systems. The combined methodological and substantive contributions of this study elucidate the temporal and cumulative dimensions of how the lived experiences of children in poverty become biologically embedded. Findings have implications for developmental science as well as for programs that support families experiencing economic inequalities.

STRESS21

EARLY LIFE ADVERSITY LEADS TO ENHANCED FEAR-POTENTIATED STARTLE IN FEMALE MICE

Camila Demaestri, Brown University; Kevin Bath, Brown University

Stress-related disorders such as generalized anxiety disorders, post-traumatic stress disorders, and panic disorders affect over a third of the population. Experiencing early life adversity (ELA) increases our lifetime risk of developing these disorders, and females show increased prevalence and severity of symptoms. Patients with stress-related disorders, and those who have experienced ELA, such as abuse, exhibit increased fear-potentiated startle and increased acoustic startle responses with females having the potential for greater risk. Here, we test the impact of ELA on the evolutionarily conserved startle response and threat anticipation in a mouse model. Using the limited bedding model of ELA, we've found that, after tone-shock conditioning, mice who experience ELA exhibit enhanced startle to an intense white noise, both when presented alone and when it is paired with the conditioned tone. This effect was only observed in females. Furthermore, we explored potential mechanistic changes in startle circuitry by testing for disturbances in corticotrophin releasing hormone signaling in the bed nucleus of the stria terminals and central amygdala. Disruption in the ability to discriminate between threat and safety is critical for mental health and may lay the groundwork for sex-specific vulnerability to psychopathology. Understanding the mechanism by which disrupted threat-anticipation and enhanced startle occurs, and sex differences in risk following ELA, will be key in understanding behavioral disturbances in stress-related disorders and sex-specific vulnerabilities.

COG5

MILESTONE ACQUISITION AND NIGHTLY INFANT LOCOMOTOR ACTIVITY: INSIGHTS FROM INTERRUPTED TIME SERIES AND RECURRENCE QUANTIFICATION ANALYSIS

Aaron DeMasi, The Graduate Center, The City University of New York; Sarah Berger, College of Staten Island & the Graduate Center, CUNY

Infants who have attained a new motor milestone, like crawling or pulling-to-stand, have more disrupted night sleep than age-matched peers who have not reached those milestones (Scher, 2005). To understand why learning new motor skills disrupts sleep, we used the Nanit video baby monitor to record infants' nightly crib activity.

Five infants (range = 85-316 days old at start) participated (54-108 nights). We collected nightly video of infants' cribs. Nanit's computer vision algorithm coded maximum time spent in one location (mLoc) which we considered a proxy for locomotor activity. Parents kept daily motor skill diaries.

Interrupted time series revealed that mLoc decreased significantly when infants learned to work with hands while propping on arms, cruise, and walk, although one infant showed no change related to walking. Recurrence quantification analysis quantifies the sequential structure of a time series (Abney et al., 2014). The two youngest infants (85 and 120 days old) had the highest stability and most recurrences in mLoc nightly compared to older infants. Most locomotor milestones and one non-locomotor milestone elicited long-term increases in locomotor activity at night.

Preliminary results suggest that older infants' motor systems are in flux due to newly independent mobility (Berger et al., 2011), whereas younger infants were not yet independently mobile. While nighttime wakings decrease over infancy (Galland et al., 2012), locomotor milestones lead both to mean-level and abrupt, nonlinear changes to sleep quality through increased skill-relevant locomotor activity at night as well as increased variability.

O3-5

LOW INFANT FUNCTIONAL CONNECTOME-BASED IDENTIFICATION ACCURACY ACROSS THE FIRST YEAR OF LIFE

Alexander Dufford, Yale Child Study Center; Stephanie Noble, Yale School of Medicine; Siyuan Gao, Yale School of Medicine; Dustin Scheinost, Yale School of Medicine

In adolescents and adults, an individual's functional connectome (or connectivity matrix) is unique and stable over months to years. This uniqueness and stability can be measured using connectome-based identification or "fingerprinting", which identifies an individual from a pool of other individuals and achieves high accuracy (80%-95%) in adolescents and adults. However, it is unclear if a high identification rate can be achieved during infancy, when the brain is rapidly developing. We examined identification rate in 33 infants with longitudinal resting-state data acquired at 1-2 months of age (S1) and 9-10 months of age (S2). Connectomes were extracted from infant resting-state data using an infant-specific parcellation resulting in an 83 by 83 connectivity matrix. Similarity between connectomes was measured with correlation and

geodesic distance. We tested identification using both the raw connectomes and connectomes transformed into tangent space. Using raw connectomes and correlation, identification was low, ranging from 6% (S1 to S2) and 9% (S2 to S1). Results were similarly low using raw connectomes and geodesic distance with accuracies of 3% and 9%. Connectomes transformed into tangent space resulted in accuracies of 15% and 6%. Potential explanations for the low identification accuracy include low uniqueness and stability at the level of individual edges; average edge-wise test-retest reliability was poor (mean ICC=0.07, SD=0.09, range=0-0.57). The low identification rate may reflect unparalleled developmental changes in the functional organization of the brain during this period but may also reflect issues with measurements of functional connectivity being reliable across the first year of life. In adolescents and adults, an individual's functional connectome (or connectivity matrix) is unique and stable over months to years. This uniqueness and stability can be measured using connectome-based identification or "fingerprinting", which identifies an individual from a pool of other individuals and achieves high accuracy (80%-95%) in adolescents and adults. However, it is unclear if a high identification rate can be achieved during infancy, when the brain is rapidly developing. We examined identification rate in 33 infants with longitudinal resting-state data acquired at 1-2 months of age (S1) and 9-10 months of age (S2). Connectomes were extracted from infant resting-state data using an infant-specific parcellation resulting in an 83 by 83 connectivity matrix. Similarity between connectomes was measured with correlation and geodesic distance. We tested identification using both the raw connectomes and connectomes transformed into tangent space. Using raw connectomes and correlation, identification was low, ranging from 6% (S1 to S2) and 9% (S2 to S1). Results were similarly low using raw connectomes and geodesic distance with accuracies of 3% and 9%. Connectomes transformed into tangent space resulted in accuracies of 15% and 6%. Potential explanations for the low identification accuracy include low uniqueness and stability at the level of individual edges; average edge-wise test-retest reliability was poor (mean ICC=0.07, SD=0.09, range=0-0.57). The low identification rate may reflect unparalleled developmental changes in the functional organization of the brain during this period but may also reflect issues with measurements of functional connectivity being reliable across the first year of life.

STRESS16

IMPACT OF COVID-19 PANDEMIC ON MATERNAL PERINATAL ROUTINES AND MENTAL HEALTH: PRELIMINARY FINDINGS FROM BABIP BIRTH COHORT

Elif Duman, Bogazici University

The ongoing COVID-19 pandemic causes drastic changes in individuals' daily routines, physiology and mental health. Understanding these effects are particularly important during the perinatal period due to their impact on maternal stress physiology and fetal development. In the ongoing BABIP prospective birth cohort from Istanbul, Turkey, associations between changes in maternal daily routines and perinatal mood were investigated. Participants were women during the perinatal period (N = 46; Mage = 31.24, SDage = 4.16) that completed a brief online survey during the pandemic about changes in their daily routines and mood. Prenatal and postnatal depressive symptoms and worries were assessed by multiple measures, including the Cambridge Worry Scale and Edinburgh Postnatal Depression Scale. Pandemic-related worry was assessed

for self, spouse, child and others and aggregated into a single measure. Changes in maternal daily routines were measured by single Likert-type items in domains such as sleep, diet, housework, income, occupational workload, family and infant care. Preliminary findings indicated positive associations between pandemic-related worry and increased family care and occupational workload. In addition, as pandemic-related worry increased, pregnancy-related worry, occupational workload, and postnatal depressive symptoms also increased. Finally, individuals with higher income exhibited lower depressive symptoms during the pandemic. These preliminary findings are important to emphasize the widespread impact of COVID-19 pandemic on women's perinatal mental health. Future data analysis in the BABIP cohort will investigate how these results are associated with changes in maternal stress physiology and infant development. Funding: Bogazici University BAP #11662 grant awarded to EAD.

S3-2

LINKING THE SOCIAL WORLD TO PHYSICAL HEALTH: INSIGHTS AND NEW DIRECTIONS

Katherine Ehrlich, University of Georgia; Kelsey Corallo, University of Georgia; Sarah Lyle, University of Georgia

Social stressors (e.g., early adversity, chronic interpersonal stress, loneliness) have long been recognized as risk factors for a diverse set of poor outcomes across development, including poor physical health in adulthood. But how do these experiences get under the skin to shape risk for infection or disease? And how can we study these phenomena in childhood and adolescence; a developmental window during which most youth have exceptionally good health? Conceptual models point to the important role of the immune system in shaping risk for chronic diseases of aging, including heart disease and diabetes. In this talk, I will provide an overview of my research program, which focuses on links between social experiences and physical health across development. Highlights will include recent evidence documenting associations between (a) parent-child relationship experiences and children's asthma morbidity and cytokine regulation, (b) children's exposure to parental depression and future risk for metabolic dysregulation, and (c) maltreatment exposure and low-grade inflammation in childhood. I will conclude with a road map for the next chapter of our lab's work, which is focused on how social and environmental stressors relate to children's response to vaccination. These ongoing studies leverage standard vaccinations as a tool to evaluate children's adaptive immunity; a branch of the immune system that plays an important role in fighting off infectious disease. Collectively, our work suggests that social experiences are associated with both the innate and adaptive branches of the immune system, and these links may have long-term implications for physical health.

O4-4

WHAT PATTERN OF BRAIN ACTIVITY IS ADAPTIVE? IT DEPENDS ON ONE'S ENVIRONMENT

Monica Ellwood-Lowe, University of California, Berkeley; Silvia Bunge, University of California, Berkeley; Susan Whitfield-Gabrieli, Northeastern University

Prior research indicates that certain patterns of functional connectivity are more adaptive—for example, associated with better cognitive test scores. One such pattern thought to be adaptive is an anti-correlation between lateral frontoparietal network (LFPN; supports executive functions), and Default Mode Network (DMN; supports internally-directed thought). Lower LFPN-DMN connectivity has been linked to higher cognitive test performance. However, most studies are based on non-representative samples of individuals from higher-socioeconomic status backgrounds. Children living in poverty are at the greatest risk of low performance on cognitive tests, yet we know little about the neural underpinnings of success for them. In a pre-registered study, we analyzed 1,034 children ages 9.00-10.92y ($M = 9.90y$) living in poverty, identified from a larger sample (ABCD study). We did not find this expected relation. Further testing confirmed an interaction ($p = 0.003$), such that for children in the larger sample living above poverty ($N = 5,805$) high cognitive test performance was related to lower LFPN-DMN connectivity ($B = -1.41$, $p = 0.002$), replicating prior studies, whereas for children living below poverty, this relation trended in the opposite direction ($B = 2.11$; $p = 0.060$). Follow-up cross-validated predictive analyses revealed that the relation between LFPN-DMN connectivity and test performance varied systematically depending on children's environments. For children living in dangerous neighborhoods, for example, more positive LFPN-DMN connectivity was linked to better test performance; for children living in safe neighborhoods, this relation was in the expected, negative, direction. This pattern indicates that adaptive brain function depends crucially on adolescents' environments, highlighting the need for more diverse representation in developmental cognitive neuroscience.

O1-1

INSUFFICIENT PARENTAL CONTACT IN EARLY-LIFE LOWERS MEDIAL AMYGDALA MESOTOCIN SENSITIVITY AND IMPAIRS FLOCK SIZE DISCRIMINATION IN ADULT ZEBRA FINCHES

Michael Emmerson, Virginia Tech

Inadequate early-life contact with parents can lead to impairments in later-life social cognition and social behaviour, such as deficits in recognising and approaching unfamiliar individuals. Lower nonapeptide functioning (e.g. oxytocin) in regions of the neural social decision-making network, such as the medial amygdala, may underly such outcomes. Whether gregariousness, i.e. recognising and preferring larger groups, is affected by early-life parental contact is unclear, as are the effects of early-life social contact with siblings. Here, we used a highly gregarious flocking bird, zebra finches, to explore if parent and/or sibling contact shapes adult medial amygdala nonapeptide receptor expression alongside recognition and preferences for social groups (small vs. large flocks). Chicks were raised by a single mother or father in small broods (3 chicks per nest) or by paired parents in small or large broods (3 or 6 chicks per nest) matched to single parents for chicks per nest or per parent, respectively, to simultaneously manipulate early-life parent and sibling contact. Pair raised birds had clear flock size preferences as adults, but birds raised by single parents had equal preference for either flock size. Medial amygdala mesotocin receptor expression (an equivalent of the mammalian oxytocin receptor) was lower in birds raised by single parents compared to pair raised controls. Inadequate parental, but not

sibling, contact in early-life therefore diminishes adult neural nonapeptide functioning and impairs group size discrimination. Our results highlight the important role of early-life parental contact on the formation of adult socio-cognitive abilities and the neuroendocrine social brain.

NEURO27

RELATIONS BETWEEN PARENT-REPORTED EMOTIONAL LABILITY AND CHILDREN'S CORTICAL THICKNESS IN EARLY TO MID-CHILDHOOD.

Arcadia Ewell, Boston University; Tamara Allard, University of Maryland; Morgan Botdorf, University of Maryland, College Park; Tracy Riggins, University of Maryland

Emotional lability refers to an individual's rapidness and intensity in responding to emotional stimuli (Dunsmore, Booker, & Ollendick, 2011). It has been associated with measures of neural structure in older populations, yet understanding of these relations in younger children is limited.

Participants were drawn from two longitudinal studies. The present analyses include 102 children, aged 3-9 years (55 female) whose parents completed the Emotion Regulation Checklist and who had a usable structural MRI scan. A standard resolution (.9mm³) T1-weighted structural scan was acquired and processed in FreeSurfer 6.0. Cortical thickness labels were derived from the Desikan-Killiany atlas.

A ROI analysis examined cortical thickness in four a priori brain regions (inferior frontal gyrus (IFC), anterior cingulate cortex (ACC), medial orbitofrontal cortex (mOFC), and insula). Results indicate a negative relation between emotional lability and IFC thickness when controlling for age and gender, $r(97) = -.224$, p . These results suggest that individual differences in emotional lability may relate to individual differences in brain structure during early to mid- childhood and will inform future research probing how the associations in these regions relate to similar associations in older children and adults.

S2-4

PREWEANING STRESS SENSITIZES ADULT FEAR AND DRUG-RELATED LEARNING DESPITE THE LACK OF CONTEXTUAL FEAR MEMORY

Michael Fanselow, UCLA

Previous research (e.g., Rudy & Morledge, 1994) indicates that preweanling rats do not acquire contextual fear conditioning. Here we report that rats receiving a single significant contextual fear conditioning experience at postnatal day 19 also show no evidence of contextual fear memory as adults. However, these same rats show profound alterations in adult behavior along with corresponding neurobiological changes. These early-life stressed rats show a dramatic enhancement in the acquisition of adult fear conditioning and increased baseline anxiety. As adults, these preweanling stressed rats acquired and extinguished operant responding for intravenous cocaine normally. However, they were more motivated for drug reward, evidenced

by increased effort to obtain a single unit dose, and more likely to reinstate operant responding following exposure to a mild stressor or cues previously associated with drug availability.

COG1

FOOD HARDSHIP AND MEASURE OF INFANT MEMORY

Cristina Fernandez, Columbia University Irving Medical Center; Kimberly Noble, Teachers College, Columbia University

Material hardship has been associated with child short-term memory deficits, yet less is understood about the association between food hardship and memory in infancy, a critical brain plasticity period. A cross-sectional analysis of an economically diverse sample of 90 infants ages 6-12 months enrolled in the Baby Behavior, Language, and EEG Study from 2016-2018 compared visual recognition memory in infants by food hardship experience. Food hardship was measured by caregiver report of child or caregiver going hungry and/or receiving free food in the last year due to lack of money. Caregivers reported receiving Supplemental Nutrition Assistance Program (SNAP) and/or Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) benefits. Infant visual recognition memory was measured with the Video Paired Comparison (VPC) task. Linear regression tested the relationship between food hardship and VPC ratio, adjusting for parent ethnicity. Food hardship, experienced by 20% of families, was associated with Hispanic ethnicity (82% vs. 27%, $p=0.001$), less parental education (median (interquartile range): 12 (3) years vs. 16 (6) years, $p=0.0002$), and receipt of SNAP and/or WIC (94% vs. 39%, $p < 0.0001$). Median child age at testing was 9.2 (4.7) months. VPC ratio was not significantly different between infants with and without food hardship (0.6 ± 0.1 vs. 0.6 ± 0.2 respectively, $p=0.6$). Food hardship did not significantly predict infant VPC ratio (adjusted beta estimated $\pm$ standard error: $\beta=0.05 \pm 0.05$, 95% CI= $-0.05-0.15$). Future research using validated food insecurity measures with a larger sample size to increase power will further explore food hardship effects on infant memory development.

COG14

AMYGDALA ACTIVITY IS NECESSARY FOR AGE-SPECIFIC INCREASES IN SOCIAL BEHAVIOR FOLLOWING BRIEF ISOLATION

Nicole Ferrara, Rosalind Franklin University; Mallika Padival, Rosalind Franklin University; Max Loh, Rosalind Franklin University; Amiel Rosenkranz, Rosalind Franklin University

Adolescence is characterized by high social drive and ongoing brain maturation. The decline in social drive during development coincides with cortical maturation, which likely influences the age-dependent changes in the regulation of emotions. Increased activity in cortical regions, such as the anterior cingulate cortex (ACC), and NMDA receptor-dependent activity in the basolateral amygdala (BLA) have been linked to social behaviors, suggesting there may be existing developmental changes in NMDA receptor mediated activity in the ACC-BLA pathway regulating social drive. Brief isolation experiences that facilitate social interaction can be used to investigate the developmental shifts in social behaviors and ACC-BLA circuits. We found that

brief social isolation (2hrs) increases contact behavior in adolescents and adults, while play-fight was selectively increased in adolescents. This was accompanied by increases in BLA synaptic expression of NMDA receptor subunits and BLA hyperactivity during anesthetized in vivo recordings. Inhibition of BLA activity during isolation blocked isolation-dependent increases in social interaction in both adults and adolescents; however, ACC stimulation increased BLA activity in adults but not adolescents following isolation. Further, ACC activity was necessary selectively during isolation for isolation-dependent increases in social interaction in adults. Together, these results suggest that isolation may increase age-specific social behaviors through NMDAR-mediated BLA activity in adults and adolescents, while the ACC→BLA pathway may play a larger role in regulation of social behavior in adults. These results begin to provide insight to the maturation of cortico-BLA circuitry that contribute to the refinement of social behaviors.

SOC13

FEAR REDUCES ATTENTIONAL ORIENTING TO PARENTS DURING CHILDHOOD/ADOLESCENCE

Andrea Fields, Columbia University; Jennifer Silvers, UCLA; Bridget Callaghan, The University of California, Los Angeles; Michelle VanTieghem, Columbia University; Tricia Choy, University of California, Riverside; Kaitlin O'Sullivan, Columbia University; Nim Tottenham, Columbia University

When faced with threat, adults typically deploy fight or flight strategies to manage fear. In contrast, infants are much more likely to look to familiar adults, like their parents, to help them navigate threatening events. This social referencing behavior is particularly common early in life, as very young children depend heavily on their caregivers for survival and cannot deploy the safety strategies available to adults. However, work has yet to investigate how readily older children socially reference familiar adults in threatening or fearful contexts. The current work addressed this question using a visual search paradigm that included arrays of parents' and strangers' faces as target and distractor stimuli. The search array was preceded by a fear or neutral emotion prime to investigate whether fear alters searching behavior during childhood and adolescence. Linear mixed-effect models indicated that children and adolescents ($N = 80$, Mean Age = 10.35 years, 40M/40F) were slower to search for faces of a stranger than their parents ($\beta = 225.96$, p and adolescents were significantly slower to identify parents in an array of stranger faces if they were first primed with fear than with neutral ($\beta = 114.39$, $p = .007$). This work indicates that fear may temporarily interfere with parental referencing in this age range, potentially because during childhood and adolescence, fear can reallocate attention away from parents and towards environmental threats, to facilitate the development of independent threat coping systems.

S4-5

ASSOCIATIONS BETWEEN AMYGDALA CONNECTIVITY AND INFANT REACTIVITY

Courtney Filippi, UMD; Sanjana Ravi, Vanderbilt University; Daniel Pine, NIMH; Nathan Fox, University of Maryland

While infant fearful temperament has been linked to the development of anxiety, the neurobiological origins of this association remain unclear. In part, because no studies link amygdala connectivity early in life to behavioral assessments of fear (only parental report). While parent report and behavioral assessments are modestly correlated, behavioral assessments of temperament are more robust predictors of later anxiety. Thus, it is critical to evaluate the link between behavioral assessments of temperament and amygdala connectivity. To do so, we assessed negative reactivity, an infant temperament characterized by distress to novelty at 4 months (Mage=4 months 5 days). Following the presentation of novel visual and auditory stimuli, coders scored infants positive affect, negative affect, and movement using a 7-point Likert scale. Negative reactivity was characterized by greater negative affect than positive affect. Functional magnetic resonance imaging was acquired during natural sleep to assess resting state functional connectivity (rs-fc; Mage=4 months 24 days). Associations between negative reactivity and amygdala rs-fc were investigated using a whole-brain voxel-wise approach. Results demonstrated that infants showing high negative reactivity exhibited greater amygdala-cingulate gyrus connectivity (pvoxel-wise<.001, pFWE-corrected<.05). To supplement these findings, we evaluated associations between amygdala connectivity and parent-reported distress to limitations (i.e., a subscale of the Infant Behavior Questionnaire that distinguished negative and positive reactivity in a large independent cohort; $d=.45$, $t(137.6)=2.9$, $p=.004$) and fear. Results were weaker, albeit comparable (pvoxel-wise=.05, pFWE-corrected=.05). Overall, these findings provide novel insight into the neural origins of anxiety and temperament and highlight the value of integrating behavioral and neural measures.

NEURO15

DORSAL ANTERIOR INSULA ACTIVATION AND THE EFFECTS OF INTOLERANCE OF UNCERTAINTY IN DECISION-MAKING

Katherine Foray, National Institute of Mental Health; Emily Weiss, National Institute of Mental Health; Ryan Philips, National Institute of Mental Health; Christian Grillon, National Institute of Mental Health; Monique Ernst, National Institute of Mental Health; Margaret Westwater, National Institute of Mental Health

Intolerance of Uncertainty (IU) is the dispositional tendency to view uncertainty as harmful, a characteristic often found in patients with anxiety. Previous studies utilized reaction time (RT) to study cognitive processes involved in decision-making and have demonstrated dorsal anterior insula's (DAI) involvement in processing salience. This study sought to examine the interactions between salience, valence, and IU on RT and fMRI DAI activity during decision-making.

Healthy volunteers (N=41) were asked to participate in a monetary incentive task measuring the influence of incentive salience and valence on RT. Data from two runs of the task were collected using a 7-tesla fMRI scanner (Siemens). Prior to the task, participants completed the Intolerance of Uncertainty-Short Form (IU-SF) questionnaire.

A repeated measures ANCOVA (rANCOVA) identified a significant main effect of salience ($F(1,32)=52.76, p=2.97 \times 10^{-8}$), valence ($F(1,32)=11.02, p=0.0023$), and IU ($F(1,32)=8.91, p=0.0054$) on RT. There was a significant two-way interaction between salience and IU ($F(1,32)=0.207, p=0.0054$) on RT. Further rANCOVAs indicated a significant main effect of salience (right: $F(1,32)=46.34, p=1.07 \times 10^{-7}$; left: $F(1,32)=48.45, p=6.96 \times 10^{-8}$) and a significant two way interaction between salience and IU (right: $F(1,32)=8.06, p=0.008$; left: $F(1,32)=4.40, p=0.04$) on DAI activity. RT was positively correlated with IU score only for gain trials ($p=0.0058, r=0.45$). IU scores were positively correlated with the right DAI's activity ($p=0.009, r=0.43$) for both gain and loss trials.

The results suggest that individuals with higher intolerance to uncertainty also exhibit higher reaction times and DAI activity for uncertain trials. Thus, behavioral and neural correlates of uncertain decision making could reflect facets of anxiety.

NEURO21

USING FNIRS TO STUDY THE ROLE OF NEURAL RESPONSES TO MOTHERS' VOICE IN INTERGENERATIONAL TRANSMISSION OF DEPRESSION

Xiaoxue Fu, University of South Carolina; Eric Nelson, Nationwide Children's Hospital; Michele Morningstar, Nationwide Children's Hospital; Whitney Mattson, Nationwide Children's Hospital; Xin Feng, Ohio State University

Early exposure to parental depressive expressions contributes to the parent-to-child transmission of depression. Existing studies suggested that mothers' speech evoked greater activations in cortical regions in unselected, typically developing infants and children (7- and 8-year-olds). Extending from these studies, the present study utilized fNIRS to investigate whether early risk of depression is associated with differential neural responses to voice from mothers and unfamiliar females.

The current sample was drawn from an ongoing multi-visit study. Of the 41 children ($Mage = 4.36, SD = 0.31$), 16 children had mothers who were characterized with Major Depressive Disorder during their children's lifetime. Mothers reported their children's internalizing symptoms in the Child Behavior Checklist. The fNIRS system outfitted with source-detector channels that were arranged to capture hemodynamic changes in the bilateral temporal regions. We used a "localizer" task to identify function channels of interest (COIs) that were sensitive to human voice relatively environmental sound. In the main task, the child listened to sentences spoken by own mother and another participant's mother.

Significant Group-by-Speaker interaction was found in right temporal COIs (The present study showed that early exposure to maternal depression is associated with reduced neural responses to voices from own mother than an unfamiliar female. This may contribute to the enhanced risk for developing internalizing symptoms.

STRESS17

NEUROFUNCTIONAL CONSEQUENCES OF EARLY-LIFE STRESS ON EXECUTIVE FUNCTIONING: A COORDINATE-BASED QUANTITATIVE META-ANALYSIS

Naomi Gancz, VA Pittsburgh Healthcare System; Sarah Forster, VA Pittsburgh Healthcare System

Individuals exposed to severe or chronic early-life stress (ELS) manifest executive control deficits that are associated with poorer school and workplace performance and increased morbidity. However, efforts to elucidate developmental mechanisms underlying these deficits through neuroimaging studies of executive functioning in ELS-exposed groups have yielded conflicting, often contradictory, results. Identifying brain areas that consistently demonstrate an aberrant BOLD response during executive processing in ELS-exposed, relative to healthy comparison, groups may reveal generalizable mechanisms of ELS effects on neurodevelopment. We therefore performed a coordinate-based meta-analysis to examine convergence in BOLD findings across existing fMRI studies of executive control in ELS-exposed participants. A systematic literature search identified 22 publications examining 1119 subjects. Activation Likelihood Estimation was subsequently conducted on 225 ELS-related foci identified therein. No significant spatial convergence in effects was identified using cluster-level thresholding. However, exploratory analysis using an uncorrected p-value threshold revealed convergence in 14 unique clusters in canonical control-related areas, as well as in visuospatial and motor regions. Examination of constituent foci revealed convergence of ELS-related hyperactivation effects in visuospatial and motor regions and convergence of hypoactivation effects in visuospatial and frontal cortical areas. Our findings provide preliminary evidence that, despite significant methodological heterogeneity, alterations in control-related brain activity in ELS-exposed groups generally converge in visuospatial, motor, and frontal regions; in addition, convergence in ELS-related hypoactivation effects was specifically identified in frontal regions. While factors contributing to inter-study variability require further examination, our results support consistent effects of ELS on specific aspects of executive neural network functioning.

SOC11

PARENT'S ADAPTIVE COGNITIVE EMOTION REGULATION STRATEGIES PREDICT CHILDREN'S LEFT FRONTAL EEG ASYMMETRY DURING COGNITIVE REAPPRAISAL

Tatiana Garcia Meza, Virginia Tech; Alex Tucker, Virginia Tech; Martha Ann Bell, Virginia Tech

Parents provide an emotion-rich environment that can affect children's developing emotion regulation in many ways (Morris et al., 2017). Parent cognitive reappraisal (CR) abilities are related to those of their children (Bridgett et al., 2015) and parent emotion coaching (EC) and emotion dismissing (ED) impact children's psychosocial adjustment through children's developing emotion regulation (Eisenberg et al., 1999). Emotion regulation can be assessed using frontal EEG asymmetry (FA; Fox, 1994). In adults, left FA is observed during effective CR (Choi et al., 2016), but there are no FA data during CR in children. We focused on parents' self-reported CR, EC, ED, and children's FA during CR. We observed 50 children age 9-10 and

recorded EEG during resting baseline and during a sad film. Children were given CR instructions prior to watching the film and we used FA during the film as a physiological indicator of children's emotion regulation, hypothesized the result of CR. Controlling for baseline FA, parent's adaptive CR ($\beta = .26$, $p = .006$), but not EC ($\beta = -.18$, $p = .06$), accounted for 7 percent of the variance in FA during the film, with the positive beta for CR indicating left FA. The interaction between parent's adaptive CR and EC was not significant. In a separate analysis, parents' maladaptive CR ($\beta = -.17$, $p = .08$) and ED ($\beta = .03$, $p = .68$) did not predict children's FA during the sad film. Children of parents who self-reported greater use of adaptive CR displayed greater left FA during the sad film, suggesting these children as more effective implementers of instructed CR.

SOC1

MINDFUL PARENTING IN INFANCY SCALE (MPIS): INSTRUMENT DEVELOPMENT AND VALIDATION.

Maria Gartstein, Washington State University; Sydney Iverson, The Seattle Clinic; Allegra Campagna, Washington State University

Mindful parenting is characterized by intentionality in parent-child interactions: careful listening, attention to the child, low reactivity, non-judgmental attitude, emotional awareness, and compassion. Although mindfulness in parenting has been recognized as important, with interventions attempting to increase related attributes, there is a dearth of instruments to measure mindfulness in parenting, especially for caregivers of infants.

We conducted two studies: (1) developing and providing an initial psychometric evaluation of the Mindful Parenting in Infancy Scale (MPIS); (2) reproducing initial findings with an independent sample of infants and caregivers. In Study 1, 37 caregivers of infants (3-12 months of age) responded to MPIS, providing indicators of parenting stress via the Parenting Stress Inventory (PSI; Abidin, 2012) and infant temperament using the Infant Behavior Questionnaire-Revised (IBQ-R; Gartstein & Rothbart, 2003). Study 2 caregivers ($N = 57$) responded to identical measures.

Study 1 results indicated good internal consistency ($\alpha = .80$), with Study 2 providing additional support for reliability ($\alpha = .66$). Correlations with parenting stress markers were also significant across both investigations: Study 1 r 's range $-.35$ to $-.61$, Study 2 r 's range $-.31$ to $-.40$; all significant and indicative of greater stress with lower levels of mindfulness. Correlations with IBQ-R scores were also computed, with Study 1 producing significant correlations with Positive Affectivity/Surgency ($r = .42$) and Regulatory Capacity/Orienting ($r = .63$), and Study 2 for Positive Affectivity/Surgency ($r = .34$). Importantly, the MPIS score was predictive of total parenting stress even after controlling for infant temperament in both investigations: Study 1 ($R^2 = .24$; $F(1, 35) = 11.03$, $p = .002$); Study 2 ($R^2 = .07$; $F(1, 55) = 4.71$, $p = .03$).

YOUTH EXPOSED TO MALTREATMENT SHOW AGE-RELATED ALTERATIONS IN HIPPOCAMPAL-FRONTAMYGDALA FUNCTION DURING EXTINCTION RECALL

Dylan Gee, Yale University

Exposure to childhood trauma is a major risk factor for psychiatric disorders. Delineating the neurodevelopmental mechanisms linking early-life trauma to psychopathology is critical for the early identification of risk and optimizing interventions to promote resilience. Maltreatment-exposed youth show alterations in fear conditioning and related hippocampal-frontoamygdala circuitry, yet much remains unknown about extinction and extinction recall, which are central to discriminating threat from safety following trauma. Youth ages 8-17 years old (N=161) with or without exposure to maltreatment completed fear acquisition and extinction. Within one week, participants completed extinction recall and re-extinction during fMRI scanning. Given hypotheses about maltreatment and frontolimbic development, we tested for group differences in age-related patterns of activation in the amygdala, hippocampus, and subgenual anterior cingulate cortex (sgACC) during extinction recall and re-extinction. Maltreatment-exposed youth showed altered age-related activation in the amygdala ($F(1,125)=5.40$, $p=.022$) and hippocampus ($F(1,125)=4.58$, $p=.034$) during extinction recall. Whereas non-exposed youth showed stable activation, maltreatment-exposed youth showed age-related increases in amygdala and hippocampus activation to the CS- (vs. CS+). A maltreatment x age x sex interaction ($F(1,125)=4.86$, $p=.029$) revealed that maltreatment-exposed females (but not males) had altered age-related sgACC activation to the CS+ (vs. CS-) during re-extinction. Childhood maltreatment may alter the development of fear extinction and related brain activation. In particular, findings suggest that maltreatment-exposed youth fail to discriminate between threat and safety in an age-expected manner. Altered hippocampal and frontoamygdala function may underlie difficulties learning or integrating environmental cues signaling safety that could increase risk for psychopathology during development.

S1-5

PREADOLESCENT STRESS HAS ENDURING EFFECTS ON SOCIABILITY IN FEMALE MICE

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Psychiatric disorders peak in prevalence during childhood and adolescence, and adverse experiences early in life increase the lifelong risk for psychopathology. Impairment in social behaviors is a key feature of many psychiatric disorders. Notably, adolescence is a time when social reorientation (from caregiver to peers) takes place, and social skills mature setting the stage for critical maturational milestones. To explore the enduring effects of pre-adolescent stress on the maturation of social behaviors and the neural systems mediating them, we used an acute variable foot shock stress (P28-P30) or a chronic unpredictable stress (P22-P31) paradigm followed by behavioral tests to measure sociability. We found that acute and chronic pre-adolescent stress exposure led to reduced sociality and altered social communication (measured by ultrasonic vocalizations) towards a novel conspecific in adulthood in female, but not male, mice. These deficits are not apparent during adolescence, but instead emerge during the transition to early adulthood. Our findings suggest that the pre-adolescent/pre-pubertal window is

a sensitive period for social development in female mice. The nucleus accumbens has been implicated in social reward and motivation, and adults with major depressive disorder exhibit reduced activity of the nucleus accumbens in response to rewarding stimuli. Ongoing fiber photometry and molecular studies are investigating the effects of pre-adolescent stress on developing dopamine and glutamate systems in the nucleus accumbens.

STRESS13

RELATIONS BETWEEN CHRONIC PHYSIOLOGICAL STRESS, PERCEIVED STRESS, AND CAREGIVING

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Caregivers play a critical role in children's social-emotional, cognitive, and neural development. Research has suggested that lower socioeconomic circumstance may result in increased stress, which in turn, can lead to reductions in warm and supportive caregiving. Research directly linking stress with caregiving behavior has predominantly utilized self-report questionnaires and point-in-time measures of physiological stress, such as salivary cortisol. Less is known about the role of chronic physiological stress. Though research is emerging that investigates chronic physiological stress, typically indexed by hair cortisol, and caregiving behavior, results have been mixed. The present study examined associations between maternal chronic physiological stress, perceived stress, and caregiving behavior in a diverse sample of mother-infant dyads (infant age range: 11.70-12.95 months). We hypothesized that increased chronic physiological and perceived stress would be associated with less developmentally supportive caregiving. Chronic physiological stress and perceived stress were assessed using maternal hair cortisol concentration (N= 26) and the Perceived Stress Scale (PSS; N= 35). A play-based observational measure of developmentally supportive caregiving that included four domains (affection, responsiveness, encouragement, and teaching) was used to measure caregiving behavior. Contrary to our hypothesis, maternal chronic physiological stress ($\beta = -0.299$; $p = .137$) and perceived stress ($\beta = 0.072$; $p = .680$) were not significantly associated with developmentally supportive caregiving. Results did not change when controlling for maternal education or income. However, the small sample sizes of this investigation may have limited our ability to detect effects. Future studies will investigate chronic physiological stress and caregiving behavior in a larger sample.

STRESS6

MULTIPLE HITS OF ADVERSITY: SEX-DEPENDENT NEUROIMMUNE AND NEUROSTRUCTURAL EFFECTS THROUGHOUT DEVELOPMENT

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Early life adversity alters prefrontal cortex development and increases vulnerability to neuropsychiatric disorders. Notably, evidence from clinical studies demonstrates that repeated stressful life events throughout childhood result in more severe neuropsychiatric symptoms, specifically in women. Microglia – the main immunocompetent cells in the brain – and perineuronal nets (PNNs) – extracellular matrix structures that preferentially enwrap fast-spiking parvalbumin (PV)-expressing interneurons – play important roles in the brain’s developmental response to adversity. Few studies, however, assess sex differences in microglia and PNN structure and function following multiple stress exposures. Here, we investigated whether early life adversity increases vulnerability to a secondary hit later in development in a sex-dependent manner. Rat pups underwent maternal separation (MS) from postnatal day (P) 2-20 and exposed to the endotoxin lipopolysaccharide (LPS) in juvenility (P20) or adolescence (P40) and Iba1+ microglia morphology was quantified. In a separate cohort, pups were exposed to MS, followed by juvenile social isolation (SI) from P21-35. Anxiety-like behavior was measured in early adulthood (P70) using the elevated zero maze. In adulthood (P85), the number and intensity of PNNs enwrapping PV neurons was quantified. We observed that both MS and LPS administration affected morphological characteristics in juvenile males and females, with MS exposure leading to a greater increase in soma size following LPS in females. Additionally, MS paired with SI resulted in decreased structural integrity of PNNs surrounding PV cells, only in females. We present evidence that multiple hits of adversity influence neuroimmune and neurostructural development in a sex-dependent manner that may impact later-life behavioral outcomes.

O2-5

EFFECTS OF PRENATAL EXPOSURE TO TOBACCO AND ALCOHOL ON NEONATAL AUDITORY BRAINSTEM RESPONSE: RESULTS FROM THE SAFE PASSAGE STUDY

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Prenatal exposures to alcohol (PAE) and tobacco (PTE) are known to produce adverse neonatal outcomes including damage to the developing auditory system. Knowledge of the timing, extent, and combinations of these exposures on damage to the developing system will aid in understanding the etiology and underlying mechanisms.

Auditory Brainstem Responses (ABRs) were acquired as one of several physiology measurements in the Safe Passage Study (Dukes et al., 2014) on 2,345 newborns (1,260 males) from research centers located in South Africa and the Northern Plains of the U.S. ABRs were elicited by 80 dB nHL clicks using standard procedures (Sininger et al., 2018).

Prenatal information on alcohol and tobacco exposure was gathered prospectively on mother/infant dyads (Dukes et al., 2014; 2017). Cluster analysis was used to characterize levels of PAE and PTE into subcategories which were formed according to timing, duration, and

amount of exposure. Repeated-measures ANOVAs were performed for effects of PAE, PTE, and interactions while controlling for hours of life at test, gestational age at birth, sex, and site.

A significant interaction (PTE x PAE) was found ($p=.037$) for left ear latencies. A significant main effect of PTE was found for ABR peak latencies elicited from the right ($p=0.001$) and left ear ($p=0.026$). Responses from both ears showed a reduction in latency with tobacco exposure. Results are consistent with early disruption of neuronal pathways and synaptic function particularly due to nicotine exposure and with reports of hemispheric differences in auditory system dysfunction in children with adverse prenatal exposures.

NEURO16

SUSTAINED ATTENTION IN INFANCY: AN EARLY MARKER OF ENHANCED BIOLOGICAL SENSITIVITY TO CONTEXT

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The ability to sustain attention in infancy promotes the development of effortful control and self-regulation (Rothbart et al., 2003) and conversely, self-regulation fosters sustained attention (SA) (Posner & Rothbart, 1998). A chronic physical/psychosocial stressor, early-life poverty is associated with heightened sympathetic nervous system reactivity (Wolff et al., 2012), a physiological marker of self-regulation (Blair, 2010). Infant SA has been shown to partially mediate poverty-related risk on self-regulation, and is positively associated with executive function, in preschool (Brandes-Aitken et al., 2019). However, little research has examined how SA emerges in the context of poverty.

We examined the unique and joint effects of early-life poverty and physiological self-regulation on infant SA. We hypothesized that better self-regulation [indexed by lower levels of respiratory sinus arrhythmia (RSA)] would buffer infants from deleterious effects of financial stress on attention [indexed by longer SA]. Mother-child dyads ($N=42$) were followed from pregnancy through 6-months postpartum. At 3-months of age, infant baseline RSA was measured and mothers completed a financial strain questionnaire. At 6 months, infant attention was indexed via a puppet task. Using linear regression – controlling for infant's age at assessment – we found that effects of maternal financial stress on attention were conditional upon infant 3-month RSA ($\beta = 0.39$, $p = 0.02$). Surprisingly, after probing the interaction using simple slopes (Aiken & West, 1991), we found children exposed to high financial stress had greater SA if they had higher RSA ($\beta = 0.53$, $p = 0.02$). Our findings suggest that SA could be an early marker of enhanced biological sensitivity to context in infancy.

O4-1

IMPACTS OF EARLY LIFE ADVERSITY ON MOTHER-INFANT RELATIONSHIP IN RATS: A POTENTIAL FOR ULTRASONIC VOCALIZATIONS AS AN EXPERIENTIAL MEASURE IN ADVERSITY MODELS

Lauren Granata, Northeastern University; Jennifer Honeycutt, Bowdoin College; Heather Brenhouse, Northeastern University; Alissa Valentine, Northeastern University

Early life adversity can lead to social dysfunction later in life, which underlies many psychiatric conditions. Two widely used rodent models of adversity, maternal separation (MS) and limited bedding (LB), resemble different types of adversity, but both influence the mother-infant relationship during a critical developmental window. Identifying the influencing factors between disparate paradigms can reveal individual aspects of adversity modulating later-life outcomes. Interfering with parental care during early development necessarily affects the mother-infant relationship and may affect the development of communication strategies on the part of the pup. Ultrasonic vocalizations (USVs) are an ethologically relevant measure of the pup's response to acute stressors and facilitate pup-dam communication. USV acoustic parameters change throughout early development, presenting the possibility that these changes are developmental milestones that reflect aberrations in the pup-dam relationship if shifted or delayed. Thus, this study compares the effects of MS and LB on the pup-dam relationship by quantifying pup USVs and maternal behavior, and relates these measures to behavior in a dyadic social interaction test in adolescence. We recorded USVs on postnatal days 5, 10, 15, and 21 to define a typical developmental trajectory of acoustic parameters in control pups and observed deviations from this trajectory in altered rearing conditions. Maternal behavior was assessed for entropy rates to quantify behavioral predictability, which revealed a relationship between maternal entropy, rearing condition, and USV emissions. Findings from this study will elucidate the role of communication during the critical developmental window and characterize USVs as a developmental milestone for rodent models.

S5-4

FMRI SIGNAL VARIABILITY IN REWARD NEURAL HUBS RELATE TO EARLY-LIFE ADVERSITY AND SYMPTOMS OF DEPRESSION

Jamie Hanson, University of Pittsburgh

Those who suffer early-life adversity (e.g., exposure to abuse or violence) are at a heightened risk for affective disorders later in life, particularly depression. Though well-studied in psychological and epidemiological research, the exact neurobiological mechanisms mediating these associations remain unclear. Emerging evidence, however, implicates dysfunction of reward-related neural circuitry in the pathophysiology of depression. Connected to these ideas, here we investigate a novel biomarker to more robustly understand connections between adversity, depression, and neurobiology. Specifically, BOLD fMRI signal variability may be an important individual difference measure of interest, often demonstrating more predictive power than mean activation patterns. Such temporal variability may reflect differences in neuronal signal detection, dynamic range, or the ability to move into different network states. Leveraging a large-scale neuroimaging dataset of 9-10-year-old participants ($n=11,875$), we found that early-life adversity, in the form of high family conflict, was: 1) related to higher symptoms of depression; 2) associated with greater variability in a key reward-related neural hub, the ventral striatum, on a reward-processing fMRI task, and 3) VS BOLD variability mediated associations between family conflict and depression (indirect effect [$a \times b$], $z=1.992$, $p=.046$). In contrast,

mean BOLD activity for similar fMRI contrasts did not relate to depression or adversity. This novel work affords an opportunity to identify critical neurobiological alterations related to mood dysregulation and connected to adversity, elucidating novel markers of depression risk. Sustained progress on this issue could produce insights that practitioners could eventually use in reducing the negative mental health consequences of different early-life adversities.

STRESS11

PERIGESTATIONAL EXPOSURE TO MORPHINE LEADS TO IMMUNE DEFICITS IN MALE AND FEMALE RATS

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Approximately one-third of women of reproductive age in the United States fill an opioid prescription, leading to an increasingly large population of children exposed to opioids during a critical period of development, namely gestation. Opioids hijack the endogenous opioid receptors in the developing brain, leading to neonatal opioid withdrawal syndrome (NOWS). Children born with NOWS show withdrawal symptoms early in life, including autonomic dysfunction, hypersensitivity, and gastrointestinal distress, and, later in life, are at risk for cognitive and behavioral deficits. Chronic opioid exposure in adults leads to suppression of the peripheral immune system, which produces increased susceptibility and sensitivity to infection. Very little evidence exists to determine whether perigestational opioid exposure (POE) leads to immunosuppression. The use of a clinically-relevant animal model of NOWS is essential to identify immune deficits after POE. Our clinically-relevant model involves exposure of adult female rats to pulsatile morphine exposure using micro-infusion pumps pre-gestation, during pregnancy, and in the post-partum period. Offspring from this model are exposed to morphine throughout critical periods of brain and immune system development. Preliminary data suggests that male and female POE rats have altered fever and sickness behavior after an adulthood immune challenge of lipopolysaccharide (LPS). Specifically, morphine-exposed males and females show increased hypothermic response to LPS, suggesting increased sensitivity to immune challenge, and morphine-exposed females show increased sickness behavior post-LPS. Future studies will attempt to identify mechanisms for this immune deficit, including immune cell cytotoxicity, microglial activation, and gut microbiota dysbiosis.

SOC27

AGE OF FIRST MEMORY POSITIVELY RELATES TO ADULTHOOD ANXIETY AND NEGATIVELY RELATES TO EARLY LIFE ADVERSITY EXPOSURE IN HUMANS

Sylvia Harmon-Jones, The University of New South Wales; Rick Richardson, University of New South Wales

Infantile amnesia is a robust, cross-species phenomenon which refers to the more rapid rate of forgetting observed in infants relative to older humans/animals. We have previously shown that,

in rats, exposure to early life adversity causes an earlier offset of infantile amnesia (e.g., good infant memory). In addition, we have also found that, in the absence of early life adversity, an earlier offset of infantile amnesia is associated with an increased risk of anxiety-like behavior and heightened fear in adulthood. In the present studies, we examined whether these relationships between infantile amnesia, anxiety, and early life adversity would translate to humans. We asked American (Studies 1 and 2) and Australian (Study 3) adults to report their first memory and the age they were when the event occurred. We also measured adults' current anxiety (Studies 1-3), resilience (Studies 1 and 2), neuroticism (Study 3), and experience of childhood adversity (Studies 2 and 3) via self-report. We found that human adults' age at the time of their first memory was positively related to current anxiety, and negatively related to number of adverse childhood events. We did not find evidence of a relationship between age of first memory and resilience, but found a trend towards a positive relationship between age of first memory and neuroticism. These results partially replicate previous rodent work in humans, and suggest that, across species, the expression of childhood/infant memories relates to adulthood anxiety and experiences of early life adversity.

O1-5

INFLUENCE OF MATERNAL PARENTING EMPATHY AND INFANT PHYSIOLOGICAL REGULATION ON TRAJECTORIES OF INFANT MENTAL HEALTH

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Although mental health difficulties can be identified as early as infancy, we know little about the development of mental health across infancy. Because infants lack the capacity for verbal communication, parents require empathy to effectively recognize and respond to the needs of their infant to support positive psychological outcomes. The infant's own inability to effectively regulate can also contribute to psychological outcomes. We examined the interactive influence of maternal empathic parenting towards her infant and infant physiological regulation (i.e., baseline respiratory sinus arrhythmia) at 8 months on the developmental trajectory of infant mental health across three timepoints at age 8-, 14-, and 18- months ($N = 50$). Among infants with lower physiological regulation, maternal empathic parenting had little impact on the change in infant mental health, such that these infants exhibited relatively high, stable levels of mental difficulties over time. In contrast, among infants with greater physiological regulation, maternal empathic parenting predicted infants' trajectory of mental health across time. Infants with greater physiological regulation and high maternal empathic parenting demonstrated relatively stable, low levels of mental health difficulties. However, infants with greater physiological regulation and low maternal empathic parenting exhibited relatively higher levels of mental health difficulties at 8 months of age, but they exhibited decreases in mental health difficulties over time. We speculate that as infants gain more agency and control over their environment, their innate capacity for self-regulation may result in them being less sensitive to the potentially negative impact of their parents' lack of empathetic responding.

GENETICS1

INTERPLAY BETWEEN POLYGENIC LIABILITY AND MALTREATMENT IN CHILDHOOD ADHD

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We explored whether the spectrum of polygenic liability for ADHD could be moderated by childhood maltreatment, including careful comparisons between individuals with very low polygenic liability from those with high polygenic liability. In light of the recent findings that found that individuals with the lowest polygenic scores (PGS) for ADHD also had better functional outcomes (i.e., cognitive, mental health, social-emotional) than individuals with middle or higher PGSs (Li, 2019), we hypothesized that low PGSs for ADHD would have a protective effect on maltreatment exposure. To test this hypothesis, we used four Waves of prospective longitudinal data from National Longitudinal Study of Adolescent to Adult Health (Add Health, Wave I: N = 20,745). As expected, individuals in the lowest 20th percentile of PGS-ADHD had 1.29 times fewer ADHD symptoms relative to the remaining sample. Exposure to childhood maltreatment (based on factor analysis of five self-reported maltreatment experience) contributed to 1.13 times increase in ADHD relative to non-exposure. However, the interaction between low PGS-ADHD and maltreatment was not significant. Results did not support the hypothesis that individuals with the lowest PGS-ADHD were protected from the negative effects of maltreatment. In other words, despite the strong heritability of ADHD, deleterious environmental impacts such as childhood maltreatment may not be overridden by an “advantageous” genotypic profile characterized by low PGS for ADHD.

STRESS7

MENTAL HEALTH AND SOCIAL CONNECTION OF PREGNANT AND POSTNATAL WOMEN BEFORE AND DURING COVID-19: A LONGITUDINAL STUDY

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The Covid-19 pandemic has been uniquely challenging for pregnant and postpartum women. Uncontrollable stress amplifies risk for maternal depression and anxiety, and poor maternal mental health is linked to adverse mother and child outcomes. This study examined change in symptoms of depression and anxiety in response to Covid-19 among women who were pregnant or postpartum, and whether change was moderated by interpersonal risk factors (loneliness, social support). Method: 135 women enrolled in an existing longitudinal study completed self-report questionnaires including the EPDS and STAI-short form at three timepoints: early pregnancy, a follow-up prior to the start of the Covid-19 pandemic, and during Covid-19. Results: Symptoms of depression and anxiety changed from early pregnancy to Covid-19. Depressive symptoms were higher during the pandemic as compared to pre-Covid ($F(1, 134)=44.68$, Loneliness moderated an increase in depressive symptoms from pre-Covid to Covid levels (p Social support was not associated with the patterns of depressive or anxiety symptoms over time. Conclusion: Covid-19 has impacted the mental health of pregnant and postpartum

women, and experiencing loneliness during the pandemic is a risk factor for depressive symptoms specifically. It is critical to implement screening for interpersonal risk in addition to broad mental health symptoms at prenatal and postpartum visits during this extraordinary time.

S3-1

RODENT AND NONHUMAN PRIMATE MODELS OF ATTACHMENT DISRUPTION AND INFLAMMATORY-MEDIATED DEPRESSION

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Disruption of filial attachment in children is associated with lasting neuroinflammatory burden that appears to increase vulnerability to depression and other stress-related psychological and physical disorders when individuals are challenged again in adolescence and beyond. Comparative experiments can confirm causality inferred from correlative human studies and are necessary for establishing underlying mechanisms. Rodent models are efficient for establishing mechanisms while complementary findings in nonhuman primates increase confidence in generalizability to humans. Guinea pig pups show many similarities in filial attachment to primate infants, including a 2-stage reaction to separation: initial distress followed by depressive-like passive responses. We have shown that these depressive-like responses of guinea pig pups are mediated by inflammatory mechanisms as evidenced by accompanying fever and increased cytokine gene expression, as well as by partial reversibility with anti-inflammatory treatment. Importantly, early separation increases depressive-like behavioral and febrile responses to a further separation in adolescence. This sensitization supports the interpretation that disruption of early attachment produces neuroinflammatory burden that increases vulnerability to depression following a “second hit” in later life. Findings that a COX inhibitor attenuates the sensitized response, and that earlier separation alters expression of prostaglandin-synthesizing enzyme genes, implicates a prostaglandin (PGE-2) mechanism. In parallel studies with rhesus macaques, we showed that isolation in adulthood also produces a depressive-like behavioral response that is associated with increased markers of inflammation and is subject to sensitization following repeated separation. As in humans, this depressive-like response was enhanced in monkeys who received poor quality maternal care in infancy.

NEURO13

CHANGES IN INFANT SLEEP STATES AROUND MOTOR MILESTONE ACQUISITION

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Motor milestone acquisition disrupts infant sleep, but the cause of these disruptions is unknown (Berger & Moore, 2020). In adults, skill acquisition impacts subsequent ultradian cycles and states have a distinct role in later skill mastery and

refinement (Fogel et al., 2015). It is unclear whether this relationship underlies previously reported infant sleep disruptions. This study documented infants' sleep states around naturalistic skill acquisition. Videos from the night before, of, and after skill onset were behaviorally coded into REM, NREM, indeterminate and wake (Anders & Keener, 1985). Six infants are currently enrolled. Three comprised the current wave of data analysis; the second wave will be available within the next 6 weeks. Bayesian repeated-measures ANOVAs examined the impact of motor skill acquisition (night before, of, or after onset) on each sleep state (NREM, REM, indeterminate, and wake). A Bayes Factor of 3 was set as the cut off for support of the alternative hypothesis (Stefan et al., 2019). The initial analyses produced moderate evidence for an effect of crawling on time spent in NREM ($BF_{10} = 10.23$) and anecdotal evidence for effects on time spent in REM ($BF_{10} = 1.39$) and awake ($BF_{10} = 1.21$). The night of onset, time spent in NREM increased. The night after onset, REM increased and time spent awake decreased. Preliminary results suggest that the acquisition of new motor skills alters infants' sleep in a way congruent with adult literature. Infant sleep states serve different roles during the process of skill acquisition through consolidation and refinement.

NEURO2

LATE PREGNANCY MATERNAL CORTISOL IS ASSOCIATED WITH ATYPICAL BUT NOT MELANCHOLIC POSTPARTUM DEPRESSIVE SYMPTOMS

Mariann Howland, University of Minnesota, Twin Cities; Laura Glynn, Chapman University

Associations between HPA axis dysregulation and mood disorders are well-documented. For example, hypercortisolism and hypocortisolism are established correlates of melancholic and atypical depression subtypes, respectively. However, whether these subtype-specific associations are evident during pregnancy, a period characterized by substantial change in maternal HPA axis function, is currently not known. The present study examined whether cortisol levels are associated with postpartum melancholic and atypical depressive symptoms. The sample included 133 women recruited from the prenatal clinics in Southern California during the first trimester of pregnancy and assessed longitudinally. Cortisol production during early (2-15 weeks) and late (26-35 weeks) pregnancy was determined in hair samples by liquid chromatography and tandem mass spectrometry. Melancholic and atypical symptom scores at 2-months postpartum were computed from the Inventory of Depressive Symptoms- Self Report (Rush et al., 1996). In a path analysis, lower late-pregnancy cortisol production was associated with elevated postpartum atypical symptoms ($\beta = -.20$, $p = .01$) but not melancholic symptoms ($\beta = .06$, $p = .26$). This association persisted after adjusting for relevant covariates (maternal age, education, income, gravida, parity). Early-pregnancy cortisol production was not associated with either subtype. These findings are consistent with evidence implicating hypocortisolism in the pathophysiology of atypical depression outside of the peripartum. Results also may assist in explaining inconsistent findings in the literature assessing links between cortisol and PPD. Given evidence that melancholic and atypical depression have distinct clinical patterns and treatment outcomes, findings also are relevant to efforts focused on early detection and treatment of PPD.

STRESS23

NURSE-EXAM AND HORMONAL INDICES OF PUBERTAL DEVELOPMENT ARE ASSOCIATED WITH INTERNALIZING DIFFICULTIES AMONG YOUTH WITH AND WITHOUT A HISTORY OF EARLY LIFE ADVERSITY

Mariann Howland, University of Minnesota, Twin Cities; Brie Reid, University of Minnesota; Bonny Donzella, University of Minnesota Twin Cities; Megan Gunnar, University of Minnesota

Individual differences in the timing and tempo of pubertal development are associated with later mental health difficulties (Berenbaum et al., 2015). Exposure to early life adversity (ELA) has been associated with pubertal timing and tempo and with mental health difficulties, but few studies have examined these associations longitudinally. In an accelerated longitudinal design of ELA-exposed youth (previously-institutionalized, PI, $N = 86$) and comparison youth (COMP, $N = 106$), we characterized 1) pubertal tempo with nurse-assessed pubertal stage and 2) trajectories of the adrenal pubertal hormone dehydroepiandrosterone (DHEA). Pathways from nurse-assessed pubertal stage tempo and salivary DHEA to later internalizing and externalizing difficulties also were assessed. Participants completed three annual sessions, beginning at ages 7-15. Latent growth curve models for pubertal stage and DHEA were fit in a stepwise fashion and adjusted for age and sex. PI and COMP youth did not differ in pubertal stage tempo, nor in DHEA trajectories. Faster pubertal stage tempo ($\beta = .18, p = .008$) and higher DHEA levels ($\beta = .12, p = .002$) were associated with higher internalizing difficulties, adjusting for session 1 internalizing difficulties. Pubertal stage tempo and DHEA were not associated with externalizing difficulties. Findings address gaps in the literature regarding the effects of early deprivation on pubertal development and the impacts of pubertal tempo on psychological adjustment. Results also highlight the utility of assessing pubertal development at both physical and physiological levels.

NEURO19

REAL-TIME MOTHER-CHILD PHYSIOLOGICAL COORDINATION: THE MODERATING EFFECTS OF MUTUALLY RESPONSIVE ORIENTATION IN TWO PLAY CONTEXTS

Yannan Hu, University of Illinois at Urbana-Champaign; Nancy McElwain, University of Illinois Urbana-Champaign; Daniel Berry, Institute of Child Development, University of Minnesota

Mother-child mutual responsiveness and physiological coordination each play an important role in children's socioemotional development. However, we know less about associations between these behavioral and physiological processes. Guided by Feldman's (2012) model of bio-behavioral synchrony, we used 'real-time' indices of maternal and child parasympathetic dynamics (i.e., phasic Respiratory Sinus Arrhythmia; RSA) and behavior in 15-s epochs to test the extent to which physiological coordination within the dyad was contingent on the dyad's mutually responsive orientation (MRO; assessed via observer ratings). Based on data from 110 mothers and their preschoolers (49.1% boys, M age = 53.63 months, $SD = 7.74$) across two 5-min play tasks (i.e., challenging puzzle, pretend play), the results from a series of multi-level models indicated that RSA coordination was conditional on the dyad's level of MRO. For dyads showing high MRO during pretend play, there was evidence of a positive lagged relation between increases in maternal RSA_{t-1} and children's subsequent increases in RSA_t—consistent

with child vagal augmentation (see Figure 1a). However, in the context of low MRO, the sign was reversed across both tasks; maternal RSA t-1 increases were predictive of a subsequent decrease in child RSA t—consistent with child vagal withdrawal (see Figure 1). No effects of MRO emerged for contemporaneous or child-lead RSA coordination. Consistent with the model of bio-behavioral synchrony, results suggest that mother-child mutual responsiveness may facilitate positive mother-lead physiological coordination in the context of cooperative play, whereas lack of mutual responsiveness may disrupt physiological coordination in both challenging and cooperative contexts.

PS-1

MATERNAL INTRUSIVENESS AND INFANT HIPPOCAMPAL VOLUME

Kathryn Humphreys, Vanderbilt University; Ian Gotlib, Stanford University

Infancy is a developmental period characterized by significant brain plasticity. In particular, early environmental experiences shape brain development, with stress-sensitive brain regions (e.g., the hippocampus) being particularly influenced by received caregiving. One dimension of caregiving that exists even in contexts not typically thought to be atypical is intrusiveness, a set of behaviors that are adult led and indicate that the mother is imposing her agenda on the child (e.g., offering a barrage of physical or verbal interactions, not allowing the child to influence the pace or focus of play, engaging in excessive physical touch). Here, we examined the relation between observer-rated intrusive behavior during the repeated Still-Face Procedure in 111 mother infant dyads (infant age 6.77 months; 50% male) and hippocampal volume (available in 59 infants). Higher levels of intrusive behavior were associated with smaller right (beta=-.28, $t(56)=-2.18$, $p=.03$; R-square=.08), but not left, hippocampal volume (beta=-.18, $t(56)=-1.18$, $p=.19$; R-square=.03). Furthermore, the association between intrusiveness and right hippocampal volume held after accounting for infant stress exposure, indicating potential specificity of caregiving. These findings were not moderated by sex. Our results suggest that variation in typical caregiving, particularly intrusiveness, influence infant brain development, such that more adult-led caregiving behaviors lead to smaller hippocampal volume in infants.

S5-1

STRESS AND HIPPOCAMPAL VOLUME: INVESTIGATING THE POTENTIAL FOR SENSITIVE PERIODS

Kathryn Humphreys, Vanderbilt University

The human brain undergoes rapid change in the first years of life. Stress-sensitive regions may be particularly vulnerable to threatening experiences that occur during periods of development. We provide evidence of the potential for early life (birth through age 5 years) as a period when the hippocampus may be particularly sensitive to stress. In 178 early adolescents ($M=11.39$, $SD=1.04$ years; 43% male) interviewed regarding stress exposure and who also completed an anatomical MRI scan, we found a moderate and significant negative association between stress severity during early childhood and bilateral hippocampal volume. Stress severity in older childhood was not associated with differences in hippocampal volume. We followed this work

by investigating the stress experienced prenatally in relation to newborn hippocampal volume. Data collection is ongoing, and to date 42 infants ($M=4.79$, $SD=0.88$ weeks; 44% male) have completed anatomical scans. Women were interviewed in pregnancy to obtain assessments of preconception and prenatal stress exposure. Taken together, this work informs the potential for sensitive periods in key points in hippocampal development that align with increased brain plasticity.

COG9

THE EFFECT OF COMPREHENSIBILITY ON SALIENCY-BASED GAZE PREDICTION FOR CHILDREN AND ADULTS WATCHING VIDEO

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Visually salient features (e.g., movement, contours) predict eye gaze during free viewing of dynamic scenes, and this predictability has been found to increase with age (Frank et al., 2009; Mital et al., 2010; Rider et al., 2018). The purpose of the current study was to investigate whether the age-related increase in saliency-based gaze prediction (SBGP) is due, at least partially, to increasing comprehension of video (Kirkorian & Anderson, 2018). To examine the impact of comprehension on SBGP, we compared the eye movements of viewers watching a 4.5-min TV segment with a full story arc (10 four-year-olds, 10 adults) to those watching the same video with the constituent shots presented in a random sequence (10 four-year-olds, 10 adults). The results show that, overall, SBGP was higher in adults than in children, consistent with the literature. However, while children had similar SBGP for the two versions of video, adults had significantly higher SBGP when watching the random shot sequence compared to the normal shot sequence. This finding revealed in adults further suggests that age-related increases in SBGP is not due to age-related increases in video comprehension; it might be explained by other factors (e.g., inter-subject consistency in eye movements; Franchak et al., 2016). The finding that the comprehensibility manipulation did not influence children's SBGP further suggests that high-level narrative comprehension does not drive SBGP. The absence of a group-level condition effect for children may be explained by lower narrative comprehension or attentional synchrony in children compared to adults.

SOC17

DEVELOPMENTAL MILESTONES OF CAPTIVE CHIMPANZEES STUDIED: GROSS MOTOR ACHIEVEMENTS IS RELATED TO CHILDREN'S INDEPENDENCE

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Chimpanzee living in zoos provide us opportunities to observe their development in detail. At Tama Zoo, Tokyo, Japan, approximately 20 chimpanzees are kept in a social group. Among

variety of trees, ropes, artificial termite hills, there is a small confinement with tiny entrance that only kids can go in.

Since 2000, we have been observing infant chimpanzees once a month, 60-90 minutes. Video recording data is used to analyze the development of 9 chimpanzees born and raised by the mother. Press release, literatures by zookeepers and some YouTube recordings by non-professionals are also used as additional sources.

Comparison of 9 chimpanzees suggest that shortly after infant starts brachiation, swinging with both arms to move, they start using the kids' room. The average age for brachiation is 14 months and the use of kids' room is 16.4 months. At the beginning, mothers are very upset to have their children go into the confinement. Children enjoy playing with other without the interferences by the adults.

According to the zookeeper's reports, they stop using around 8-10 years old, while they are still capable of entering the room. So far, only one male chimpanzee got stuck in the room.

Going into the room, is a first step of the independence, and for most of them, by 10 years they lose interest in going in there. Observation of this type of milestone is only possible under captivity.

O2-4

WHITE MATTER ALTERATIONS IN YOUNG CHILDREN WITH PRENATAL ALCOHOL EXPOSURE

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Introduction: Prenatal alcohol exposure (PAE) can lead to cognitive, behavioural, and social-emotional challenges. Previous neuroimaging research identified widespread alterations to brain structure in youth with PAE, however little is known about brain structure in younger children. Extensive brain development takes place during early childhood; therefore, understanding the neurological profiles of young children with PAE is critical for early identification and effective intervention.

Methods: We studied 54 children (5.21 ± 1.11 years; 27 males, 27 females) with confirmed PAE, compared to 54 age- and sex-matched typically-developing controls with no PAE. Children underwent diffusion tensor imaging between 2-7 years of age. Mean fractional anisotropy (FA) and mean diffusivity (MD) were obtained for the whole brain and 10 major white matter tracts. A multivariate analysis of covariance was conducted to test for group differences (PAE vs. control).

Results: Our results reveal widespread white matter microstructural differences in young children with PAE. Higher FA and/or lower MD in the PAE group compared to controls were observed in the corpus callosum and the uncinate fasciculus (Figure 1).

Discussion: Our findings contrast those in older populations, which have consistently reported lower FA and higher MD in individuals with PAE. Together, this suggests that young children with PAE have a different white matter profile than older populations. It is possible that young children with PAE show premature development of white matter, as a compensatory mechanism in response to PAE teratogenesis and altered brain plasticity, that may plateau too early, leading to the lower FA/higher MD observed at older ages.

NEURO1

PREDICTING AGE IN 8-TO-24-MONTH-OLDS USING RESTING-STATE FUNCTIONAL CONNECTIVITY MRI

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Resting-state functional connectivity (rsFC) measured with functional MRI has been used to predict phenotypes such as chronological age and clinical diagnoses in typically and atypically developing adults and children. However, its utility for predicting phenotypes in infants and toddlers is less well-characterized. Here, we use fMRI data from the Baby Connectome Project sample to predict the age of 110 infants and toddlers age 8-24 months old using data collected during natural sleep. Successful prediction could provide initial evidence that rsFC in infancy is reliable and informative of chronological age, and thus potentially predictive of other measures of interest in this group such as language or motor development with age. Using 10-fold cross-validation, we trained and tested support vector regression (SVR) models to predict age-at-scan using whole-brain rsFC constructed from 333 cortical parcels. Models successfully predicted novel infants' age with ± 4.1 months error and predictive $R^2 = 0.32$. To characterize the anatomy of predictive networks, we grouped connections into 11 infant-specific or 12 adult-defined canonical resting-state functional networks (e.g., the default mode network). We found that connections between regions of the same networks—i.e., within-network connections—predicted age as well as or better than the full functional connectome (RMSE= ± 4 months error and $R^2 = 0.35$ for within-infant-network connections). Furthermore, control analyses confirmed that results are not driven by head motion. Looking ahead, the current findings can help characterize

changes in functional brain organization across development and inform work predicting measures of cognitive development in infants.

NEURO33

EFFECTS OF SENSITIVE PARENTING EARLY IN LIFE ON NEURAL FUNCTION IN MIDDLE CHILDHOOD AMONG A HIGH-RISK SAMPLE

Danielle Katz, University of Delaware; Mary Dozier, University of Delaware; Johanna Bick,

Sensitive parenting has been linked to positive behavioral and socioemotional outcomes. However, there is limited research on the link between early-life sensitive parenting and later neural function among high-risk children. The current prospective study aimed to explore the association between sensitive parenting experienced early in life and neural function in middle childhood among a high-risk sample. Children and parents completed a dyadic play assessment when children were two years old, and children completed a resting-state electroencephalogram (EEG) assessment at age ten ($n = 66$). Linear mixed effects modeling was used to examine the effects of sensitive parenting at age two on relative and absolute EEG power in the alpha band at age ten. The alpha band was split into low alpha (slow wave; 6-9 Hz) and high alpha (fast wave; 9-12), as recommended by prior research. Sensitive parenting was inversely associated with absolute low and high alpha power and was marginally associated with relative low and high alpha power. Findings suggest that greater sensitive parenting may promote optimal brain function, as indicated by lower power in the low alpha frequency band.

O1-3

ASSOCIATIONS BETWEEN ACOUSTIC FEATURES OF MATERNAL SPEECH AND INFANTS' EMOTION REGULATION FOLLOWING A SOCIAL STRESSOR

Jacek Kolacz, Indiana University; Elizabeth daSilva, Indiana University; Gregory Lewis, Indiana University; Bennett Bertenthal, Indiana University; Stephen Porges, Indiana University

Infant directed speech (“motherese”) is marked by exaggerated frequency modulation and strong high frequency power, features of prosody that may provide physiological cues for mobilization or calming through functional linkages between vocalization production, listening, and neurophysiological state regulation systems (Kolacz, Lewis, & Porges, 2018; Porges & Lewis, 2010). This study examined whether a prosody index derived from maternal speech frequency bands and modulation depth predicted changes in infants’ biobehavioral state during the Still Face Paradigm, a stressor in which the mother withdraws and reinstates social cues. 94 dyads participated in the study (infant age 4-8 months). Infants’ heart rate and respiratory sinus arrhythmia (measuring cardiac vagal tone) were derived from an electrocardiogram (ECG). Infants’ behavioral distress was measured by negative vocalizations, facial expressions, and gaze aversion. Mothers’ vocalizations were measured using spectral analysis and spectro-temporal modulation using a two-dimensional fast Fourier transformation of the audio spectrogram.

Analyses were conducted using regression and cross-lagged panel modeling. High maternal prosody post-stressor was associated with decreases in infants' heart rate ($\beta = -.26$, 95%CI: $[-.46, -.05]$) and behavioral distress ($\beta = -.20$, 95%CI: $[-.38, -.02]$), and increases in cardiac vagal tone in infants whose vagal tone was low during the stressor (1 SD below mean $\beta = .39$, 95%CI: $[.06, .73]$). High infant heart rate predicted increases in maternal prosody ($\beta = .18$, 95%CI: $[.03, .33]$). These results suggest that specific vocal acoustic features of speech associated with motherese are relevant for regulating infants' emotions and demonstrate mother-infant bi-directional dynamics.

SOC28

MATERNAL STRESS, CONVERSATIONAL TURN COUNT, AND INFANT LANGUAGE ABILITY AT 6 MONTHS

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Language development begins in infancy and relies on a variety of factors including caregiver responsiveness and consistency, as well as the quantity and quality of language heard in the home (Pace et al., 2017). Conversational turn count (CTC) is frequently used to measure the quality of the home language environment, with greater CTC indicating a more responsive, engaging context for language learning (Romeo et al., 2018). Parents who experience significant stress due to socioeconomic instability, career expectations, or parenting responsibilities are often less responsive to their child's verbal cues. This lack of responsiveness may impact the quality of the home language environment, thus limiting linguistic development in early childhood (McKelvey, Fitzgerald, Schiffman, & Eye, 2002; Rowe, 2008). In this study, we investigated associations among maternal stress, conversational turn count (CTC), and infant language ability at 6 months of age ($N = 29$ parent-infant dyads) in a socioeconomically diverse sample. Mothers reported on their stress by completing the Perceived Stress Scale (PSS) survey and reported on their infant's language abilities using the Language Environment Analysis (LENA) Snapshot questionnaire. In addition, LENA recording devices and software were used to record and analyze each participant's home language environment. Preliminary analyses showed that there were no significant relationships between maternal stress, CTC, and infant language ability. Data collection is ongoing, and a larger sample size may increase power to detect hypothesized differences.

O4-5

PROFILES OF EARLY FAMILY ENVIRONMENTS AND THE GROWTH OF EXECUTIVE FUNCTION: THE PROTECTIVE ROLE OF MATERNAL SENSITIVITY

Seulki Ku, New York University School of Medicine; Clancy Blair, NYU

The development of executive function (EF) is susceptible to early life-adversity. There is emerging evidence that different types of early-life adversity reflect distinct risk profiles, which in turn differentially affect EF. However, the risk-protective framework suggests that maternal

sensitivity may play a protective role in promoting EF for children at risk. We identified family risk profiles at 6 months using socioeconomic status (SES) and maternal mental health indicators with data from the Family Life Project (N = 1,292). We related profiles to EF at 36 months (intercept) and growth in EF between 36 and 60 months. We hypothesized that maternal sensitivity at 24 months would predict the intercept and growth of EF in high-risk profiles but not low-risk profiles. Our expectations were generally confirmed. Specifically, maternal sensitivity predicted faster growth in EF among children in the profile characterized by deep poverty and the absence of maternal mental health symptoms. Maternal sensitivity also predicted higher EF intercept and slower EF growth among children in the profile characterized by deep poverty and maternal mental health problems, and children in the near poor (low SES), mentally healthy profile. Maternal sensitivity also predicted higher EF intercept but had no effect on growth in EF in the near poor, mentally distressed profile. In contrast, maternal sensitivity did not predict the intercept or growth of EF in the high SES profile, Privileged SES/healthy. Our findings provide evidence of the protective role of maternal sensitivity for EF in children growing up in disadvantaged environments.

SOC2

PRENATAL EXPOSURE TO BISPHENOL A, S, AND F EFFECTS ON DAM-PUP INTERACTIONS, BRAIN GENE EXPRESSION, AND OFFSPRING COGNITION

Hannah Lapp, University of Texas at Austin; Frances Champagne, University of Texas at Austin

Gestational exposure to the endocrine disruptor bisphenol (BP) A alters offspring cognitive, emotional, and neural development and these effects may be partly mediated by changes in postnatal maternal care. However, little research has investigated whether BPA alternatives (i.e. BPS and BPF) have similar effects despite wide and growing use in BPA-free products. We tested whether daily exposure to vehicle (corn oil; n=4), BPA (50ug/kg; n=3) or a mixture of BPs (BPA, BPS, and BPF 150ug/kg; n=4) from gestational day 8 through parturition affected maternal behavior and offspring cognition. Deeplabcut was used to assess maternal behavior in daily 1 hour home cage recordings. Dams and a subset of pups were sacrificed at weaning and tissue from five brain regions (prelimbic cortex, nucleus accumbens, hypothalamus, hippocampus, and amygdala) were laser-dissected for RNA-seq analysis. Remaining offspring underwent open field and novel object testing during adolescence. BP exposure had a dose-response-like effect on maternal weight gain during pregnancy, where dams exposed to the BP mixture gained more weight during pregnancy compared to controls ($p < .05$). In preliminary analysis, BP-exposed dams had fewer total maternal behaviors on postnatal day 1 and 2 ($p < .05$). Group differences in offspring performance on the novel object task did not reach significance, although BPA-treated offspring had reduced mean time spent investigating the unfamiliar object, consistent with previous reports of curvilinear effects of BP dose on offspring outcomes. These findings contribute to data showing gestational BP exposure alters dam-pup interactions with potential implications for pup cognitive development.

SOC31

MATERNAL ANXIETY POSITIVELY PREDICTS DYNAMIC PARENT-CHILD INTERACTIONS IN THE EARLY POSTNATAL PERIOD

Maria Lemus, New York University; Sarah Vogel, New York University; Natalie Brito, New York University

Postpartum maternal mental health has been typically associated with worse parent-child interactions (PCI). The objective of this study is to investigate how different profiles of maternal mental health could impact the quality of PCIs early in the postnatal period, with a specific focus on bidirectional interactions.

Seventy mother-infant dyads participated in this study when the infants were 3-months-old. Surveys were given to obtain demographic information and current maternal mental health symptoms. Dyads were videotaped during a 5-minute free-play to measure the quality of PCI using the Coding Interactive Behavior (CIB) (Feldman, 1998). Composites for PCI, maternal anxiety, and maternal depression were created. PCI composite consisted of codes measuring the fluency and reciprocity of dynamic interactions; anxiety composite consisted of scores from the anxiety subcategory of the Edinburgh Postnatal Depression Scale (EPDS) and the State-Trait Anxiety Inventory (STAI); and depression composite included scores from the depression and anhedonia subcategories of the EPDS.

Results indicated that higher maternal anxiety was associated with better dyadic interactions ($b = 0.35$, $p = 0.39$). In a model with both maternal anxiety and depression, the effect of maternal anxiety on PCI persisted ($b = 0.350$, $p = 0.005$) and these findings remained unchanged when controlling for socioeconomic status and maternal perceived stress.

Overall, our findings highlight the differential impact of maternal postpartum mental health on PCI and suggest that higher maternal anxiety during the postnatal period could possibly play an adaptive role in fostering more dynamic and fluid parent-child interactions.

PS-2

PARENT-INFANT NEURAL DYNAMICS DURING SOCIAL LEARNING

Victoria Leong; Sam Wass, University of East London

Infants learn vicariously through observation, but how the infant brain accomplishes this feat remains unknown. Here, electroencephalography (EEG) signals were simultaneously measured from forty-seven mother-infant dyads (10.9 months) during a social learning task. First, infants observed mothers demonstrate positive or negative emotions toward novel toys. Next, we assessed how these maternally modelled emotions influenced infants' subsequent toy interaction (i.e. affective social referencing, a form of social learning).

Two performance indices were computed: Valence (a trait-level index of infants overall bias toward the positively or negatively modelled object; computed by participant), and Likelihood (given the infants bias, a state-level index of whether s/he utilized the relevant emotional information from the parent to influence behaviour on each trial). Each performance index was

then correlated to mothers and infants intra-brain and interpersonal neural connectivity indices (phase-locking value, PLV) to identify the respective neural correlates.

At the trial level, an increased likelihood of infant social learning and faster responding was predicted by higher mother-infant Alpha (6-9 Hz) interpersonal neural connectivity. Stronger dyadic neural connectivity was in turn associated with extended ostensive eye contact and higher-pitched maternal utterances. Conversely, intra-infant neural connectivity predicted infants overall learning valence (i.e. bias toward positive/negative emotional information) but not learning likelihood or response latency. Therefore, interpersonal neural connectivity is a mechanism that underpins infants readiness to learn from social partners during dynamic interactions.

NEURO9

ASSOCIATIONS BETWEEN PRENATAL MATERNAL CORTISOL, THE DEVELOPING HUMAN BRAIN IN UTERO, AND EARLY CHILDHOOD ADHD SYMPTOMOLOGY

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Prenatal cortisol exposure has been linked to both infant cognitive ability and early childhood brain development. Additionally, maternal prenatal stress relates to ADHD symptomology and altered amygdala connectivity during childhood. These findings suggest that cortisol during pregnancy may alter the fetal brain in ways that are consequential for future neurodevelopment. Our recent (unpublished) research, corroborates the first of these hypotheses, showing that maternal prenatal cortisol levels relate to variation in fetal brain resting state functional connectivity (RSFC). In particular, we observed cortisol-related variation in amygdala to medial prefrontal cortex (PFC) functional connectivity. The current study assessed associations between amygdala-PFC neural connectivity influenced by maternal prenatal cortisol and ADHD symptomology and aggressive behavior at age 3.

Of the 57 fetuses with RSFC data, 30 mothers completed the Child Behavioral Checklist (CBCL) during a 3-year old behavioral visit. We analyzed the relationship between the identified RSFC patterns and ADHD symptomology and aggressive behaviors subscales of the CBCL. Amygdala to ventromedial PFC RSFC was positively correlated with ADHD symptomology ($r = .39$, $p = .035$) and aggressive behavior ($r = .45$, $p = .022$). Amygdala-vmPFC RSFC was not related to internalizing behaviors ($r = .23$, $p = .241$).

These results suggest that prenatal maternal cortisol levels may influence amygdala RSFC with consequences for behavioral difficulties, ADHD and aggression, at age 3. This study highlights the profound influence that maternal stress biology may have over fetal brain maturation and the importance of these changes to future child health and development.

NEURO36

LINKS BETWEEN MATERNAL DISTRESS, BRAIN FUNCTION, AND WORKING MEMORY IN EARLY CHILDHOOD

Xinge Li, University of Houston; Rebecca Lipschutz, University of Houston; Samuel Hernandez, University of Houston; Brian Biekman, University of Houston; Shutian Shen, University of Houston; Susan Perlman, Washington University- St. Louis; Luca Pollonini, University of Houston; Johanna Bick,

Background: Maternal depression and anxiety have long been associated with adverse academic and behavior outcomes in young children and adolescents 1,2. A key gap in understanding is on the changes in neural mechanisms that contribute to risk in the preschool years, when cognitive and emotional regulation develop rapidly. Methods: To further understanding, we examined functional near infrared spectroscopy (fNIRS) based brain function in lateral prefrontal cortices (LPFC) associated with working memory (WM) in 28 children age 4-7 years old (Meanage = 5.21, SDage = 0.88, 11 males). Parents reported on their own depression and anxiety symptoms, and child executive functioning using the Behavioral Rating Inventory of Executive Function (BRIEF)³. Results: Our results showed that maternal distress, a principal component derived from the high covariation between depression and anxiety ($r = 0.61$, $p < .001$), was significantly and marginally negatively associated with HbO activation in the left and right LPFCs ($tHbO = -2.33$, $p = .027$; $tHbO = -2.00$, $p = .055$), while it was significantly positively associated with HbR activation in the left LPFC ($tHbO = 2.05$, $p = .050$). Furthermore, our results showed that both HbO and HbR activation in the right LPFC, but no task performance (reaction time and accuracy), were associated with general executive functioning as measured by the BRIEF ($tHbO = -2.48$, $p = .020$; $tHbR = 2.59$, $p = .016$). Conclusions: In summary, our results indicate that young children who exposed to greater maternal depression and anxiety exhibited lower brain activation in prefrontal regions. Variability in LPFC activation was associated with risk for poor executive functioning in early childhood, suggesting a potentially preclinical neuromarker to help assess child behavior problems.

SOC10

ADAPTING THE WELCH EMOTIONAL CONNECTION SCREEN (WECS) INTO CLEAR EXPLICIT TRANSLATABLE LANGUAGE (CETL)

Diana Litsas, Columbia University Medical Center; Ulla Vanhatalo, University of Helsinki; Cliff Goddard, Griffith University; Amie Hane, Williams College; Martha Welch, Columbia University Medical Center

Aim: The Welch Emotional Connection Screen (WECS) is a brief, validated mother-child relational health measure associated with physiology and long-term outcome. WECS has four items: attraction, vocal communication, facial communication, sensitivity/reciprocity. We used a linguistic convention, “semantic prime,” 65 words determined to be translatable into all languages. The hypothesis is: this format provides unambiguous prompts in English as well as descriptions easily translatable into every language. We assessed translatability with a linguistics approach to create the WECS-Clear Explicit Translatable Language (WECS-CETL).

Methods: Three groups of 15 participants, students recruited from Columbia University nursing, public health and social work schools, coded a training set of 10 videos (child on mother's lap) after randomization into (1) pre-recorded WECS evidence-based webinar, original WECS, (2) WECS-CETL, no training (3) original WECS, no training.

Results: Reading level for WECS-CETL was between grades 2.7-3.9, indicating reader accessibility. There was no significant difference in mean intraclass correlation coefficients across all domains between the WECS-CETL (0.82) and webinar (0.89) groups, even though there was a difference on "Attraction" when analyzed by separate items (one-way ANOVA). Nor was there a difference between WECS-CETL and no training (0.82). The WECS-CETL group completed the training/coding set faster than the webinar group.

Conclusion: WECS-CETL is an unambiguous, translatable mother-child Emotional Connection screen. Lack of significant differences amongst trainings indicates WECS-CETL is a valid instrument to produce reliability without formal training. Translatability across languages allows foreign language speakers of all cultures and countries to assess parent-child emotional connection to improve mother-child relational health.

NEURO23

FRONTAL EEG ASYMMETRY AND TRAJECTORY OF EXTERNALIZING PROBLEMS ACROSS EARLY CHILDHOOD.

Ran Liu, Virginia Tech; Martha Ann Bell, Virginia Tech

Frontal EEG asymmetry (FA) that underlies motivational tendencies has been demonstrated as an important biomarker correlated to children's behavioral problems. We focused on how FA at age 3 shapes the developmental trajectory of externalizing problems (EP) from age 3 to age 6. 189 children (94 boys, 95 girls) participated in the study. At age 3, baseline (Finding Nemo, sea turtles video) EEG was recorded for 2 minutes. FA was calculated by subtracting left ln EEG power (F3 & F7) from right ln EEG power (F4 & F8). EP were measured via the Child Behavior Checklist when children were at 3, 4, and 6 years. Unconditional latent growth curve model was examined via R to examine the trajectory of EP. The model provided good fit, χ^2 (3, N = 189) = .78, p = .38, RMSEA = .00, CFI = 1.00. EP linearly decreased from age 3 to age 6 (M = -1.71, p = 0.00) and the rate of change significantly varied among children (4.46, p = 0.00). Conditional latent growth curve model was estimated to examine the predictive effect of FA. The model provided good fit, χ^2 (3, N = 189) = 1.82, p = .61, RMSEA = .00, CFI = 1.00. Controlling for sex, FA at age 3 positively predicted the rate of change (b = 1.28, p = .005), indicating children who had greater left FA showed a slower decrease in EP. Boys had higher initial level of EP than girls (b = -2.30, p = .02).

S4-4

FAMILY'S HOUSEHOLD ASSETS AND HEAD CIRCUMFERENCE AT BIRTH PREDICT EEG ACTIVITY FOR INFANTS IN A RESOURCE-POOR PROVINCE IN SOUTH AFRICA

Diana Lopera-Perez, Boston University, Universidad del Norte; Jukka Leppänen, University of Tampere; Laurel Gabard-Durnam, Boston Children's Hospital; Amanda Tarullo, Boston University; Peter Rockers, Boston University; Denise Evans, University of Witwatersrand; Lezanie Coetzee, University of Witwatersrand

Children in developing countries often present cognitive delays (McCoy et al., 2016), suggesting insults to brain development. However, we know little about how specific environmental risk factors shape neurocognitive development in these resource-poor settings. This study examines how prenatal and environmental risk factors relate to slow- and fast-wave electroencephalography (EEG) activity for 7-month-old infants in a resource-poor province in South Africa. We collected 6 minutes of baseline EEG from 228 infants (115 girls, $M=7.6$ months old, all born full term). Caregivers reported on the family's financial situation by checking household assets they owned, such as gas stoves or radios. Using repeated measures ANOVAs, we examined the relation of infant's sex, head circumference at time of birth, height-for-age z-score at 7 months, and household assets, to absolute EEG power in the Theta (4-6 Hz) and Gamma (30-48 Hz) bands. For the Theta band, we found a main effect of sex ($F(1,219)=4.832$, $p=.029$) and household assets ($F(1,219)=5.134$, $p=.022$), such that males and infants with more household assets had higher Theta power. For the Gamma band we found no main effects but an interaction of region by head circumference ($F(3.267,715.398)=2.963$, $p=.041$), such that infants with smaller head circumferences at birth had less Gamma power in the frontal, central, and parietal regions. Thus, slow-wave EEG activity is sensitive to the family's financial situation, while fast-wave EEG activity is sensitive to intrauterine growth restriction. This study shows that even in widely resource-poor settings, brain development is sensitive to variations in environmental and prenatal risk factors.

SOC24

SOCIAL TRANSMISSION OF MATERNAL BEHAVIORS THROUGH OBSERVATION

Naomi Lopez Caraballo, NYU School of Medicine; Robert Froemke, NYU School of Medicine; Kelvin Quiñones-Laracuente, NYU Langone Health

Oxytocin is a peptide hormone important for maternal physiology and social behaviors (Jurek & Neumann *Physiol Rev* 2018). One behavior influenced by central oxytocin signaling in rodents is pup retrieval (Marlin et al. *Nature* 2015; Scott et al. *Nature* 2015). When mouse pups are out of the nest, they emit vocalizations that prompt dams to fetch the pup back to the nest. Virgin females do not initially retrieve pups, but can learn to retrieve after several days of co-housing with an experienced mother and pups in a manner that may involve visual observational learning of dams interacting with the nest and pups (Carcea et al. *BioRxiv* 2019).

To explore what aspects of maternal behavior are socially transmitted, we showed audio-visual movies to head-fixed awake virgins that initially did not retrieve. It allows us to manipulate the sensory stimuli presented to the virgins and further explore experience-related effects on behavior and neural activity. Our data ($n=11$) shows that virgins can learn to retrieve in the virtual setup, while virgins presented with dark background did not learn to retrieve ($n=14$). Alternatively, presenting virgins with videos of maternal mistakes (out of the nest retrievals;

n=4) or non-maternal behaviors (video of conspecific; n=8) lead to decreased performance. This setup is an essential step towards understanding which visual stimuli are informative for retrieval learning. It will allow us to manipulate sensorial experience, and employ electrophysiological and optogenetical techniques to further explore the role of oxytocin on social behavior.

NEURO32

HOUSEHOLD CHAOS AND ANTIBODY PRODUCTION FOLLOWING VACCINATION IN ADOLESCENTS

Sarah Lyle, University of Georgia; Kelsey Corallo, University of Georgia; Katherine Ehrlich, University of Georgia

Household chaos (e.g., excessive noise and unpredictability in the home) is associated with innate immune function in adolescence (e.g., Schreier et al., 2014). In the present study, we used a vaccine challenge paradigm to explore whether household chaos was similarly associated with adolescents' antibody production following vaccination, an assessment of adaptive immune function. Research suggests that boys and girls respond to household stress differently, and further, that sex differences in immune function may exist; therefore, we hypothesized that the link between chaos and antibody production would differ as a function of adolescent sex.

Across two consecutive flu seasons, adolescents (Table 1) and one parent completed two study visits. At Visit-1 parents reported on household chaos, and adolescents provided a blood sample and received the quadrivalent influenza vaccine. One month later, adolescents provided another blood sample. Antibody titers were quantified pre- and post-vaccination. We corrected for pre-vaccination antibodies (Beyer et al., 2004) and formed a standardized composite score of all four influenza strains in the vaccine (Segerstrom et al., 2012).

Regression analyses revealed that the Household Chaos X Sex interaction predicted antibody production for the 2017, but not 2018, cohort (Table 2). Among boys in the 2017 cohort, household chaos was negatively associated with antibody production, and among girls, this association was positive (Figure 1).

Findings suggest that household chaos may dampen adaptive immune function among adolescent boys, whereas it may be enhancing for girls. These findings highlight the importance of studying sex as a moderating variable in psychobiological research.

NEURO39

EXAMINING LINKS BETWEEN PARASYMPATHETIC REGULATION ACROSS THE STILL-FACE PARADIGM AND LATER CALLOUS-UNEMOTIONAL TRAITS.

Sarah Lynch, Boston University ; Cathi Propper, University of North Carolina at Chapel Hill; Nicholas Wagner, Boston University

Callous-unemotional (CU) traits, characterized by deficits in guilt, empathy, and prosociality, are associated with increased risk for stable and severe patterns of aggression. Although research suggests that CU traits are underpinned by deficits in social affiliation and reduced engagement during interactions with caregivers in infancy and early childhood, there has been little investigation of the underlying physiological regulatory processes. To address this gap, the current study examines relations between infants' respiratory sinus arrhythmia (RSA), an indicator of parasympathetic nervous system regulatory functioning, across the still-face paradigm at 6-months and CU traits and oppositional defiant behaviors at age 3-years. Moreover, we examine whether these links are moderated by attachment quality. Using data from a longitudinal study of 206 families, findings from saturated linear path models with covarying outcomes indicate that reduced negative affect during the still-face episode predicts both CU traits and oppositional behaviors, yet lower RSA during this episode is associated with only CU traits. A multiple group model indicates that the observed relations are specific to infants with an insecure attachment as determined using the strange situation paradigm. Findings suggest biobehavioral asynchrony (i.e., reduced behavioral reactivity but increased physiological reactivity) in response to a social stressor and insecure attachment may constitute risk for later CU traits.

O5-3

DOES LOW PHYSIOLOGICAL SELF-REGULATION AMPLIFY NERVOUS BEHAVIOR IN TEMPERAMENTALLY SHY CHILDREN?

Taigan MacGowan, McMaster University; Louis Schmidt, McMaster University

One consequence of temperamental shyness is self-conscious behavior during social situations (Cheek & Melchior, 1990). But are shy children with lower physiological capacity to modulate social arousal at higher risk for such behavior? We explored the moderating role of change in respiratory sinus arrhythmia (RSA) during a stranger approach episode on the relation between temperamental shyness and observed distress during a self-presentation task. One-hundred and one typically developing children (Mage = 66.7 months, SD = 2.56) and their mothers visited the laboratory. Mothers reported on demographic information and their children's temperamental shyness, using the Colorado Childhood Temperament Index (CCTI; Rowe & Plomin, 1997). Children took part in various activities with a female experimenter, including a self-presentation task that involved being asked to give an unplanned speech about their most recent birthday in front of a video camera. Behaviors during this task were later coded. Approximately 20 minutes later, children were approached by an unfamiliar experimenter without the primary experimenter present. RSA change in response to the Stranger Approach was calculated by comparing RSA during the episode to baseline RSA that was measured at the outset of the laboratory visit. We found that children who were rated as relatively high on shyness and had low RSA change in response to the stranger exhibited the highest observed nervous behavior in during the self-presentation task, $F(5, 96)=2.28$, $b = -0.05$, $t = -2.51$, $p = 0.01$. Our findings showcase that self-conscious discomfort may be governed by a combination of both temperamental shyness and physiological dysregulation in response to a social stressor.

NEURO40

PERINATAL HAIR CORTISOL CONCENTRATION LINKED TO PSYCHOLOGICAL WELL-BEING OVER TIME IN WOMEN WHO EXPERIENCE BIRTH COMPLICATIONS

Jennifer Madigan, Washington State University; Maria Gartstein, Washington State University; Sara Waters, Washington State University; Jennifer Mattera, Washington State University; Christopher Connolly, Washington State University, Pullman; Erica Crespi, Washington State University

Animal models show that physiological stress experienced by women during the perinatal period can affect maternal well-being, birth outcomes, and the post-natal development of offspring. However, the relationship between elevated cortisol and psychosocial stress during this period is not well understood. Hair cortisol concentration (HCC) has emerged as an indicator of chronic physiological stress in humans, but the relationship between psychosocial measures of stress and anxiety and HCC during the perinatal period or birth experiences is unknown. We investigated the relationships between HCC during the 3rd trimester ($n=56$) and 6 months after birth ($n=50$), measures of anxiety/perceived stress, and birth outcomes of women (82.76% Caucasian, 17.24% other race, 22% had birth complications). We found that mean HCC during the 3rd trimester was twice as high in women who had birth complications ($t=2.10$, $P=0.04$), and HCC was positively correlated with state and trait anxiety and perceived stress only in women who experienced birth complications ($r=.46-.54$, all complication $\times$ score interactions $P<0.05$). HCC at 6 months was positively correlated with anxiety/perceived stress scores measured after birth, and these relationships were stronger in women reporting birth complications and perinatal trauma (2 months: $r=.65-.89$, 6 months $r=.47-.57$). These findings suggest self-reported measures of anxiety and stress are positively associated with circulating cortisol levels throughout the perinatal period, especially in women experiencing birth complications, and the measurement of anxiety/perceived stress and HCC during pregnancy may help identify women at risk of birth complications.

NEURO37

THE RELATIONSHIP BETWEEN PARENTAL DEPRESSION AND ADOLESCENT PHYSICAL HEALTH

Dana Mansfield, DePaul University; Madeline Curzon, DePaul University; Emma Kruis, DePaul University; Jocelyn Carter, DePaul University

This poster will explore the effects of parental depression on decreased sleep, greater cortisol reactivity levels, and negative physical health outcomes in urban youth. Results will highlight important implications for prevention and intervention.

The study included 379 adolescents (ages 11 to 18) and their parents. Measures included cortisol levels, self-report sleep and physical health habits, parental depression, and parental monitoring assessed across two waves of data collection.

Correlations between parental and adolescent measures were performed at both waves. Parental BDI was significantly correlated with the average number of hours the child slept per night at Wave 1 ($r(245) = -.278, p=0.01$), parental monitoring of amount of time child goes out with friends on a school night at Wave 1 [father ($r(379) = -.236, p=0.05$; mother ($r(379) = -.276, p=0.01$)] and how often the father and mother limit the amount of time watching TV or playing games ($r(379) = -.229, p=0.05$ and $r(379) = -.178, p=0.05$). Parental monitoring in the form of mothers' checking on their child's homework completion and screen time was significantly correlated with child's overall quality of health ($r(349) = -0.22, p=0.01$ and $r(349) = -.234, p=0.01$). Adolescents' amount of restful sleep in the last month was also significantly correlated with quality of health and cortisol awakening response ($r(349) = .372, p=0.01, r(349) = -.303, p=0.01$).

Results showed a significant relationship between parental depression at Wave 1 and child's sleep at Wave 2. Additional analyses will examine the mediation of parental monitoring between parental depression and adolescents' sleep quantity.

NEURO11

THE ROLE OF BIRTH SIZE IN PUBERTAL HORMONE LEVELS AND CORTICAL BRAIN DEVELOPMENT IN US-BASED ADOLESCENTS

Hawa Mariko, University of California, Irvine; Megan Herting, University of Southern California; Jenna Riis, University of California, Irvine; Kristina Uban, University of California, Irvine

Neuroendocrine function is heavily implicated in the etiology of later life health, yet little is known about how birth size predicts neuroendocrine development. We examined associations between birth size (birthweight (BW) and size for gestational age (GA)) and neuroendocrine metrics in 9-10 year-old typically developing children participating in the Adolescent Brain and Cognitive Development (ABCD) Study ($N=8,981$). We used linear mixed effects models to relate birth size to baseline cortical structural MRI. Separate models related birth size to salivary estradiol (females only), testosterone, and dehydroepiandrosterone (DHEA) collected at baseline plus 2 additional years. Additional models using hormone-birth size interaction terms assessed whether birth metrics moderate baseline hormone-brain associations.

Despite small effect sizes, children born small for GA or low BW had significantly smaller gray matter volumes (GMV), cortical volume, and cortical area in both sexes as compared to children born appropriate-for-gestational-age (AGA) or at a normal BW. Large for GA and high BW children had significantly larger cortical volumes in males and females, and larger cortical area in males only as compared to children born AGA and at a normal BW. Across age 9-12, low BW males and females exhibited 12-27% higher average DHEA and testosterone as compared to normal BW children. Lastly, hormone-birth size interaction terms predicting brain metrics were widely nonsignificant. Our finding suggests that while restricted fetal growth relates to neurodevelopment and hormone production independently in early adolescence, birthweight and size for gestational age have limited effects on hormone-brain relationships at ages 9-10.

S1-2

TRAUMA EXPOSURE AND POSTTRAUMATIC STRESS SYMPTOMS LINKED TO ALTERATIONS IN FEAR-EXTINCTION NEURAL CIRCUITRY IN CHILDREN

Hilary Marusak, Wayne State University

Exposure to childhood trauma is extremely common (60%) and is a leading risk factor for anxiety and posttraumatic stress disorder. Trauma-related disorders are characterized by deficits in fear-extinction and dysfunction in fear-extinction neural circuitry. Given the strong and pervasive link between childhood trauma and the development of psychopathology, fear-extinction may be a key mechanism. The present study tests the impact of childhood trauma and posttraumatic stress symptoms (PTSS) on fear-extinction and underlying neural circuitry. Children (N = 44; 45% trauma-exposed; 6-11 yrs) completed a novel two-day virtual reality fear-extinction experiment. On day one, participants underwent fear conditioning and extinction. Twenty-four hours later, participants completed a test of extinction recall during fMRI. Conditioned fear was measured throughout the experiment using skin conductance, subjective ratings, and approach/avoidant behavior, and activation in fear-relevant brain regions was estimated during recall. There were no group differences in conditioned fear responses during fear conditioning or extinction learning. During extinction recall, however, trauma-exposed children failed to approach the previously extinguished cue ($p = 0.91$). This avoidant behavioral response was accompanied by higher activation to the previously extinguished cue in fear-relevant brain regions, including the dorsal anterior cingulate cortex ($p\text{FWE} = 0.001$) and anterior insula ($p\text{FWE} = 0.032$), in trauma-exposed relative to control children. Children with higher PTSS showed poorer differentiation between threat and safety cues during fear conditioning and extinction recall ($ps < 0.05$). Alterations in fear-extinction and underlying neural circuitry may be a core mechanism through which childhood trauma confers heightened vulnerability to psychopathology.

NEURO44

EARLY LIFE STRESS IS ASSOCIATED WITH ACCELERATED DENTAL DEVELOPMENT

Cassidy McDermott, University of Pennsylvania; Katherine Hilton, University of Pennsylvania; Muralidhar Mupparapu, University of Pennsylvania; Austin Boroshok, University of Pennsylvania; Anne Park, University of Pennsylvania; Ursula Tooley, University of Pennsylvania; Lourdes Delgado Reyes, University of Pennsylvania; Julia Leonard, University of Pennsylvania; Erin Bumann, University of Missouri - Kansas City; JoAnna Scott, University of Missouri - Kansas City; Allyson Mackey, University of Pennsylvania

Introduction

Recently, accelerated biological aging has gained increasing attention as a potential mechanism linking early adversity to poor mental and physical health outcomes. Here, we examine how a

novel domain of somatic maturation – namely, dental development – is related to early life stress, mental health, and neural maturation in childhood.

Methods

Eruption status of the primary molars was evaluated for 117 children (63 female) between ages 4 and 7. Molar eruption was rated on a scale of 1 (unerupted) to 4 (fully erupted and in occlusion) from T2-weighted MRIs. Volumetric segmentation of T1-weighted structural images was performed using FreeSurfer. Parents completed the Child Behavior Checklist (CBCL) and Adverse Childhood Experiences (ACEs) questionnaire about their child, and reported their family income. Relationships between molar eruption, childhood environment, and lateral ventricle volumes were examined using linear models, with age and sex as covariates.

Results

Lower family income and higher ACEs were each significantly associated with earlier molar eruption. Earlier molar eruption was associated with elevated levels of attention problems and aggressive behavior, as well as increased volume of the lateral ventricles. The relationship between income and first molar eruption was replicated in a population-representative sample from the National Health and Nutrition Examination Survey (NHANES).

Conclusion

These findings suggest that the impact of stress on the pace of biological development is evident in early childhood and detectable in the timing of dental development. Future research should determine whether psychosocial interventions can alter patterns of accelerated biological development and thereby reduce the associated health risks.

SOC21

LOW INCOME NON RESIDENT FATHERS: SUPPORT, COPARENTING AND FATHER CHILD CONTACT

Katrina McLaughlin , Queen's University ; Theresa McShane , Queen's University ; Geraldine Macdonald, University of Bristol ; Maria Lohan, Queen's University; Martin Dempster , Queen's University

Recent decades have witnessed a surge of interest in fathering; with the role of fathers in child development now well documented. Whilst interest in the diversity of fathering has also grown, gaps in the literature remain. Higgs et al., (2018) highlight the need for more participatory and community based research to identify the needs of low income fathers and the strategies needed to support them. Schoppe-Sullivan & Fagan (2020) argue that the undermining/conflictual aspects of coparenting relationships warrants more attention. The current paper addresses these limitations and is based on 22 interviews in total; 18 with low income, non resident fathers aged between 18 and 55yrs old and 4 practitioners who work in family support organisations. The majority of the fathers reported protracted court battles and/or hostile coparenting relationships. The data was analysed using thematic analysis (Braun & Clarke 2006). Findings highlight the lack of institutional and societal support for non resident fathers and the consequences of this for their father identity. The paper explores the perceived maternal ‘gate closing’ and the impact of

this on father child contact and fathers' mental health and well being. The results illuminate the needs of this particularly vulnerable group and identifies strategies needed to support them. Findings will be discussed using Bronfenbrenner's bio-ecological model and the PPCT model which will help to examine the father experience in it's environmental context, and explore internal and external influences on non resident fathers, father child contact and the father child relationship.

COG4

S-EQUOL: A NEUROPROTECTIVE THERAPEUTIC FOR CHRONIC NEUROCOGNITIVE IMPAIRMENTS IN PEDIATRIC HIV

Kristen McLaurin, University of South Carolina; Rosemarie M. Booze, University of South Carolina; Charles Mactutus, University of South Carolina; Hailong Li, University of South Carolina; Anna Cook, University of South Carolina

Chronic neurocognitive impairments, commonly associated with pediatric human immunodeficiency virus type 1 (PHIV), are a detrimental consequence of early exposure to HIV-1 viral proteins. Strong evidence supports S-Equol (SE) as an efficacious adjunctive neuroprotective and/or neurorestorative therapeutic for neurocognitive impairments in adult ovariectomized female HIV-1 transgenic (Tg) rats. There remains, however, a critical need to assess the therapeutic efficacy of SE when treatment occurs at an earlier age (i.e., resembling a therapeutic intervention for children with PHIV) and across the factor of biological sex. Utilization of a series of signal detection operant tasks revealed prominent, sex-dependent neurocognitive deficits in the HIV-1 Tg rat, characterized by alterations in stimulus-reinforcement learning, the response profile, and temporal processing. Early (i.e., Postnatal Day 28) initiation of SE treatment precluded the development of chronic neurocognitive impairments in all (i.e., 100%) HIV-1 Tg animals; albeit not for all neurocognitive domains. Most notably, the therapeutic effects of SE generalized across the factor of biological sex, despite the presence of endogenous hormones. Results support, therefore, the efficacy of SE as a neuroprotective therapeutic for chronic neurocognitive impairments in the cART era; an adjunctive therapeutic that demonstrates high efficacy in both males and females. Optimizing treatment conditions by evaluating multiple factors (i.e., age, neurocognitive domains, and biological sex) associated with chronic neurocognitive impairments and HIV-1 associated neurocognitive disorders affords a key opportunity to improve the therapeutic efficacy of SE. Funded by DA013137, HD043680 MH106392, NS100624.

EVOLVING ANXIETY AND DEPRESSIVE SYMPTOMS IN CHILDREN BORN VERY PRETERM: NEONATAL STRESS, BRAIN DEVELOPMENT AND PARENTING IN TODDLERHOOD

Mia Mclean, The University of British Columbia & B.C. Children's Hospital Research Institute; Anne Synnes, British Columbia Children's Hospital Research Institute; Steven Miller, Hospital of Sick Kids; Ruth Grunau, University of British Columbia

Internalizing problems (anxiety/depressive symptoms) are highly prevalent in children born very preterm. While childhood internalizing behaviors develop and are maintained within a multilevel biopsychosocial ecological system, longitudinal studies considering the interplay between early stress, brain development and parenting are scant. We previously established that, beyond clinical factors related to prematurity, neonatal pain-related stress of invasive procedures in the neonatal intensive care unit (~10 daily), is associated with altered brain development and child behavior. Now we examined how vulnerability to internalizing behaviors develops across early childhood, considering the role of early pain/stress and neonatal brain development in regions affected by stress (e.g. hippocampus), in children born very preterm. Importantly, we investigated whether specific parenting interactions may ameliorate effects of early pain/stress and brain dysfunction, thereby reducing risk of internalizing problems in this vulnerable population. In a prospective longitudinal cohort, infants born 24-32 weeks gestation (N= 132) were followed from birth, at term and ages 1.5, 3, 4.5 years. Utilizing serial neuroimaging (MRI, DTI) at early-life and term equivalent age, we found that hippocampal volume at term is related to internalizing behaviors in early childhood at lower, but not higher levels of parent sensitivity, suggesting a buffering role of supportive parenting. Thus our work identifies specific parenting behaviors that may mitigate development of child internalizing behaviors, with potential implications for clinic and community.

NEURO48

SPATIAL SELECTIVE ATTENTION AND ASYNCHRONY OF COGNITIVE SYSTEMS IN ADULT DYSLEXIC READERS: AN ERP AND BEHAVIORAL STUDY

Shay Menashe, University of Haifa

The aim of this study was to gain additional knowledge about the asynchrony phenomenon in developmental dyslexia, especially when spatial selective attention is manipulated. Adults with developmental dyslexia and non-impaired readers underwent two experimental tasks, one including alphabetic stimuli (pre-lexical consonant-vowel syllables) and the other containing non-alphabetic stimuli (pictures and sounds of animals). Participants were instructed to attend to the right or left hemifields and to respond to all stimuli on that hemifield. Behavioral parameters and event-related potentials were recorded. The main finding was that the dyslexic readers demonstrated asynchrony between the auditory and visual modalities when alphabetic stimuli were presented on the right hemifield. These results suggest that intact reading is linked to a synchronized auditory and visual speed of processing even when spatial selective attention is manipulated. The findings of the current study are discussed in terms of asynchrony between modalities as a neurocognitive marker in developmental dyslexia.

SOC39

OXYTOCIN AND EMBRYONIC DIAPAUSE

Jessica Minder, NYU School of Medicine; Robert Froemke, NYU School of Medicine; Moses Chao, NYU School of Medicine

We have examined oxytocin receptor expression in the mouse embryo, detecting the receptor at the blastocyst stage. This is the developmental stage where implantation into the uterine endothelium begins, an event critical for successful pregnancy. Interestingly, rodents- like most if not all mammals- undergo a phenomenon called diapause, in which the timeframe for implantation is delayed during a maternal state unfavorable for pregnancy, such as while nursing a previous litter (Fenelon et al., 2014). Embryonic diapause is thought to be regulated by the hypothalamic neuroendocrine axis, but the underlying mechanism is unknown (Renfree and Shaw, 2000).

Therefore, we hypothesize that oxytocin, released in response to the sensory stimulus of a suckling pup, might act to initiate diapause in mice. In support of this, we have recapitulated a developmental delay in vitro using a cell culture model of blastocyst implantation (Bedzhov et al., 2014), in which implantation is delayed by 12 hours in the presence of oxytocin (p-value:0.0087). Using patch-clamp electrophysiology, we have elucidated that oxytocin may be functioning to signal entry into diapause by reducing the overall conductance of the blastocyst. Additionally, we are using chemo- and opto- genetics to activate oxytocin neurons in the hypothalamus of mothers in the absence of nursing to ask if oxytocin release is sufficient for diapause induction.

Furthering our understanding of conditions favorable for pregnancy progression, and the mechanisms by which embryos integrate cues from their surroundings to dictate developmental timelines has major implications for hormone signaling, developmental biology, and reproductive medicine.

COG20

EFFECTS OF ACUTE EARLY LIFE STRESS ON ADOLESCENT AND ADULT FEAR ACQUISITION AND EXPRESSION, SUCROSE PREFERENCE, AND FORCED SWIM BEHAVIOR

Brianna Minshall, Miami University; Madeline Booms, Miami University; Catherine Wasylyshyn, Miami University; Collin Riddle, Miami University; R Lab, Miami University; Sarah Reitz, Miami University; Elle Henley, Miami University; Ian Stuart, Miami University; Madelynne Hall, Miami University; Jennifer Quinn, Miami University

Post-traumatic stress disorder (PTSD) represents a spectrum of debilitating anxiety symptoms resulting from exposure to trauma. Exposure to early-life stress (ELS) yields considerable vulnerability to the development of PTSD and depression later in life. Early programming of brain circuits regulating emotion mediates increased vulnerability to stress during early periods of life resulting in stress-enhanced fear learning (SEFL) in adulthood. Rodents are a useful model organism for investigations of fear- and anxiety-related behaviors in humans, as previously stressed animals exhibit many physiological and behavioral stress responses that

parallel those observed in humans. The present experiments addressed whether male and female rats exposed to acute ELS (aELS) differ in the acquisition and/or expression of fear during adolescence/adulthood. In addition, we assessed whether aELS alters sucrose preference and/or forced swim behavior in adolescence/adulthood. Rats received 0 or 15 footshocks on postnatal day (PND)17. In Experiment 1, rats were fear conditioned in a novel context on PND41 or PND91 using a single footshock. Adult, but not adolescent, male and female rats showed comparable SEFL. In Experiment 2, sucrose preference and forced swim behavior were assessed in adolescent/adult rats previously exposed to aELS or not. Sucrose preference testing lasted 14 days and was followed by a 2-day forced swim test. Stressed females show increased sucrose consumption in comparison to males only in adulthood. Forced swim data are currently being assessed. These data demonstrate persistent effects of aELS on fear memory and sucrose preference in adulthood, while expression of these behaviors is diminished during adolescence.

COG8

ROLES OF PARVALBUMIN INTERNEURONS AND PERINEURAL NETS IN LONG-TERM MEMORY FORMATION IN INFANT RATS

Janelle Miranda, New York University; Emmanuel Cruz-Torres, New York University; Cristina Alberini, New York University

Episodic memories formed during infancy are rapidly forgotten, a phenomenon associated to infantile amnesia, the inability of adults to recall infantile memories. We previously showed that contextual experiences in infant rats are stored as latent memories and can be reinstated by reminders given later in life. We also found that infantile memory formation requires the dorsal hippocampus (dHPC) and biological mechanisms typically used in developmental critical periods. The development of parvalbumin interneurons (PVIs) and surrounding perineural nets (PNNs) are important mechanisms of critical periods for sensory functions. Furthermore, episodic memory formation in adult mice involve PVIs and PNNs in the dHPC. Whether PVIs and PNNs in the dHPC play a role in the critical period of memory development remains unknown. We used Inhibitory Avoidance (IA) to model contextual episodic learning in infant rats at postnatal day 17 (PN17), and biochemical/immunohistochemical and pharmacological approaches to determine the regulation and critical role of PVIs and PNNs in the dHPC during infantile memory formation. Western blot analyses showed that training significantly increases the levels of parvalbumin and the PNN protein brevican, 48h after training (p Hence, infantile learning regulates the expression of PV and PNN proteins, and GABAAR and PNNs play critical roles during infantile learning in the dHPC.

NEURO31

THE NEUROBEHAVIORAL CASCADE OF SOCIAL-EMOTIONAL DIFFICULTIES: MATERNAL CHILDHOOD MALTREATMENT AND PERCEIVED STRESS DURING PREGNANCY, NEONATAL HIPPOCAMPAL VOLUME, AND INFANT SOCIAL-EMOTIONAL DEVELOPMENT

Nora Moog, Charité - Universitätsmedizin Berlin; Saara Nölvi, University of Turku; Theresa Kleih, Charité - Universitätsmedizin Berlin; Martin Styner, University of North Carolina; John

Gilmore, University of North Carolina; Alice Graham, Oregon Health and Science University; Damien Fair, Oregon Health and Science University; Jerod Rasmussen, UC Irvine; Christine Heim, Charité - Universitätsmedizin Berlin; Sonja Entringer, University of California, Irvine; Pathik Wadhwa, University of California Irvine; Claudia Buss, University of California Irvine

Maternal psychosocial distress during pregnancy can have persistent effects on child social-emotional development, which are likely mediated by alterations in the developing fetal brain. Animal studies have implicated the hippocampus as one of the main structures affected by prenatal stress, however, evidence in humans is still rare. We sought to investigate whether maternal perceived stress across pregnancy is related to hippocampal volume shortly after birth and the implications of these alterations for infant social-emotional development. In addition, we sought to explore concurrent and pre-conceptional determinants of psychosocial distress during pregnancy.

In a sample of 86 healthy mother-child dyads, maternal perceived stress was assessed in early, mid and late pregnancy. Structural magnetic resonance imaging of the newborn brain was employed to characterize hippocampal volume. At 6 months and one year of age, social-emotional developmental milestones were assessed with the Bayley-III.

After adjustment for important covariates, we observed a negative effect of maternal perceived stress during pregnancy on newborn left hippocampal volume ($B = -0.293$, $p = .008$). In addition, infant left hippocampal volume was positively associated with more advanced social-emotional development across the first year ($B = .010$, $p = .035$). Maternal childhood maltreatment and negative life events during pregnancy independently predicted higher maternal perceived stress during pregnancy.

These findings advance our understanding of the neurodevelopmental cascade of social-emotional difficulties and they highlight the importance of monitoring the psychosocial state in pregnant women exposed to adverse childhood experiences to break the cycle of transmission from one vulnerable population to the next.

SOC6

ACUTE CARETAKER STRESS INFLUENCES INFANT REGULATION OF THE AUTONOMIC NERVOUS SYSTEM

Isabelle Mueller, University of Massachusetts Boston; Nancy Snidman, University of Massachusetts Boston; Jennifer DiCorcia, University of Massachusetts Boston; Ed Tronick, University of Massachusetts Boston

Early exposure to maternal stress influences health and development across the lifespan. Research in humans and animals implies that the autonomic nervous system (ANS) is especially sensitive to the effects of early caregiving environment and crucial in the prediction of mental health. Understanding how exposure to maternal stress affects the developing ANS could inform approaches for prevention, yet most experimental research to date uses the Still-Face Paradigm, stressing the infant, not the mother. Here we use an experimental Caretaker Acute Stress

Paradigm (CASP) to study the effects of maternal stress on infant self-regulation. 104 4-months-old infants and their mothers were randomly assigned to either the caretaker-stress (listening to aberrant infant cries and viewing images of infants in distress) or caretaker-control condition (listening to infant positive vocalizations and viewing images of infants smiling) of the CASP. Changes in behavior, heart rate (HR), and respiratory sinus arrhythmia (RSA) were recorded. Infant average HR and RSA before and after the introduction of a caretaker stressor or control condition were compared.

Results show a significant main effect of group by time ($F(1, 102) = 9.81, p = .002$), with a significant increase in infant heart rate when mothers were in the stress condition. Infants in the control condition showed a marginally significant faster RSA recovery ($F(1, 75) = 3.539, p = .064$). Results indicate that exposure to acute maternal stress may affect infant regulation of the autonomic nervous system. The CASP could be a useful tool to investigate these effects further.

SOC7

EARLY SOCIAL GAME ROUTINES: IMPACT ON CARDIAC REACTIVITY AND SALIVARY CORTISOL

Isabelle Mueller, University of Massachusetts Boston; Ed Tronick, University of Massachusetts Boston

Throughout the first year of life the mother-infant dyad begins to co-construct multimodal social game routines (e.g. Peek-A-Boo). Recent literature suggests that 3-months-olds actively participate in these game routines, mothers use them to scaffold infant, and engaging in them increases infant oxytocin. Yet research on maternal scaffolding has mostly focused on sensitivity, synchrony, and facial expressions. Here we investigate whether mothers use social game routines in the context of a stressor and how they influence common biomarkers of stress.

Forty 4-months-old infants and their mothers participated in a classic Still-Face Paradigm (SF). The play episodes were coded for two types of common social game routines, vocal-kinetic play (e.g. Itsy-Bitsy-Spider) and physical play (e.g. tickling). Changes in play, heart rate, and cortisol were evaluated.

Vocal-kinetic play after the SF stressor showed a negative association with infant heart rate ($r(39) = -.396, p = .026$), indicating that these routines may assist in scaffolding and decrease of physiological arousal. Physical play was positively linked to post-stress cortisol ($r(36) = .377, p = .032$). An additional stepwise regression showed that relative duration of physical play predicted the increase of post SF cortisol better than infant negative affect, crying, or infant drop out episode ($\text{Beta} = .378, t(35) = 2.38, p = .032$). Overall these results suggest game routines may play a part in the dyadic coregulation. The observed results may also link cortisol to physiological arousal rather than stress.

STRESS3

THE COVID-19 OUTBREAK INCREASES MATERNAL STRESS DURING PREGNANCY, BUT NOT THE INCIDENCE OF POSTPARTUM DEPRESSION

Lotte Muskens, Tilburg University; Marion van den Heuvel, Tilburg University; Myrthe Boekhorst, Tilburg University; Lianne Hulsbosch, Tilburg University; Victor Pop, Tilburg University; Katrijn Van Deun, Tilburg University; Veerle Bergink, Icahn School of Medicine at Mount Sinai

Background: The COVID-19 pandemic has substantial impact on society and may especially affect the mental health of vulnerable groups, such as perinatal women. COVID-19-related changes and uncertainties can increase worries in pregnant women. This study compared perinatal symptoms of depression and stress during and before the pandemic in a large prospective cohort study (the Brabant Study).

Methods: Participating women (N = 670) completed online questionnaires during three trimesters of pregnancy (12, 20, 28 weeks) and postpartum (8-10 weeks). Up until 1 March 2020 (before the pandemic), 402 women completed questionnaires during pregnancy, of whom 250 also completed postpartum assessment. During the pandemic (March-May 2020), 268 women filled out at least one questionnaire during pregnancy and 59 postpartum. We assessed perinatal depressive symptoms using the Edinburgh (Postnatal) Depression Scale (E(P)DS), and the negative affect subscale of the Tilburg Pregnancy Distress Scale (TPDS-NA) was used to assess pregnancy-specific stress.

Findings: Results of linear mixed models showed that there was a main effect for the pandemic on TPDS-NA scores ($\beta = -0.69$, $SE=0.32$, $t = -2.13$, $p = 0.034$), indicating higher levels of pregnancy-specific stress symptoms in pregnant women during the pandemic. No significant main effect for the pandemic on depressive symptoms (E(P)DS) was found ($\beta = -0.03$, $SE=0.32$, $t = -0.09$, $p = 0.925$). We also did not find an increase in incidence of postnatal depression during the COVID-19 pandemic.

Discussion: It is important for clinicians to be aware of increased stress levels in pregnant women during the pandemic and to offer adequate mental health care.

NEURO34

FAMILY NURTURE INTERVENTION IN THE NICU LOWERS HEART RATE IN PRETERM INFANTS: POSSIBLE EVIDENCE FOR AUTONOMIC CONDITIONING

Michael Myers, Columbia University Irving Medical Center; Martha Welch, Columbia University Medical Center; Robert Ludwig, Columbia University Medical Center; Julia Chafkin, Columbia University; Alexandra Schulz, Columbia University; Joseph Barone, Columbia University Medical Center; Joseph Isler, Columbia University; Ruth Grunau, University of British Columbia; Cecil Chau, BC Children's Hospital Research Institute; Amie Hane, Williams College; Raymond Stark, Columbia University Medical Center

Preterm birth is associated with autonomic dysregulation that extends into adulthood. In this study we tested the hypothesis that Family Nurture Intervention calming cycles (CC) between mother and prematurely-born infants would lead to lower infant heart rates (HR) over the course of the NICU stay. We enrolled 32 mother/infants, ~30 weeks GA. Mother/infant pairs engaged in

Nurture Specialist-facilitated calming sessions ~1 hr, 4 times/wk. A concurrent control group was matched for length of stay, age-at-birth, twin status, and sex. For both groups, HR data were obtained from a continuous, 24/7, hospital monitoring system. Mean HR was computed for one hour each day (4:30 to 5:30am) during the NICU stay. Data were analyzed using generalized estimating equation modeling. In addition, we compared a subset of 9 CC infants that had at least 5 weeks of intervention with 13 controls who remained in the NICU for at least 5 weeks using repeated measures ANOVA. This analysis was based on mean HRs over 24 hours for each day then averaged for each week. Results showed a significant time x group interaction for both analytic methods. After about two weeks of intervention, average HR of treatment infants decreased more rapidly than controls infants as they approached discharge. These findings are consistent with calming cycle theory, which predicts that repeated mother-infant calming cycle sessions will counter-condition dysregulated autonomic activity to an autonomic state with lower resting HR. We suggest that FNI mother-infant calming sessions are mitigating infant physiological stress, promoting energy conservation, growth and development.

NEURO8

BRAIN VOLUME AND SUSCEPTIBILITY DIFFERENCES IN CHILDREN WITH PRENATAL ALCOHOL EXPOSURE

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Background: Prenatal alcohol exposure (PAE) causes lifelong structural aberrations in the brain, specifically, the volume of subcortical structures is highly affected. Children with PAE have lower blood iron, and lower blood iron during gestation is associated with cognitive deficits and altered affective functioning in children without PAE. In animal models of PAE with low blood iron, impairments in learning are observed, as well as reduced cellularity in the hippocampus. This is the first study to use quantitative susceptibility mapping (QSM) to examine iron in the brain, measured by susceptibility, in children and adolescents with PAE.

Method: T1-weighted and QSM images were acquired from 64 participants aged 7-15 years old. Twenty participants had PAE and 44 participants were typically developing. Susceptibility values were extracted using the Harvard-Oxford atlas and a basal ganglia atlas, and volumes were extracted using Freesurfer and a basal ganglia atlas, for nine subcortical structures. ANCOVAs were conducted to compare subcortical structures on susceptibility and volume measures.

Results: The PAE group had higher susceptibility, indicating greater iron, in the thalamus, and lower susceptibility in the hippocampus compared to controls. The PAE group had smaller volumes for the bilateral pallidum and caudate, and left putamen.

Conclusion: These findings show altered brain susceptibility in children and adolescents with PAE for the first time, suggesting differences in brain iron levels. Altered brain susceptibility may underlie some of the common cognitive and behavioural difficulties that individuals with PAE experience, such as executive functioning deficits and concurrent mental health disorders.

O4-2

SYSTEMIC INFLAMMATION CONTRIBUTES TO THE ASSOCIATION BETWEEN CHILDHOOD SOCIOECONOMIC DISADVANTAGE AND MIDLIFE CARDIOMETABOLIC RISK

Brianna Natale, University of Pittsburgh; Stephen Manuck, University of Pittsburgh; Matthew Muldoon, University of Pittsburgh; Daniel Shaw, University of Pittsburgh; Karen Matthews, University of Pittsburgh; Anna Marsland, University of Pittsburgh

Childhood socioeconomic disadvantage is associated with greater risk for chronic inflammation and cardiometabolic disease at midlife. However, it is presently unknown whether inflammation mediates the relationship between childhood socioeconomic status (SES) and adulthood cardiometabolic risk. Here, we investigated associations between retrospectively reported childhood SES, circulating levels of inflammatory mediators, and a latent construct of cardiometabolic risk in midlife adults.

Participants were 1,359 healthy adults aged 30 to 54 (Adult Health and Behavior {AHAB} cohorts I & II; 52% female, 17% Black) who retrospectively reported childhood SES via the Hollingshead Index (parental education, occupational grade). Measurements of circulating interleukin-6 (IL-6), C-reactive protein (CRP), and cardiovascular risk factors were also obtained. Analyses were conducted using structural equation modeling, in which cardiometabolic risk was modeled as a second-order latent variable with adiposity, dyslipidemia, insulin resistance, and blood pressure as first-order components.

As expected, lower childhood SES was associated with greater risk for cardiometabolic disease ($\beta = -0.07$, CI[-0.040,-0.003], $p = 0.020$) and higher circulating levels of CRP ($\beta = -0.11$, CI[-0.012,-0.004], p Supported in part by NIH grant PO1 HL040962.

COG6

DEVELOPMENTAL PRIMATE COGNITION: A STATE OF THE FIELD REVIEW

Eliza Nelson, Florida International University; Jacqueline Alvarez, Florida International University; Brenda Jimenez, Florida International University; Kasey Padron, Florida International University

Primate cognition is a research topic of interest to developmental psychobiology (DPB). A defining feature of the DPB approach is its emphasis on developmental trajectories. However, the vast majority of primate cognition studies have exclusively tested adults. The purpose of this review was to provide a state of the field on developmental primate cognition by synthesizing recent literature that sampled infants, juveniles, or mixed ages. A secondary analysis was conducted on the dataset generated by the collaborative open science group ManyPrimates (2019), which consists of 574 studies on primate cognition published between 2014 and 2019. Of these, 36 reported on only infants, 16 reported on only juveniles, and 198 included more than one age class and were classified as mixed. Data extracted from all 250 studies included article

keywords and experimental tasks, which were used to summarize research trends. Additional data extracted from mixed age studies included whether age was examined statistically and if a longitudinal design was used. Mixed age studies identified as meeting these additional filters were also described. Preliminary results suggest that very few recent studies in primate cognition have been longitudinal, and nearly three-quarters of the studies that span different age classes did not analyze age effects. Although all major taxonomic categories were represented in this state of the field review, recent work in developmental primate cognition has been driven by a small number of species. The value of considering the developmental context for understanding the processes underlying primate cognition will be discussed.

COG7

PREDICTING GROWTH TRAJECTORIES OF ROLE-DIFFERENTIATED BIMANUAL MANIPULATION (RDBM) FROM EARLY MOTOR SKILLS IN INFANTS

Eliza Nelson, Florida International University; Stefany Coxe, Florida International University; Megan Taylor, Florida International University

The ability to coordinate the hands together to act on objects where each hand does something different is known as role-differentiated bimanual manipulation (RDBM). RDBM is a fundamental motor skill because it is used in many activities of daily living. Prior work has charted patterns of hand use for RDBM, but little is known about what predicts individual growth in RDBM. To test the hypothesis that early manual and postural skills are related to RDBM growth trajectories, 90 infants were examined at seven timepoints in a longitudinal design. The first lab visit measured infants' baseline object management skill and sitting ability, and six subsequent lab visits measured RDBM. Infants with advanced object and sitting skills at 6 months were predicted to show a higher increase in RDBM from 9 to 14 months. Latent growth modeling (LGM) revealed that infants' early skill managing objects, controlling for infants' early sitting skill, predicted RDBM growth trajectories ($p = .049$). Higher object management scores were related to steeper RDBM slopes. Conversely, early sitting skill when controlling for early object management skill did not predict change in RDBM over time ($p = .202$). These results suggest that managing objects improves collaborative hand use by providing infants with the opportunity to practice skills that will be needed later to perform successful RDBM. By comparison, sitting frees the hands in an unspecified manner for manipulation. [Supported by NIH R03HD097419-01 and NIH/NICHD T32-HD-007376 to ELN; and NSF DLS 0718045 to G.F. Michel]

SOC20

THE EFFECTS OF DEVELOPMENTAL LEAD EXPOSURE ON LATER LIFE SOCIAL BEHAVIORS: IMPLICATIONS FOR SOCIAL & EMOTIONAL PSYCHIATRIC SUSCEPTIBILITIES

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Lead (Pb²⁺) is neurotoxicant that causes damage the developing brain resulting in life-long impacts to cognition and behavior. However, less is known regarding Pb²⁺-influences on social-emotional behavior that are equally important domains of cognitive function, which promote adaptive, procreative, and survivalist outcomes. Here we compared male and female Control Long Evans Hooded rats to characterize the sex-dependent differences in in the Neuwirth-El Idrissi™ Light/Dark Social Interaction Test (LD/SIT). Then we compared the effects of Perinatal to Postnatal Day 22 (PND-22) and Early Postnatal (birth to PND 22) rats exposed to either 150 ppm or 1,000 ppm Pb²⁺-acetate in their drinking water, against the male and female control rats. The LD/SIT consisted of a 3-Days (habituation/alone, stranger, and novel toy) series of conditions for 10-minutes under green light (3 Lux). The rats' frequency, duration, latency to first response, and rate of response per minute were examined for social attempts, socializations, and social avoidances. The results showed that Control female rats showed an increase in the frequency, duration, and response per minute for socializations and social avoidance, as well as, a decrease in the latency to first social avoidance, when compared to Control male rats. In contrast, the male Peri-22 150 ppm rats were no different from Control male rats. However, the Peri-22 1,000 ppm male rats showed an increased duration in their social avoidance when compared to Control male rats. Alternatively, female Peri-22 150 ppm rats showed a decrease in the frequency of social avoidance and rate of socialization and an increase in the duration of social attempts and latency to first socialization when compared to female Control rats. In contrast, the female Peri-22 1,000 ppm rats showed a decrease in the frequency, duration, and rate of social attempts, as well as, an increase in the latency to first social attempt. Taken together, the present study provides the first evidence in the literature that targeted a social-emotional model of childhood Pb²⁺-poisoning, that showed sex- and dose-dependent effects in which females are more negatively affected than males. These findings provide a unique ability for future neuropsychopharmacological applications for treating social-emotional psychiatric susceptibilities.

O5-1

BIDIRECTIONAL CONTROL OF INFANT SOCIAL BEHAVIOR BY DOPAMINERGIC INNERVATION OF BASOLATERAL AMYGDALA

Maya Opendak, New York University Langone Medical Center; Regina Sullivan, Nathan Kline Institute & NYU School Medicine; Elizabeth Zeldin, New York University Langone Medical Center; Shannon Hu, New York University Langone Medical Center; Haniyyah Sardar, New York University Langone Medical Center; Charlis Raineke, University of British Columbia; Donald Wilson, NYU School of Medicine and Nathan Kline Institute; Rosemarie Perry, New York University; Peter Serrano, Hunter College

Social interaction deficits seen in psychiatric disorders emerge in early-life and are most closely linked to aberrant neural circuit organization and function. Due to technical limitations, we have had little understanding of the typical ontogeny of social behavior neural circuits or how environmental perturbation at different stages of development impacts infant behavior to perturb

lifelong social interaction. Using a suite of invasive procedures in awake, behaving infant rats, including optogenetics, microdialysis and microinfusions, we charted the gradual increase in social behavior deficits and dissected circuits controlling this process. We adapted optogenetics for the 14 day-old pup (pups infused at PN1) and observed that silencing the amygdala during social behavior rescued typical approach towards the mother and peers following adversity, suggesting the amygdala is not typically involved in approach behavior at this age. Functional 2-deoxyglucose uptake and structural equation modeling allowed us to further characterize the reorganization of neural networks supporting social processing of the mother. This highlighted the mesolimbic dopamine-amygdala interface as a locus of dysfunction, which converged with elevated dopamine levels in the adversity-reared pup BLA in the mother's presence. Persistently elevated BLA dopamine was causal in initiating social behavior pathology, as demonstrated by suppression and replacement of dopamine during treatment and during expression of social behavior deficits with the mother and peers. Taken together, these data highlight mesolimbic dopamine circuit organization and function as a potential therapeutic target in understanding behavioral deficits associated with psychiatric disorders.

NEURO14

LOOKING WITHOUT SEEING: CHILDREN DO NOT DISTINGUISH EFFICIENT FROM INEFFICIENT MEANS TO ACHIEVE A GOAL

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Observing others is a powerful way to learn about goal-directed actions because it provides information about the actor's intended goal and the means to achieve it. Prior developmental work suggests that long before children can achieve goals themselves, they can detect others' goals. However, the question is still open as to whether young children notice efficient means to achieve a goal.

We addressed this question by using a novel combination of techniques (eye-tracking, pupillary responses, EEG, and machine learning). Preschoolers (N = 22) and adults (N = 22) watched actors use efficient, adult-like and inefficient, child-like means of grasping a hammer to pound a peg. We tested whether children differentiate the efficiency of means to achieve a goal in a task where they do not use efficient means to perform the action themselves.

Eye-tracking showed that both ages looked equally long at the goal (peg), but differed in looking at the means: Adults looked longer at the hammer and hand and performed more gaze switches between hammer and hand and between hammer and peg; deep learning analysis distinguished efficient from inefficient grasps for adults, but not for children. Moreover, only adults showed differential physiological responses to efficient versus inefficient grasps with increased pupil dilation and differential patterns of action-related neural activity (EEG).

Taken together, our findings show that children can actively direct their gaze to look at goal-directed actions without seeing whether the means are efficient or not. Moreover, findings

suggest that the development of action perception is built from children's own motor experiences.

SOC33

ADVERSITY DISRUPTS INFANT RODENT PROCESSING OF MATERNAL ODOR

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Although a caregiver figure typically regulates the infant, early disruption of the caregiver-infant relationship impairs this regulation, thus impacting infant development. This has been demonstrated in children with stressed caregivers. We more recently used a rodent model to demonstrate impaired regulation of infant cortical oscillations and neural networks supporting threat and attachment, including the amygdala and mesolimbic dopamine circuitry. To further examine the typical development and disruption of this regulatory system, we assessed pup neurobehavioral responses to shock when administered alone or in the presence of the mother in pups reared with a typical mother or in the context of adversity-rearing. In typically-reared pups, maternal presence buffered pup shock responses, including activity, ultrasonic vocalization, and plasma corticosterone levels. This effect was not observed in adversity-reared pups. These data suggest the maternal odor has degraded salience for buffering pup stress responses in adversity reared pups. To assess how the maternal presence cue changed, pups were exposed to the maternal odor after control or adversity-rearing. Assessment of 2-deoxyglucose metabolism showed decreased uptake in the amygdala complex and ventral tegmental area in response to maternal odor. Functional connectivity analysis demonstrated unique patterns of correlated 2-DG uptake between the amygdala and VTA, with connectivity varying as a factor of development and rearing experience. Taken together, these data suggest that adversity dysregulates maternal regulation of the pup through altered processing of maternal odor.

NEURO25

SETTING THE STAGE: INFANT BIOLOGY AND ENVIRONMENT PREDICT CHILD INTERNALIZING BEHAVIORS

Jennifer Phillips, Virginia Tech; Martha Ann Bell, Virginia Tech

Childhood developmental outcomes have biological and environmental foundations (Feldman, 2007), including self-regulation measures of respiratory sinus arrhythmia (RSA; Lunkenheimer et al., 2015) and temperament (Rothbart, 2007), as well as maternal parenting behaviors (Szabó et al., 2008). We assessed how these factors during infancy predicted childhood internalizing behaviors (IB), a potential foundation for anxiety disorders impacting 18-20% of children (Cartwright-Hatton et al., 2006). The data come from a longitudinal study with multiple lab visits

from infancy through early childhood. At age 5-months, mothers reported on infant temperamental negative affectivity. Infant RSA was collected during baseline and peekaboo with mother. RSA change scores were calculated by subtracting task RSA from baseline RSA so that positive numbers indicated better regulation during the task (Calkins, 2004). During peekaboo, maternal behaviors, including intrusiveness and physical overstimulation, were coded. At 36-months, mothers reported on child IB using the Child Behavioral Checklist. Linear regression was used to predict 36-month IB using infant RSA change score, infant negative affectivity, maternal intrusiveness, and maternal physical stimulation. The regression equation was significant [$F = (4, 194) = 6.869, p$ [NIH grant R01 HD049878]]

NEURO28

NEURAL ACTIVATION TO INFANT CRY AMONG LATINA AND NON-LATINA WHITE AMERICAN MOTHERS

Tiffany Phu, University of Denver; Özlü Aran, University of Denver; Andrew Erhart, University of Denver; Pilyoung Kim, University of Denver

Culture may shape how parents respond to infant distress cues. Few studies have applied a cultural neuroscience approach to the transition to parenting. Here, we investigate maternal brain activation to infant cries in Latina and non-Latina White mothers. Participants: Participants were 50 first-time mothers (52% Latina; Mmother age = 26.11 years $\pm$ 5.75; Minfant age = 4.48 months $\pm$ 2.06). Results: We ran a whole-brain linear mixed model using AFNI's 3dLME. The two-way interaction of ethnicity and sound type (cry vs. noise) revealed statistically significant clusters: right posterior insula, left cerebellum, right pre-motor cortex, right dorsolateral, left somatosensory, left premotor, left auditory, right medial prefrontal, and right prefrontal regions, p 's < 0.05 , corrected. Across all clusters, activation of infant cry vs white noise sounds was lower in Latina mothers compared to non-Latina mothers. Higher brain activation to cry sounds was related to cry ratings as more soothing (rright pre-motor = .42, $p = .04$; rright dorsolateral = .43, $p = .03$) and less aversive (rright pre-frontal = -.40, $p = .05$) for Latina mothers. Non-Latina mothers rated cries as more urgent (rright pre-frontal = .54, $p = .007$) and more approach-eliciting (rright dorsolateral = .60, $p = .002$). Conclusion: Latina mothers showed lower activation across regions related to processing sensory and social information processing and planning for motor actions when listening to infant cries. Latina, first-time mothers may have increased exposure to infant cries due to strong extended family connections and perceive infant cries as less aversive, which may further be associated with reduced brain responses. Future directions include examining how different neural activation patterns seen here shape parenting behavior and using more nuanced cultural assessments.

STRESS19

PRENATAL MATERNAL STRESS AND PEDIATRIC ASTHMA ACROSS DEVELOPMENT: ADOLESCENT FEMALE-SPECIFIC VULNERABILITY

Madeline Pike, Emory University; Patricia Brennan, Emory University; Melissa Engel, Emory University

In the largest prospective longitudinal study examining the effects of objective and subjective prenatal maternal stress (PNMS) on offspring asthma through adolescence, we demonstrated that the effects of PNMS are indeed lasting, exerting their influence across development. We explored the differential effects of objective versus subjective prenatal stress on asthma outcomes at ages 5 and 15 years. In addition, we analyzed the moderating role of biological sex on the relationships between prenatal stress exposure and asthma. The sample included 815 adolescents from the Mater Misericordiae Mothers' Hospital University of Queensland Study of Pregnancy (MUSP). Objective stressful events in the last six months of pregnancy were correlated with elevated asthma risk at age 5 years, albeit not above the effects of postnatal stress. Sex moderated the association between maternal prenatal subjective stress and asthma at age 15 years. Specifically, PNMS predicted age 15 asthma in females, but not males, even when controlling for postnatal stress. Sex stratified analyses also revealed a positive association between prenatal objective stress and age 15 asthma in females. Thus, contrary to previous findings that females are more affected by post-natal stress, relative to prenatal stress, our research supports a female vulnerability to PNMS that carries delayed effects. These results reinforce the importance of timing and sex differences in the prenatal stress-asthma connection and illustrate that the effects of PNMS continue to exert their influence on asthma outcomes across development.

NEURO22

THE NEUROBEHAVIORAL UNIQUENESS OF FEAR (BUT NOT SADNESS AND ANGER) IN INFANCY

Elizabeth Planalp, University of Wisconsin--Madison; Douglas Dean, University of Wisconsin-Madison; Kristin Dowe, University of Wisconsin-Madison; H. Hill Goldsmith, University of Wisconsin-Madison

We examine neurodevelopment of discrete negative emotionality in infants at 1 and 12-months of age. The core purpose of this work is to determine whether the microstructure of white matter tracts at 1 month of age foreshadow the expression of specific negative emotions later in infancy. Infants ($n = 149$) underwent neuroimaging at 1 month of age, and mothers reported on infant fear, sadness, and anger at 12 months using the Infant Behavior Questionnaire-Revised. As might be anticipated, results showed stronger phenotypic relations between sadness and anger ($r = .54$, $p < .01$) than fear and sadness ($r = .25$, $p < .01$) or fear and anger ($r = .17$, $p < .05$). Voxel-based imaging analyses used a joint inference non-parametric combination of 6 diffusion metrics as indicators of white matter integrity. Relations between MRI and mother reported emotion indicated that 1-month white matter microstructure was differentially associated with 12-month fear, but not anger or sadness, and depended on brain region. For example, fear but not anger or sadness was related to lower overall white matter integrity in the superior longitudinal fasciculus, a tract which connects frontal and tempo-parietal regions and has been implicated in emerging psychopathology in adults. Results confer the neurobehavioral uniqueness of fear as early as 1 month of age, even though negative emotions are often not differentiated behaviorally until later in development.

O5-4

TEMPERAMENTAL SHYNESS, FRONTAL EEG THETA/BETA RATIO, AND ANXIETY IN CHILDREN

Kristie Poole, McMaster University; Raha Hassan, McMaster University; Louis Schmidt, McMaster University

Previous empirical and theoretical work has revealed that temperamentally shy children who also have high levels of neurocognitive control are at risk for developing anxiety. Frontal electroencephalogram (EEG) theta/beta ratio has been conceptualized as an electrophysiological marker of cognitive control, but we know relatively little about the role of this neural measure in typically-developing children. Here, we examined changes in frontal EEG theta/beta ratio during a social stress induction task, and whether these task-related EEG changes moderated the relation between temperament and risk for anxiety in childhood. Participants included 152 typically-developing children (Mage = 7.82 years, SD = 0.44) who had their EEG recorded during a baseline condition and during a social stress induction (speech anticipation task). Parents reported on children's level of temperamental shyness, and children reported on their level of state social anxiety to the impending speech as well as on their levels of trait social anxiety symptoms. Results revealed that children's frontal EEG theta/beta ratio significantly decreased from baseline to the speech anticipation, which may be reflective of greater cognitive control during the social stressor. Further, we found that temperamental shyness was only related to higher levels of state and trait social anxiety among children who exhibited large decreases in frontal EEG theta/beta ratio to the social stressor. These findings are in line with theoretical models hypothesizing that temperamentally shy children who also have high levels of neurocognitive control may be at greater risk for developing anxiety due to their tendency to overregulate during social encounters.

S2-3

SEX DIFFERENCES IN THE PERSISTENT IMPACTS OF ACUTE EARLY LIFE STRESS ON FEAR MEMORY IN ADULTHOOD

Jennifer Quinn, Miami University; Brianna Minshall, Miami University; Collin Riddle, Miami University; Dragana Claflin, Wright State University

Posttraumatic stress disorder (PTSD) represents a spectrum of debilitating anxiety symptoms resulting from exposure to one or more traumatic events. Individuals living with PTSD are more likely to have experienced trauma as a child. This demonstrates the importance of early adversity as a risk factor for developing PTSD later in life. We have established a rodent model of acute early life stress (ELS) which produces robust and persistent behavioral phenotypes relevant to the debilitating symptoms observed in patients with PTSD. In the model, rats or mice are exposed to 15 footshocks on postnatal day 17. In adulthood, previously stressed male and female animals demonstrate robust stress-enhanced fear learning (SEFL). However, moderate ELS (4 footshocks) reveals a female vulnerability toward adult SEFL, where females but not males

demonstrate SEFL. This female vulnerability is not due to differences in learning or footshock responsivity during the ELS session. Further, previously-stressed females demonstrate an increased propensity for fear incubation in adulthood (over a 30 day period) compared to previously-stressed males.† Animals not previously exposed to ELS show no evidence of fear incubation in adulthood. These data suggest that exposure to an acute stressor early in life can produce long-lasting alterations in future threat responding, and females appear to be more vulnerable to these effects.

S3-3

ASSESSING THE IMPACT OF EARLY-LIFE ADVERSITY ON EMOTIONALITY AND NEUROIMMUNE FUNCTION OF ANIMALS PRENATALLY EXPOSED TO ALCOHOL
 Charlis Raineke, University of British Columbia; Tamara Bodnar, University of British Columbia; Parker Holman, University of British Columbia; Joanne Weinberg, University of British Columbia

Prenatal alcohol exposure (PAE) impacts immune system development. Importantly, altered immune function can impact overall emotional regulation. Not surprisingly, PAE is associated with increased vulnerability to psychopathologies. Moreover, PAE carries an increased risk of being exposed to early-life adversity (ELA), which also impacts immune function and emotional regulation. Nevertheless, few studies have investigated how ELA contributes to the pervasive and long-lasting effects of PAE. Here, we evaluated whether ELA further exacerbates the vulnerability to emotional dysregulation and immune dysfunction observed following PAE. PAE and control rat litters were exposed either to limited bedding [postnatal day (PN) 8-12] to model ELA or to normal bedding. During early (PN30) or late (PN45) adolescence, male and female offspring were tested in the open field (OF) and elevated plus maze (EPM), and exposed to swim stress; blood and brains were collected following swim stress to evaluate cytokine levels. In adulthood, we evaluated peripheral and central immune system responses to immune challenge (LPS). Our results indicate that in females, PAE resulted in anxiety-like behaviors in the OF at both ages, whereas in males, PAE combined with ELA increased anxiety-like behaviors in the EPM at both ages. The behavioral alterations were associated with age-specific changes in peripheral and central cytokine levels. Moreover, different from PAE females, PAE males exposed to ELA failed to mount appropriate immune responses to LPS in adulthood. Taken together, our results suggest that altered immune function may underlie, at least in part, the emotional dysregulation observed following PAE and/or ELA.

SOC29

EARLY SOCIAL ADVERSITY INFLUENCES THE RELATIONSHIPS BETWEEN ATTENTION BIASES AND SOCIOEMOTIONAL BEHAVIOUR IN JUVENILE MACAQUES

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Affect-biased attention is thought to play a fundamental role in early socioemotional development, but the mechanisms through which attention biases (ABs) emerge and relate to typical versus atypical socioemotional outcomes remain unclear. Utilizing non-human primate models could help shed light on such issues, therefore here, we adopted a macaque model of early social adversity (ESA) to address three main objectives: i) investigate whether ABs to threatening and positive/reward-related facial gestures are linked to anxiety and social engagement in pre-adolescent macaques; ii) consider how ESA may influence these relationships; and iii) establish this as a suitable translational model for subsequent research. To achieve this, we presented two groups of pre-adolescent macaques differing in early social experience (mother-reared/peer-reared) with pairs of dynamic facial stimuli (neutral-threat/neutral-affiliative) to calculate ABs, and coded anxiety and grooming behaviour from videos of subjects in their everyday social environment. Results revealed that while all animals demonstrated an AB towards threat, a greater threat bias linked to anxiety was demonstrated by the peer-reared group. An AB towards affiliative gestures was demonstrated only by the mother-reared group, though the degree of positive AB was related to social engagement across groups. These results parallel effects of early institutionalization in human children. Therefore, in addition to furthering knowledge on the development of affect-biased attention more generally, such findings establish the utility of macaque models for future investigations into the learning and neural mechanisms underlying ABs and early socioemotional functioning across development.

NEURO6

PEDIATRIC NEURORADIOLOGY FINDINGS IN CHILDREN EXPOSED TO GESTATIONAL HYPERTENSIVE DISORDERS

Vida Rebello, University of California, Irvine; Kristina Uban, University of California, Irvine

Purpose

Hypertensive Disorders of Pregnancy (HDP) like preeclampsia and eclampsia, are a leading cause of maternal-child mortality and morbidity in the United States. Preeclampsia/eclampsia may result in alterations in the neurodevelopment of the offspring, leading to developmental delays. However, it remains uncertain if the increased risk of these neurological outcomes follow a structural pattern in the brain. This study aims to examine the association between preeclampsia/eclampsia on the developing brain of the offspring during a critical period of transition from childhood to adolescence using structural magnetic resonance imaging.

Methods

This study included baseline measures of 9626 participants from the Adolescent Brain Cognitive Development Study (ABCD). History of preeclampsia and eclampsia was obtained retrospectively. Cerebral cortical area, cortical thickness and cortical volume (sMRI) in preeclampsia exposed and non-exposed were examined using generalized linear mixed models. Covariates include maternal age of birth, sex of offspring, age, race/ethnicity, household income, imaging site and family ID.

Results

740 participants were exposed to preeclamptic gestations. In the mixed effects model, compared with the group not exposed to preeclampsia, there was a significant difference in both cortical area ($p = 0.01$) and cortical volume ($p = 0.00$) between the two groups. There was no significant difference seen in cortical thickness ($p = 0.97$). When the exposed group was compared to the non-exposed group, cortical surface area and volume were decreased, whereas cortical thickness did not vary.

Conclusions

Our findings highlight structural brain differences in typically developing children emphasizing the need to further understand how common prenatal conditions like preeclampsia/eclampsia, may impact child development.

O1-2

LATENT PROFILES OF INFANT BEHAVIORAL REACTIVITY, CORTISOL REACTIVITY, AND EMOTION REGULATION BEHAVIORS AT 6, 15, AND 24 MONTHS OLD AND THEIR BIDIRECTIONAL ASSOCIATIONS WITH PARENTING

Peter Rehder, Duke University; W Mills-Koonce, University of North Carolina at Chapel Hill; Clancy Blair, NYU

Developing emotion regulation (ER) skills is a key task of early childhood linked with later socioemotional and cognitive competence (Calkins & Marcovitch, 2010). This critical developmental process occurs through interactive physiological, cognitive, and behavioral responses situated within environmental context (Dennis et al., 2012), but how these multiple influences jointly and interactively contribute to the emergence of emotional competencies is not yet fully understood (Fox et al., 2012). The current study used latent transition analysis to prospectively examine the synchrony of infant behavioral reactivity, cortisol reactivity, and ER behaviors at 6, 15, and 24 months old to determine whether infants evidenced different patterns of arousal and regulation; and whether patterns were bidirectionally related to parenting behavior over time.

Data come from 1,239 families in a birth cohort study of children living in rural regions of the United States. At each assessment, infants participated in emotion-eliciting challenge tasks that were coded for behavioral reactivity and ER behaviors. Saliva samples were collected to assess cortisol reactivity. Parent-infant dyads completed play interactions that were coded for parent sensitivity and harsh-intrusion.

Results indicated that there was observable variation in infants' patterns of reactivity and regulation at each age. Harsh-intrusion at 6 months predicted 15-month membership in a latent profile characterized by the greatest behavioral reactivity, cortisol reactivity, and ER behaviors; and that same profile at 6 months predicted increases in 15-month parent sensitivity and decreases in harsh-intrusion. These findings demonstrate the importance of considering how different aspects of emotion responding operate together over development.

NEURO42

MICROBIOTA-IMMUNE ALTERATIONS IN ADOLESCENTS FOLLOWING EARLY-LIFE ADVERSITY

Brie Reid, University of Minnesota; Rachael Horne, McMaster University; Bonny Donzella, University of Minnesota Twin Cities; Jake Szamosi, McMaster University; Chris Coe, University of Wisconsin; Jane Foster, McMaster University; Megan Gunnar, University of Minnesota

Early adverse care has long-term impacts on physical and mental health. The influence of rearing conditions on the infant's gut microbiota and its relationship to developmental health has become more evident. The microbiome is essential for normal growth and metabolism, and the signalling from the gut to the brain may underlie individual differences in resilience later in life. Microbial diversity and composition were determined using 16S rRNA gene amplicon sequencing in fecal samples from 17 adolescents adopted internationally from orphanages into the United States and 18 adolescents reared in birth families who had similar educational and income levels. Analyses focused on diversity of the microbial community structure and differences in the abundance of specific bacterial taxa. Blood samples were used to immunophenotype the numbers of several T cell subsets and cytomegalovirus (CMV) seropositivity. Negative binomial regression analysis revealed several OTUs that were significantly different based on early rearing conditions and CMV seropositivity. There were significant associations between the relative abundance of certain taxa, the percentages of T cell subsets in circulation, and CMV seropositivity. These findings demonstrate a long-term impact of early life events on the gut microbiota, which appear associated with the immune alterations initiated by early life adversity.

COG19

ASSESSING 2 AND 3-YEAR-OLDS' EXECUTIVE FUNCTION DURING PEDIATRIC WELL-CHILD VISITS: FEASIBILITY AND IMPLICATIONS

Emily Reilly, University of Minnesota, Institute of Child Development; Milena Cornejo, University of Minnesota; Shanna Mliner, University of Minnesota; Michael Troy, Children's Minnesota; Megan Gunnar, University of Minnesota

Background: Executive functions (EF) are a set of cognitive skills that undergo extensive development in the preschool years and are associated with later academic achievement and adult functioning. Because these skills are so important for school success, assessing child EF skills at 2- and 3- year pediatric well-child visits can help screen for delays in EF development and connect families with early intervention resources to help increase school readiness. Methods: We assessed EF skills in 145 preschoolers at 24-, 30-, and 36-month pediatric well-child visits using the Minnesota Executive Function Scales (MEFS™), a standardized tablet-based assessment administered by a researcher. We will describe the challenges of assessing child EF skills in this setting and the adaptations we made to collect data within the flow of a well-child visit. Results: Most of the children, 115 of 145 (79%), completed the MEFS and paid attention throughout the assessment. In addition, we will present the distribution of EF scores in

this context compared to the published MEFS norms. The mean MEFS scores in this sample (45th percentile) was lower than the norm average (50th percentile), likely due to the greater opportunities for distraction in this context. Conclusion: We discuss implications of the feasibility of assessing child EF in primary care clinics and adjusting scale norms accordingly to match this context. Finally, we will consider the utility to families of screening for child EF development during well-child visits and the resources currently available to families for fostering their child's EF development.

COG21

FEMALE MICE ARE MORE SENSITIVE TO THE IMPACT OF ACUTE EARLY LIFE STRESS ON ADULT FEAR MEMORY INCUBATION

Collin Riddle, Miami University; Catherine Wasylyshyn, Miami University; Madeline Booms, Miami University; Jennifer Quinn, Miami University

Women are two to three times more likely to suffer from posttraumatic stress disorder (PTSD) than men. Early life stress (ELS) has been demonstrated to exacerbate this female vulnerability. PTSD and related psychopathologies are characterized by the impaired extinction of fearful memories and the escalation of these fear memories over time. This is modeled in rodents using acute exposure to aversive stimuli in early development and showing the aforementioned phenotypes in adulthood. The present set of experiments addressed whether male and female mice exposed to acute ELS differed in adult fear memory incubation and/or extinction. All mice received 0 or 15 footshocks on postnatal day (PND) 17. In Experiment 1 (incubation), mice were fear conditioned in a novel context using a single, low-intensity footshock during adulthood. Mice were then tested for fear memory expression 1 day or 30 days later. Previously stressed mice showed heightened fear expression at the longer retention interval; this effect was more pronounced in females. In Experiment 2 (extinction), mice were fear conditioned in a novel context using a single footshock during adulthood. Over the next five consecutive days, mice were returned to the fear conditioning context and freezing was assessed in the absence of footshock presentation. Previously stressed mice were slower to extinguish fear over the five days, compared to non-stressed controls. There was no sex difference in extinction. These findings demonstrate persistent impacts of acute ELS on fear memory into adulthood. Further, they reinforce the female vulnerability observed with some measures.

S5-2

Columbia University in the City of New York Sponsored Symposium: CONTEMPORARY APPROACHES TO STUDYING EARLY LIFE STRESS AND THE DEVELOPING BRAIN
Tracy Riggins, University of Maryland

It is well understood that early adversity negatively impacts developing brain architecture. This symposium brings together research pushing the boundaries of this field by examining the impact of early adversity on the brain in more nuanced and exciting ways. The first talk will present data assessing the impacts of early adversity during both the pre- and postnatal period on

the structure of the hippocampus, a stress sensitive brain region. The second talk will present data showing that early stress physiology relates to functional connectivity of the hippocampus later in development. This talk will also probe the question of how more typical variations in early stressful life events impact functional development of the hippocampus. The third talk will present data from a large sample of children showing that differences in BOLD signal variability of reward processing regions mediate the association between early adversity, specifically family conflict, and depression. The fourth talk will present data showing that a parenting intervention may be effective in limiting the impact of early adversity on functional development of regions important for emotion regulation. This symposium will be of interest to a wide audience as it includes a diverse group of researchers in the field who address this question across developmental periods ranging from the prenatal period through adolescence. We will promote discussion by presenting new data addressing the long-time question of how experience gets under the skin and shapes development along with mechanisms that hold potential for decreasing the impact of early adversity on the brain.

SOC45

MATERNAL DEPRESSION DURING LATE PREGNANCY STRONGEST PREDICTOR OF CHILD NEGATIVE AFFECT

Gabrielle Rinne, UCLA; Elysia Davis, University of Denver; Nicole Mahrer, University of La Verne; Christine Guardino, Dickinson College; Madeleine Shalowitz, NorthShore University HealthSystem Research Institute; University of Chicago Pritzker School of Medicine; Sharon Ramey, Virginia Tech; Chris Dunkel Schetter, UCLA

Background: Maternal depressive symptoms have been associated with greater child negative affect, a marker for later emotional/behavioral problems. But when during development does maternal depression have the greatest potential to shape child outcomes? Do depressive symptoms before conception, during pregnancy, postpartum, and during early childhood similarly predict child negative affect or do effects differ depending on timing? The current prospective longitudinal study examines associations of maternal depressive symptoms measured across five timepoints with child negative affect in early childhood.

Methods: This sample includes 85 mother-child pairs recruited by the Community Child Health Network projectNHN. Visits were postpartum following an index birth and before a subsequent conception, then during 2nd and 3rd trimester of pregnancy, postpartum, and during early childhood (M age = 3.87 years). Maternal depressive symptoms were measured at all visits (EPDS, CES-D) and examined continuously and dichotomously based on clinical cut-offs. Negative affect in children was reported by mothers at the early childhood visit (CBQ Very Brief).

Results: Adjusting for household income, maternal relationship status, and depressive symptoms during early childhood, maternal depressive symptoms before conception ($\beta = 0.206$, $p = .064$) and during the 3rd trimester ($\beta = 0.216$, $p = .064$) marginally predicted child negative affect. When examined dichotomously, maternal depressive symptoms above clinical cut-offs during

the 3rd trimester significantly predicted child negative affect ($\beta = 0.303$, $p = .006$). Depressive symptoms during the 2nd trimester, postpartum, and during early childhood did not predict child negative affect ($\beta = 0.123-0.175$).

Conclusions: These findings indicate maternal psychological distress before conception and in-utero during late pregnancy may influence child negative affect.

STRESS2

ADOLESCENT PHYSICAL HEALTH AND HEALTH BEHAVIORS DURING THE COVID-19 PANDEMIC

Kenia Rivera, University of Denver; Jenalee Doom, University of Denver; Christopher Rozek, Stanford University

Studies of adolescents during the COVID-19 pandemic have largely focused on mental health outcomes. Few have examined the impact of the pandemic on adolescents' physical health (e.g., subjective health, sleep, diet) and predictors of physical health.

Adolescents ($N = 818$) completed an online survey. Outcome variables included changes of perceived health, sleep quality, getting enough sleep, and changes in weight, diet quantity, diet quality, and physical activity. Predictors included depressive symptoms, loneliness, perceived stress, social support, concerns about COVID-19, positive childhood experiences, emotion regulation, and subjective social status in the community and at school.

Compared to before the stay-at-home restrictions, 35.4% participants reported worse physical health and 31.7% reported less healthy diet. Additionally, 50.5% reported eating more and 28.8% reported weighing more. Adolescents reported exercising 36 minutes ($SD = 94$) fewer per day, on average. Around 45.6% reported they were sleeping more while 24.8% reported sleeping less. Around 26.1% reported poorer sleep quality.

Higher depressive symptoms predicted worse subjective health ($\beta=.21$). Adolescents largely reported poorer physical health and health behaviors during the pandemic. Depressive symptoms and COVID-19 concerns were the predictors most consistently associated with physical health.

COG13

MONOLINGUAL AND BILINGUAL 2-YEAR-OLDS' LEARNING AND TRANSFER OF WORDS FROM BOOKS TO REAL OBJECTS

Joscelin Rocha Hidalgo, Georgetown University; Sylvia Rusnak, Georgetown University; Hadley Greenwood, Georgetown University; Nicholas Strautman, Georgetown University; Grace Lozano, Georgetown University; Patricia Ganea, University of Toronto; Rachel Barr, Georgetown University; Olivia Blanchfield, Georgetown University; Andrea Motta, Georgetown University

Across studies, by 24 months of age, children can consistently generalize beyond a book to a real object, but these studies have mainly focused on monolingual populations. We examined whether 24-month-old bilingual and monolingual toddlers can transfer knowledge about new words acquired from physical books to different modalities (i.e., 2D to 3D forms) and extend this knowledge to new exemplars. We hypothesized that because bilinguals need to map multiple words to the same object, they would be more flexible on this task than monolinguals. We tested 70 24-month-olds (23 bilinguals) with a picture book with color photographs of 6 familiar and two novel objects; one of the novel objects was named a *blicket*. 44/70 children successfully identified the *blicket* when pictures of the novel objects were presented. When asked to retrieve a *blicket* from a choice of a picture of the *blicket* or a different colored 3D *blicket*, 80% of the toddlers either chose the 3D *blicket* only or both options (binomial test, $p = .0001$). This pattern of performance did not differ as a function of bilingual status (Fisher's exact test, $p = .50$). On the extension test, overall performance did not differ from chance ($M = .50$), and there was no difference between monolinguals and bilinguals. Still, bilinguals were correct 70% of the time compared to 41% for monolinguals (see Figure). These findings suggest mapping a symbol from books to real objects is a complex learning task.

NEURO47

DIFFERENTIAL EFFECTS OF MATERNAL STRESS ON INFANT CORTISOL REACTIVITY AND INFANT EMOTIONAL DYSREGULATION

Katharine Ross, University of Chicago; Rimma Ilyumzhinova, University of Chicago; Kimberley Mbayiwa, University of Chicago; Kathryn Keenan, University of Chicago

Evidence suggests that prenatal exposure to psychosocial stress is associated with infant cortisol reactivity. Furthermore, infant cortisol reactivity is associated with infant emotion dysregulation. Black American women, living in urban low-resourced environments, often experience high levels of stress during pregnancy. In the present study, we examined the relationship between prenatal stress in Black American women, infant cortisol reactivity and emotion dysregulation. Data were analyzed from a subsample of forty-nine pregnant, Black American women with Medicaid insurance and their infants, participating in the Nutrition and Pregnancy Study. Self-reported maternal stress was measured using the Perceived Stress and the Difficult Life Circumstances scales towards the end of the second trimester of pregnancy. Infant cortisol levels were measured at one month of age via saliva samples collected upon arrival and at 20, 40, and 50 minutes after administration of the Neonatal Behavioral Assessment Scale (NBAS). Emotion dysregulation was characterized by irritability, intensity of and latency to distress in response to the NBAS. High levels of both perceived stress ($F(1,44) = 4.876$, $p = .032$, $\eta^2 = .100$) and difficult life circumstances ($F(1,45) = 15.989$, $p = .000$, $\eta^2 = .262$) were significantly associated with lower infant cortisol levels overall. Infant emotion dysregulation was associated with infant cortisol levels upon arrival to the lab ($r = -.295$, $p = .05$). No association was observed between prenatal stress and infant emotion dysregulation. These findings suggest that stress exposure during pregnancy is related to individual differences in cortisol functioning in infants. Further research is needed to better understand the different pathways by which maternal stress affects infant neurodevelopment.

SOC37

NEWBORN CARE AND MATERNAL STRESS: LINKS TO ACTUAL AND EXPECTED ROLE DIVISION

Marissa Roth, Vanderbilt University; Kathryn Humphreys, Vanderbilt University

Introduction

Maternal stress in the transition to parenthood affects the individual but also the care of infants. In order to understand how best to reduce stress in the transition to parenthood we investigated two hypotheses about infant care roles. We predicted that stress would be higher in women whose partners provided less childcare support or failed to provide the support the mother expected to receive: “overburden hypothesis”. Alternatively, we predicted that stress would be higher in women whose partners were providing more support or more support than expected: “partner compensation hypothesis”.

Methods

33 pregnant women (79.4% White; $M=21.73[5.10]$ years; 47% primiparous) reported expected partner involvement and were reassessed at 1 month postpartum for perceived stress and partners’ actual involvement in childcare tasks.

Results

After covarying for maternal age, education, and first-time parent status, both total amount of partner involvement ($\beta = -.56, p=.04$) and the discrepancy in actual vs. expected partner involvement ($\beta = .65, p=.01$) predicted maternal stress. In support of the partner compensation hypothesis, more partner support and greater support than anticipated were associated with higher stress.

Discussion

Our results suggest that partners respond to maternal stress by increasing their role in childcare tasks, above and beyond initial expectations. These findings may inform interventions aimed at supporting families in the transition to parenthood.

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NEURO18

DEVELOPMENT OF SOCIAL ATTENTION, AFFILIATION AND SALIENCE NEURAL NETWORKS SUPPORT MATURATION OF SOCIAL SKILLS IN INFANT RHESUS MACAQUES

Sara Saavedra, University of Washington; Zsofia Kovacs-Balint, Yerkes National Primate Research Center; Madison Wallace, Yerkes National Primate Research Center; Trina Jonesteller, Yerkes National Primate Research Center; Manuel Bautista, Yerkes National Primate Research Center; Jabari Wesson, Yerkes National Primate Research Center; Cami Poole, Yerkes National Primate Research Center; Lauren Flamenbaum, Yerkes National Primate Research Center; Margaret Kyle, Yerkes National Primate Research Center; Longchuan Li, Marcus Autism Center; Martin Styner, University of North Carolina; Jessica Raper, Yerkes National Primate Research Center; Jocelyne Bachevalier, Yerkes National Primate Research Center; Mar Sanchez, Emory University; Erin Siebert, Emory University

Non-human primates (NHP) are translational models critical for understanding social deficits in neurodevelopmental disorders, such as Autism Spectrum Disorder (ASD). The goal of this study was to map developmental trajectories of social attention, affiliation/reward and salience neurocircuits that support the maturation of prosocial behaviors and attachments in infant rhesus macaques living in complex social groups.

Longitudinal structural MRI scans (T1, T2-weighted) were acquired from 30 infant macaques from birth through 24wks of age using a 3T scanner (equivalent to first 24mos in humans). Volumetric changes were analyzed at 2, 4, 8, 12, 16, 20, 24wks in social attention, affiliation/reward and salience regions (amygdala, anterior cingulate cortex (ACC), orbitofrontal cortex, medial and ventromedial prefrontal cortex (mPFC, vmPFC), and insula). Infants' social development was measured from a subset of subjects ($n=9$) using a rhesus behavioral ethogram, and rating scales of typical/atypical social behavior (adapted from the Social Responsiveness Scale used for human ASD diagnosis).

Region-specific developmental trajectories were identified across social brain networks, with rapid growth in most regions between 8-12 and 16-20wks. These changes were paralleled by a decline in mother-infant affiliative behaviors by 8wks, when infants increase independence and social play. Finally, ACC and mPFC developmental volume increases were significant

predictors of maturation of infant social behaviors.

Our findings suggest that during the first 24wks, these social brain networks undergo robust structural changes that parallel the infant's maturation to independence and increased social interactions. Understanding NHP neurobehavioral development can help elucidate the roots of brain-behavior pathogenesis of human social deficits.

SOC8

A NATURALISTIC APPROACH TO MEASURING CAREGIVER–CHILD PROXIMITY

Virginia Salo, Vanderbilt University; Pat Pannuto, University of California, San Diego; Will Hedgcock, Vanderbilt University; Andreas Biri, ETH Zurich; David Russo, Vanderbilt University; Hannah Piersiak, Vanderbilt University; Kathryn Humphreys, Vanderbilt University

In the earliest years of life, a child's caregivers are the primary partners in the types of interactions believed to be most supportive of positive child development. However, we know little about the patterns of real-life interactions between children and their caregivers. To address this gap, we have developed a wearable, infrastructure-free device (TotTag) used to dynamically and unobtrusively measure real-time physical proximity between children and caregivers throughout the day. The present study examines the TotTag validity and reliability with data collected from a family of four (30mo son, 61mo daughter, 37yr father, 37yr mother), including information about their patterns of interaction as well as a look at how the children's experiences might differ depending on proximity to their caregivers. We explored patterns of proximity within each parent–child dyad and whether measurements corresponding to close proximity between child and caregiver would indicate periods in which increased opportunity for developmentally critical interactions occur. Each child also wore a widely-used portable language monitoring device (LENA) to collect time-synced linguistic input. Descriptive analysis of the TotTag data reveal wide variability in caregiver–child proximity over the course of the recordings. Further, results suggest that the amount of time spent in close proximity with a caregiver is associated with the quantity of a child's exposure to adult language, suggesting that variations in proximity are linked to, though not synonymous with, the experience of adult speech. Integrating in vivo measurement of caregiver–child proximity can deepen understanding of early caregiver–child interactions.

SOC5

INFANTS OF MOTHERS WITH INCREASED DEPRESSIVE SYMPTOMS SHOW BLUNTED NEURAL RESPONSES TO EMOTIONAL FACES PORTRAYED BY THEIR MOTHER, AND NOT BY A FEMALE STRANGER

Aislinn Sandre, McGill University; Kathryn Humphreys, Vanderbilt University; Clara Freeman, McGill University; Helena Renault, McGill University; Anna Weinberg, McGill University

Maternal depression during the post-partum period can adversely affect infant development in multiple ways—including increasing the risk that those infants will develop depression later in

life. In particular, affective exchanges between mothers and infants play an important role in socioemotional development during the first year of life, possibly through adaptations in infant neural responses to affective stimuli. The Negative Central (Nc) is an event-related potential component that indexes infant attention to salient stimuli and is sensitive to emotional expression. The present study, therefore, examined the associations between maternal symptoms of depression, parenting behaviors, and the Nc elicited by happy, fearful, and neutral facial expressions portrayed by their mother and by a female stranger in fifty-eight infants (mean age = 28.47 weeks; 60% female). We collected mother-reported symptoms of depression, and coded videos of mother-infant free play interactions for maternal sensitivity and warmth, as well as infants' positive engagement with the mothers. Mothers reporting higher levels of depressive symptoms were rated by coders as less sensitive ($r = -.29$) and warm ($r = -.31$), and their infants showed decreased positive engagement with the mothers ($r = -.29$). In addition, infants of mothers reporting greater depressive symptoms exhibited a smaller Nc to happy and neutral mother faces—but not stranger faces ($N = 30$; partial eta squared = .18). Together, these results point to a potential pathway by which risk for depression may be transmitted from mother to child.

O2-1

EFFECTS OF ONTOGENETIC OXYCODONE EXPOSURE ON EARLY BEHAVIOR AND DEVELOPMENT IN A MOUSE MODEL

Simona Sarafinowska, Washington University in St. Louis; Elena Minakova, Washington University in St. Louis; Joseph Dougherty, Washington University in St. Louis; Ream Al-Hasani, Washington University in St. Louis; Susan Maloney, Washington University in St. Louis

Nation-wide, opioid misuse among pregnant women has risen fourfold from 1999 to 2014, with commensurate increase in neonates hospitalized for Neonatal Abstinence Syndrome (NAS). NAS occurs when a fetus exposed to opioids in utero goes into rapid withdrawal after birth. NAS treatment via continued postnatal opioid exposure has been suggested to worsen neurodevelopmental outcomes. We developed a novel model to characterize the impact of in utero and postnatal oxycodone exposure on early behavior and development. Via subcutaneous pump implanted before breeding, C57BL/6J dams were infused oxycodone at 10 mg/kg/day from conception through pup-weaning. At birth, in utero oxycodone-exposed pups were either cross-fostered (Oxy-Fos) or continued rearing by biological dams (Oxy-Bio). Offspring from vehicle-exposed dams served as cross-fostered (Veh-Fos) or biologically-reared controls (Veh-Bio). Oxy-Fos male offspring showed post-weaning decrease in weight, potentially linked to withdrawal unmasked by cessation of foster-dam care. Oxy-Fos pups further demonstrated differences in isolation-induced ultrasonic vocalization (USV) features, including increased peak dB in all pups and decreased mean pitch in female pups. Meanwhile, Oxy-Bio pups had additional alterations in communicative behaviors, with decreases in number of USV calls, decreased pitch range, increased peak power and decreased jump frequency in all pups, and decreased mean pitch in male pups. Oxy-Bio pups also exhibited reductions in weight gain and sex-differential delays in righting reflex. Overall, ontogenetic oxycodone exposure was associated with delayed attainment of gross and sensorimotor milestones, as well as

communication deficits. Future investigations will explore withdrawal physiology and opioid-mediated mechanisms underlying these neurodevelopmental deficits.

SOC14

PARENTING UNDER PRESSURE: INDUCING AND BUFFERING PATHWAYS OF FAMILIAL DISTRESS DURING THE COVID-19 PANDEMIC

Chloe Schwartz, University of California, Los Angeles; Kristen Chu, University of California, Los Angeles; Emily Towner, University of California, Los Angeles; Bridget Callaghan, The University of California, Los Angeles

Familial fear transmission resulting from mass trauma (e.g., terrorism or health crises) is well-documented, with parents' transfer of threat information identified as a crucial mediator between parent and child fears. Extending those findings, we examined parent-inducing and parent-buffering pathways of child fear during the COVID-19 pandemic. We also explored child-to-parent pathways to parenting stress. Caregivers of 198 children (aged 6-17 years, N = 159 families) completed online measures assessing COVID-19-related fears, anxiety, parental buffering, attachment, and sources of COVID-19 threat information. Surprisingly, child anxiety was not elevated in the sample. While child fear was significantly associated with both parent fear and level of threat information in the general environment, the association between parent-specific transmission of threat information and child fear was not significant. This finding not only suggests that school-aged children's wellbeing is impacted by threat information from sources outside of the caregiving relationship, but also indicates that parents' own fears may be transferred to their children through modes other than threat-based information transmission. For parent outcomes, parenting stress increased almost threefold pre- to post-onset of COVID-19 and was negatively associated with the quality of the attachment relationship. Although replication of results is needed to determine their generalizability, our current findings suggest that caregivers in particular are experiencing heightened distress due to COVID-19 and so, should be the focus of future investigations on appropriate interventions and supports. Further, efforts to mitigate children's COVID-19-related fears may benefit from reducing the number and intensity of threat sources to which children are exposed.

SOC43

FAMILY SUPPORT AND CHILDREN'S WELL-BEING: THE MODERATING ROLE OF ENVIRONMENTAL SENSITIVITY AND CARDIAC VAGAL TONE IN A LOW SES SAMPLE

Sara Scrimin, Department of Developmental and Social Psychology, University of Padova; Ughetta Moscardino, Department of Developmental and Social Psychology, University of Padova; Francesca Lionetti, University of Chieti

Taking into account an at-risk sample of children living in socioeconomically disadvantaged families, the current study aimed to examine whether the expected association between perceived family support and child well-being was moderated by and environmental sensitivity (the ability

to register, process, and respond to context) and cardiac vagal tone (CVT), an index of self-regulation. Participants ($N = 131$, $Mage = 7.20$ years, 47% boys) were individually interviewed about the support received within the family and their physical and emotional well-being. Children's CVT was recorded at rest, whereas sensitivity was assessed via a series of behavioral tasks. A hierarchical cluster analysis revealed the presence of three sensitivity groups: 'Low sensitive' (43%), 'Moderately sensitive' (33%), and 'Highly sensitive' (24%). The three groups of children did not differ in baseline CVT. However, linear regression analyses revealed that at low and average levels of family support, highly sensitive children with higher resting CVT reported better well-being than those with low resting CVT, whereas no effect was observed among children in the other two groups. In the context of high family support, children reported high levels of well-being irrespective of their levels of vagal activity or environmental sensitivity. The findings suggest that among low SES families, when children experience a poorly supportive family environment and are highly sensitive to negative experiences, having a higher resting CVT may confer an advantage in terms of well-being. Implications for theory and practice are discussed.

SOC44

STRESS AND COMPASSION IN SCHOOL AGE CHILDREN: THE ROLE OF CARDIC VAGAL TONE

Sara Scrimin, Department of Developmental and Social Psychology, University of Padova;
Libera Mastromatteo, University of Padova; Martina Menti, University of Padova; Paolo Girardi,
University of Padova

The current study aimed to investigate whether compassionate behaviors in elementary school children are affected by stress. Moreover, we examined the relationship between cardiac vagal tone and compassionate behavior and whether cardiac vagal activity could moderate the stress-compassion link. Participants ($N = 80$, $Mage = 7.89$ years, 51% boys) were randomly assigned to 2 compassion-eliciting conditions (pain vs. mild distress) x 2 stress-conditions (stress vs. no stress). The stress exposed group was asked to complete an impossible tangram task before the compassion eliciting scene started. For the scene an experimenter entered the room and 1) accidentally hurt her feet (pain condition), 2) accidentally dropped a box full of small objects (mild distress condition). Children's reaction to the scene was video recorded and later coded. Children's heart rate was registered for the entire session, later rMSSD was computed. A multivariate mixed effects model including a subject random intercept showed a significant association between rMSSD and a three-way stress, compassion and time (baseline, stress, pause and compassion) interaction. Children in the pain condition showed greater self-regulation (no decrease in rMSSD) in the stress condition compared to the non-stress one. A poisson regression model showed that compassionate behaviors were influenced by a three-way interaction between stress, compassion condition and rMSSD. In the stress condition compassionate behaviors increased among children with greater vagal tone, this effect was stronger in the mild distress condition.

The findings suggest that there is a significant association between stress and compassionate behaviors in school age children and that this is moderated by their cardiac vagal tone.

O2-2

THE IMPACT OF PERIGESTATIONAL MORPHINE EXPOSURE ON THE ALCOHOL REWARD SYSTEM IN MALE AND FEMALE RATS

Chris Searles, Georgia State University; Hannah Harder, Georgia State University; Anne Murphy, Georgia State University; Lauren Hanus, Georgia State University; Myurajan Rubaharan, Georgia State University

Approximately every fifteen minutes, a baby is born in the US experiencing neonatal opioid withdrawal syndrome (NOWS). NIDA reports that since 2004, the rate of NOWS has increased 5-fold. Remarkably, the long-term consequences of early life exposure to morphine are largely unknown. Clinical studies have established that intrauterine exposure to drugs of abuse is a risk factor for adverse health outcomes in adult life, including drug use. Despite extensive knowledge about common mechanisms of action in the neural circuitry of reward that drive opioid and alcohol use, there is no data on the risks that those born with NOWS incur with alcohol use later in life. Here, we investigate the impact of perigestational opioid exposure on the mesolimbic reward system of rats at postnatal and adolescent ages. To do so, our lab has developed a clinically relevant model for morphine exposure during early development spanning conception to post-natal day 7. With this model, we show site-specific changes in mu opioid receptor (MOR) and potassium-chloride cotransporter (KCC2) expression; changes in MOR and KCC2 have previously been shown to alter reward-seeking behaviors in adult animals experiencing withdrawal. Using a novel three-dimensional analysis, we also explore how neuroinflammation, and more specifically, microglial morphology relate to these molecular changes, as previous literature dictates their mediation of the brain's morphine response. Lastly, we show changes in self-regulated alcohol consumption in adolescent rats exposed to morphine during early development. These changes contribute to a growing body of work that suggests long-term consequences following perigestational opioid exposure.

S4-2

NEONATAL EEG COHERENCE AND NEURODEVELOPMENTAL-RISK IN TODDLERS

Lauren Shuffrey, Columbia University Medical Center; Nicolò Pini, Politecnico Milano; Natalie Brito, New York University; Maristella Lucchini, Columbia University Medical Center; Joseph Isler, Columbia University; William Fifer, Columbia University

The overwhelming majority of studies examining prognostic markers of neurodevelopmental-risk during infancy focus on familial risk for autism spectrum disorder (ASD). Few studies have attempted to identify markers of neurodevelopmental-risk in community samples or in infants with adverse in-utero exposures. The present study examined associations between neonatal EEG

coherence, prenatal maternal depression, and developmental outcomes in toddlerhood. The final sample included 305 term-age infants (gestational age at birth 39.49 weeks) who had both neonatal EEG and later developmental assessments. EEG data were acquired during infant natural sleep 12 to 100 hours after birth (62.12–22.35) and developmental assessments were collected between 31 and 41 months of age (38.33–3.02). Increased short-range frontal delta, theta, and alpha intrahemispheric coherence and prenatal maternal depression scores on the Edinburgh Perinatal Depression Scale were associated with increased autism-risk scores on the Brief Infant-Toddler Social and Emotional Assessment ($= 1.53–1.98$, $t(298) = 1.98–2.71$, $p < .01$). Additionally, increased long-range frontal-parietal and frontal-temporal alpha intrahemispheric coherence and lower prenatal maternal depression scores were associated with higher cognitive scores on the Bayley Scales of Early Learning ($= 0.57–1.68$, $t(298) = 2.15–2.37$, $p < .01$). These data highlight the importance of addressing potentially modifiable risk factors during pregnancy, such as prenatal depression. Although prior studies have demonstrated alpha frontal hyperconnectivity and long-range hypoconnectivity in children with ASD, this is the first study to report that neonatal coherence is significantly associated with neurodevelopmental outcomes.

NEURO10

THE EFFECT OF HBA1C ON BIRTHWEIGHT VARIES BY INFANT SEX IN EARLY BUT NOT LATE PREGNANCY FOR WOMEN IN PAKISTAN

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Over 20 million infants are born with low birth weight (LBW) each year, with 75% of cases in Sub-Saharan Africa and Southern Asia. LBW is associated with infant morbidity, mortality, and lifelong health consequences. In high income countries, elevated HbA1c levels (an indicator of long-term glucose regulation) is associated with LBW. However, it is unclear if this relation exists in low- and middle-income countries, as research in these locations has been limited. Using secondary data from a subsample of pregnant women who gave blood samples ($N_{\text{total}} = 300$; $N_{\text{analyzed}} = 185$) and received antenatal care at the Aga Khan University Hospital in Karachi, Pakistan, this study sought to investigate: 1) whether HbA1c was negatively associated with birthweight and moderated by infant sex; and 2) if timing (i.e., 12–19 vs. 22–29 weeks' gestation) mattered. At 12–19 weeks' gestation, a multiple regression indicated that after adjusting for maternal weight and preterm birth, the overall model was significant [$R^2_{\text{Adj}} = .16$, $F(5,184) = 8.32$, p

NEURO7

ASSOCIATIONS BETWEEN ENVIRONMENTAL NOISE EXPOSURE AND RESTING-STATE FUNCTIONAL CONNECTIVITY IN CHILDREN

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Increased exposure to noisy environments may render it difficult for children to focus and understand speech, which may in turn lead to disparities in language development. While high levels of noise exposure have been associated with poorer language development in children in previous studies, less is known about whether increased environmental noise may impact neural functioning. In this study, we tested whether greater exposure to noise would be associated with differences in resting-state functional connectivity (rsfMRI) in language- and attention-related brain regions in children. A socioeconomically diverse sample of children aged 5-9 (N = 94, n=43 with complete data) was recruited to participate in a rsMRI scan session. Digital language processors (LENA) were used to measure average environmental noise levels over a typical day (recording range: 5.2-16h). The proportion of time the child spent exposed to more than 70 decibels was calculated. Seed-based connectivity analyses were conducted using IFG, STG, and insula as seed regions of interest. Controlling for child age, sex, and recording time, analyses revealed that higher noise exposure was associated with increased functional connectivity between the insula and anterior cingulate cortex, using a whole-brain voxel-wise threshold of p comparisons. These preliminary results align with work suggesting that increased connectivity may be a result of increased network use, perhaps needed to understand speech in difficult listening conditions. Future analyses will focus on longitudinal relations between noise exposure and brain development, as well as potential moderators of this association.

NEURO45

STRESS, PREDICTABILITY, PARASYMPATHETIC ACTIVITY, AND CHILDREN'S MOTIVATED BEHAVIORS

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Being able to effectively learn and use cues signaling rewards and threats is critical to survival. Chronic or extreme stress during childhood has been associated with alterations in these processes, but the mechanisms through which this occurs are not well understood. One hypothesis is that these effects are due to children in high stress environments being exposed to high levels of unpredictability. Additionally, variability in parasympathetic cardiac regulation, which is linked to both differential responses to stress in children and variability in sensitivity to cues of threat and reward, may contribute to these effects. Here, we examined whether parasympathetic cardiac regulation interacts with experiences of stress and perceptions of predictability to influence how children use learned information to approach and avoid rewards and threats. Measures of resting parasympathetic activity, perceptions of predictability, and exposure to stress were collected from 72 children (8-9 years old). Children's approach and avoidance of rewards and threats was assessed using an instrumental conditioning paradigm. We

found that higher levels of predictability were associated with more effective approach and avoidance behaviors, but only for children with high levels of resting parasympathetic activity. Overall, this research suggests that resting parasympathetic cardiac regulation moderates children's effective use of learned value information. Further, children's use of value information is related to their perceptions of environmental predictability.

GENETICS2

EPIGENOME-WIDE ANALYSIS OF BRAIN DNA METHYLATION IN OPIOID USERS AND CONTROLS

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Background

Opioid use poses significant risk to individuals in the United States. Epigenetic changes are a leading potential biomarker of drug dependence, but evidence is mostly limited to candidate gene analysis in whole blood. We conducted an epigenome-wide analysis of DNA methylation in brains of individuals who died from acute opioid intoxication and controls.

Method

Tissue samples were extracted from the dorsolateral prefrontal cortex of 160 deceased individuals (Mean = 35.15, SD = 9.42 years; 62% male; 78% White). The sample included 73 individuals who died of opioid intoxication, 59 group-matched psychiatric controls, and 28 group-matched normal controls. Bisulfite treated DNA was run on the Illumina Infinium MethylationEPIC BeadChip; analyses adjusted for sociodemographic characteristics, negative control and ancestry principal components, cellular composition, and surrogate variables. Methylation age was calculated using the Horvath and Levine clocks, and gene ontology (GO) analyses were performed.

Results

No CpG sites were epigenome-wide significant after multiple testing correction, but 17 sites reached nominal significance (p Conclusions

Results inform our understanding of the neurobiology of opioid use, and future research with larger samples across stages of opioid use will elucidate the complex genomics of substance use disorders.

NEURO26

MATERNAL AND INFANT RSA AND SCR RESPONSES TO THE STILL-FACE PARADIGM

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The Still-Face Paradigm (SFP) is commonly used to study infants' behavioral responses to stress. Although there is evidence suggesting that the SFP also results in physiological responses from infants, there is substantially less research investigating parents' physiological responses to this task. The purpose of this study was to explore whether mothers' average autonomic nervous system responses to the SFP were concordant with infants' average autonomic responses or whether mothers and infants exhibited discordant autonomic activity during the SFP.

Information about respiratory sinus arrhythmia (RSA) and skin conductance response (SCR)—which reflect parasympathetic and sympathetic nervous system activity, respectively—was collected from 99 seven-month-old infants and their mothers during a two-minute baseline and during each of the three two-minute episodes of the SFP. Results indicated that the autonomic responses of each member of the mother-infant dyad mostly were discordant. For example, infants exhibited a decrease in RSA during the still-face episode. In contrast, mothers exhibited significant decreases in RSA only during the play and recovery episodes of the SFP. Although both mothers and infants exhibited SCR increases during the play interaction, they exhibited opposite patterns of SCR activity during the still-face and recovery episodes. Specifically, infants' SCR levels increased during still-face episodes and decreased during recovery episodes, but mothers' SCR levels decreased during still-face episodes and increased during recovery episodes. Overall, this pattern of results supports a mutual regulation model of development and indicates that each member of the mother-infant dyad alternates periods of increased physiological self-regulation during stressful interactions.

SOC41

THE STUDY OF PARENTAL EMBODIED MENTALIZING IN SECURE VS. AN INSECURE INFANT-CAREGIVER DYAD

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During the pre-verbal period, infants and caregivers primarily rely on bodily-kinesthetic expressions to communicate with each other. The caregiver's implicit appreciation of and attunement to the infant's affective states at a visceral and motor level is known as Parental Embodied Mentalizing (PEM). The cross-modal, body-to-body dialogues of this interactive dance pertain fundamentally to the intersubjective unfolding of the attachment motivational system. The present study aims to investigate and compare PEM in the embodied intersubjective contexts of a secure and insecure infant-caregiver dyad. Measuring the risk and protective factors, the researchers assessed PEM and discussed the embodied narrative of each dyad through a 10-minute video of a free-play session. The researchers took a series of snapshots of the nested series of regulation, rupture, and repair throughout the videos and illustrated them by drawings to highlight the kinesthetic movement qualities. The results indicated different interactive movement patterns. In particular, a higher degree of PEM was accompanied by

protective factors including sustained presence, connectivity, attempts to repair, and creativity was observed in the secure dyad whereas the insecure dyad showed a lower score of PEM and risk factors such as disembodiment, controlling and intrusiveness, and clashing qualities of movement. We conclude that attachment is an embodied phenomenon and represents the way the infant's body has moved and has been moved by the caregiver's body. PEM illuminated the ports of entry in secure and disorganized attachment and identified treatment targets for clinical practice.

NEURO43

SOCIOECONOMIC STATUS MODERATES THE RELATIONSHIP BETWEEN PRENATAL MARIJUANA AND TOBACCO CO-EXPOSURE AND INFANT NEUROBEHAVIOR

Jocelyn Stanfield, Emory University; Cassandra Hendrix, Emory University; Anne Dunlop, Emory University; Elizabeth Corwin, Emory University; Dana Barr, Emory University; Patricia Brennan, Emory University; Karson Fair, The Miriam Hospital

Tobacco (TOB) and marijuana (MJ) are two of the most commonly used substances during pregnancy, but their individual and collective impact on child development remains poorly understood. In particular, few studies have examined the additive impact of TOB and MJ exposure on infant neurodevelopment, and no study has yet examined socioeconomic status (SES) as a moderator of this relationship. To address this gap in the literature, women were recruited during the first trimester of pregnancy to report on their substance use and to provide urine samples. These samples were subsequently assayed for cotinine and THC, which are considered valid biomarkers of TOB and MJ exposure, respectively. At two weeks postpartum, the NICU Network Neurobehavioral Scale (NNNS) was used to examine newborn neurobehavior (i.e., attention, excitability, and self-regulation; n=96). Newborns were grouped based on their prenatal exposure: co-exposed to TOB and MJ (n=27), exposed to TOB only (n=21), or not exposed to either TOB or MJ (n=48). Separate one-way ANOVAs revealed no differences between the exposure groups on any measure of newborn neurobehavior. However, SES did moderate the effect of prenatal exposures on newborn attention. As hypothesized, newborns who were prenatally exposed to TOB or TOB and MJ in tandem showed lower attention scores compared to unexposed newborns, only if they were also from a low SES household. There were no exposure-related differences in newborn attention in high SES households. Our findings emphasize the crucial role that socioeconomic factors during pregnancy play in determining offspring vulnerability to perinatal exposures.

NEURO3

A BIOPSYCHOLOGICAL PERSPECTIVE ON PRENATAL ALCOHOL EXPOSURE: INVESTIGATING THE PROTECTIVE ROLE OF MATERNAL RESILIENCE

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University of Southern California; Elizabeth Sowell, Children's Hospital Los Angeles; Dan Stein, University of Cape Town; Kristina Uban, University of California, Irvine

The variations in Fetal Alcohol Spectrum Disorder (FASD) conditions and previous findings that alcohol is necessary but not sufficient to cause symptomology underlines the multifaceted etiology of FASD. While research has primarily focused on risk factors, little is known about protective factors that buffer the teratogenic effects of prenatal alcohol exposure (PAE). This study examines how maternal psychological resilience affects neurodevelopmental outcomes in PAE children. Mother-child dyads (n=82 pairs; children 9-12 yrs; 51% girls; 52% PAE) from a prospective birth cohort study (the Prenatal Alcohol and SIDS and Stillbirth (PASS) Cohort), returned 9-12 years later for child white matter assessment using diffusion tensor imaging, all residing in Bishop Lavis, South Africa.

Statistical tests of global psychological resilience in mother, or alcohol consumption during pregnancy, predicting the child's white matter microstructure at age 9-12 years were analyzed using general linear modeling, with region of interest and average fractional anisotropy (FA) as outcome variables. To assess resilience and PAE effects in the brain, three tracts were assessed based on earlier (F_{major}) versus later (bilateral superior longitudinal fasciculus and F_{minor}) across postnatal development. We hypothesized alterations in white matter microstructure (lower FA) in children with PAE and/or with lower prenatal global resilience scores. Although preliminary results support the prediction that decreased maternal global resilience in pregnancy, or PAE, relates with lower FA in children, findings did not achieve significance in this sample. Follow-up analyses will examine how specific resilience factors impact white matter in children with PAE versus without PAE.

SOC16

CONNECT TO BABY: A NOVEL INTERVENTION FOR MOTHERS AND FATHERS DURING THE TRANSITION TO PARENTHOOD

Samantha Steimle, Georgetown University; Rachel Barr, Georgetown University; Rebecca Ryan, Georgetown University

The transition to parenthood is a time of heightened risk for mental health problems, particularly for economically disadvantaged parents (Wilson & Brooks-Gunn, 2001). Two of the strongest mental health buffers during the perinatal period are a positive coparenting relationship (McHale & Sirotkin, 2019), or the support and coordination between parents in childrearing, and high parenting self-efficacy, or expectations about one's ability to parent well (Jones and Prinz, 2005). Connect to Baby (CTB), a perinatal intervention, blends a coparenting program, Family Foundations (Feinberg et al., 2016), with Just Beginnings, a parenting program developed for at-risk fathers (Barr et al., 2014).

In CTB, mothers and fathers engage in a play-based parenting curriculum and interactive coparenting activities in order to strengthen parent-child and coparenting interactions. The inclusion of fathers alongside mothers in sessions, the focus on coparenting and parent-child relationships, and the use of digital media to facilitate practice of key skills, all help distinguish

CTB from other perinatal programs.

Last year, CTB was piloted with 18 families in DC's Wards 7 and 8. Pre-post analyses found that coparenting relationship quality (Brief Measure of Coparenting; Feinberg, Kan, & Goslin, 2009) and father involvement with the infant (FRPN Father Engagement Scale; Dyer, Kaufman, Cabrera, Fagan, & Pearson, 2015) increased from baseline to exit, while parental depression decreased (CESD-SF; Eaton, Muntaner, Smith, Tien, & Ybarra, 2004; Radloff, 1977). Our poster will present these findings with regard to the feasibility of CTB in the community and implications for low-income families if taken to scale.

COG18

THE EFFECT OF EARLY-LIFE ADVERSITY ON THE CORTISOL RESPONSE AND INTRUSIVE MEMORIES OF AN ADVERSE EXPERIENCE

Anthea Stylianakis, UNSW Sydney; Kathryn Baker, UNSW Sydney; Richard Bryant, University of New South Wales; Bronwyn Graham, University of New South Wales; Rick Richardson, University of New South Wales

Adverse events early in life (i.e., childhood), including abuse, neglect, parental divorce, and childhood illness, have been associated with an increased risk for later psychopathology and chronic health issues. The hypothalamic-pituitary-adrenal (HPA) axis releases a cascade of stress hormones in response to a stressor, including cortisol (in humans) or corticosterone (in rodents). As this axis undergoes substantial developmental throughout childhood, early life adversity can have a particularly detrimental impact on the functioning of this system. There is also evidence to suggest that the hormones released by the HPA axis during a psychologically stressful event (e.g., a car accident) play an important role in modulating the memory of the event. Specifically, increases in cortisol occurring as a result of stress have been shown to be a major contributor in the development of intrusive memories of that event, the presence of which are hallmarks of psychological conditions such as Acute Stress Disorder and Posttraumatic Stress Disorder. In this study, we examined the impact of early life stress on the cortisol response of adults following an acute stressor, as well as the frequency and level of distress caused by intrusive memories of distressing images. We found that exposure to early life stress resulted in both a heightened cortisol response to an acute stressor and a greater level of distress toward intrusive memories.

SOC15

UNPREDICTABLE MATERNAL SENSORY SIGNALS IN INFANCY ARE RELATED TO CHILD INTERNALIZING SYMPTOMS

Danielle Swales, University of Denver; Özlü Aran, University of Denver; Curt Sandman, University of California, Irvine; Laura Glynn, Chapman University; Tallie Baram, University of California, Irvine; Hal Stern, University of California, Irvine; Elysia Davis, University of Denver

Background: The causal processes underlying the developmental origins of mental illness begin far earlier than the emergence of symptoms. It is therefore essential to evaluate early factors contributing to mental health outcomes. The evidence that early experiences profoundly influence later psychopathology is undisputed. However, the existing literature focuses primarily on quality of these early life signals. **Objective:** We examine whether patterns of maternal sensory signals predict child risk for internalizing psychopathology. Further, because internalizing disorders are more prevalent among girls, sex differences are examined. **Method:** To assess the unpredictability of maternal sensory signals, 140 mother-child dyads (44.3% female) completed an unstructured play interaction at the age of 6 and 12 months. Maternal sensory signals were coded from video and patterns of maternal sensory signals were assessed. When the children were 8-13 years of age ($M = 9.8$, $SD = .9$), they completed self-report measures of anxiety and depression. **Results:** Unpredictable maternal sensory signals were positively associated with elevated depressive symptoms ($\beta = .31$, $p = .016$) and anxiety symptoms ($\beta = .25$, $p = .051$) in girls but not boys (depression: $\beta = -.03$, $p = .83$; anxiety: $\beta = .16$, $p = .18$). Notably, all analyses covaried maternal symptoms of depression and socioeconomic status. **Conclusions:** Findings suggest that the predictability of maternal sensory signals during infancy may have prolonged consequences of mental health through middle childhood. Further, girls may be more likely to develop internalizing disorders following unpredictable sensory signals in infancy.

SOC36

PERCEIVED AND ENVIRONMENTAL STRESS IN PREGNANCY IS ASSOCIATED WITH GESTATIONAL DIABETES MELLITUS

Samantha Syme, Barnard College; Cynthia Rodriguez, Columbia University Medical Center; Daianna Rodriguez, New York State Psychiatric Institute; Jennifer Barbosa, Columbia University; Lissete Gimenez, New York State Psychiatric Institute; Cristina Fernandez, Columbia University Irving Medical Center; William Fifer, Columbia University; Lauren Shuffrey, Columbia University Medical Center

Prenatal stress and gestational diabetes mellitus (GDM), which refers to any glucose intolerance that begins during pregnancy, are factors independently and strongly associated with adverse neurodevelopmental outcomes. However, the association between these two factors remains unclear. In a longitudinal study, we investigated the association between GDM and prenatal psychosocial stress in a sample of 87 mothers. Study-specific socio-economic status (SES) questionnaires captured prenatal psychosocial perceived stress factors (emotional support, financial support) and environmental stress factors (financial problems, food insecurity). Forty-one mothers had GDM (mean age 34.2 ± 5.6 years; 83% Hispanic ethnicity) and 46 mothers did not have GDM (mean age 30.2 ± 5.2 ; 67% Hispanic ethnicity). Gestational diabetes mellitus status was significantly associated with lower emotional support ($\chi^2(1) = 5.90$, $p = .02$), lower financial support ($\chi^2(1) = 11.28$, $p = .001$), and higher food insecurity ($\chi^2(1) = 5.27$, $p = .02$), but not associated with financial problems ($\chi^2(1) = 0$, $p = 1.00$). These results suggest that both perceived stress and environmental stress factors are associated with GDM on bivariate analyses

and further research is needed to explore these associations. Since both GDM and prenatal stress are associated with adverse maternal-infant postnatal outcomes, understanding the association between these two variables will help elucidate and mitigate prenatal risk.

O2-3

NEURAL RESPONSES TO INFANT AND OPIOID CUES AMONG OPIOID-DEPENDENT PREGNANT WOMEN

Alexandra Tabachnick, University of Delaware; Allison Hahn, University of Delaware; Rina Eiden, Pennsylvania State University; Robert Simons, University of Delaware; Mary Dozier, University of Delaware

Maternal substance use disrupts neural processing of infant cues (e.g., Rutherford et al., 2019; Rutherford & Mayes, 2017). However, less is known about how opioid dependence specifically relates to processing of infant cues relative to opioid cues.

For the present study, pregnant and peripartum opioid-dependent women viewed images in four conditions (infant, opioid, positive, and neutral) while electroencephalography data were recorded. Thirty-five women had usable data. The late positive potential (LPP) was measured (mean amplitude at Pz; 400ms-800ms after image onset). We hypothesized that women would show similar LPP amplitudes for the infant, opioid, and positive conditions. This pattern of results would indicate a disruption to typical processing, in which infant and positive images would be expected to be more motivationally salient than opioid images.

LPP amplitudes were significantly different across conditions ($F(3,136) = 3.349, p = .02$). Post hoc comparisons revealed that LPPs to infant images were significantly larger than LPPs to opioid ($p = .02$) and neutral ($p = .01$) images. However, LPPs to opioid images were not significantly different from LPPs to positive ($p = .16$) or neutral ($p = .65$) images. Similarly, LPPs to positive images were not significantly different from LPPs in any other condition.

Results were consistent with work showing that substance use is associated with blunted processing of positive images (e.g., athletic victories). However, we provide new evidence that opioid-dependent women exhibit enhanced neural responses to infant cues relative to opioid and neutral images, as would be expected in a non-opioid-dependent population.

SOC4

DISEASE RELATED EXPERIENCES OF PARENTS MAY INFLUENCE THE HOSPITAL VISITATION TIMING OF CHILDREN WITH ADHD, ASD AND OTHER CHRONIC DISEASES - A SURVEY OF PEDIATRICIANS IN JAPAN

Hanako Tajima, Department of Pediatrics, Nippon Medical School Musashi Kosugi Hospital; Miki Kakinuma, Nippon Veterinary and Life Science University; Izuru Nose, Nippon Veterinary and Life Science University; Yutaka Momota, Nippon Veterinary and Life Science University;

Morihisa Takarabe, Minami-Kyusyu University; Juri Ogawa, Nippon Medical School Musashi Kosugi Hospital

The timing of when parents decide to take their child to the hospital is important to ensure child health and safety. As children do not make these decisions, parents hold the primary responsibility for child wellness. The aim of this study was to determine how disease, disabilities and child behavior influence when and how often parents take their children to the hospital. A structured anonymous online survey was sent to pediatricians in Japan in January 2020. The pediatricians were queried about patients' dispositions including their reactivity to pain, expression of pain, behavior at the hospital, and the timing of the visit. Patients were school age children with autism spectrum disorder (ASD), attention-deficit hyperactivity disorder (ADHD), Down syndrome, mental retardation (MR), epilepsy, premature birth or allergies. Sixty-eight out of 80 pediatricians responded to the survey. Results indicate that parents of children with ASD, ADHD and MR took them to the hospital later than they should have. Conversely, children born prematurely or with allergies often visited hospitals with too mild symptoms. The creation of guidelines to assist parents in making the determination of when to visit the hospital are necessary.

SOC34

MATERNAL ANTI-SOCIAL BEHAVIOR AND AGE 6 CHILD VAGAL TONE ACROSS THREE CONDITIONS

Mary Tarsha, University of Notre Dame; Angela Kurth, University of St. Thomas; Ying Cheng, University of Notre Dame; Tracy Gleason, Wellseley College; Darcia Narvaez, University of Notre Dame

Healthy human neurobiological development requires intensive nurturing and responsiveness in the first years of life, particularly due to brain immaturity and rapid growth (Schore, 2019). Early social stress increases the likelihood of social and psychological maladaptation, partly through compromises to neurological and physiological self-regulatory systems that manage stress. The caregiving environment is thus an important context for understanding the development of baseline stress experience and flexible regulatory responses. We examined maternal antisocial behavior as an aspect of the caregiving environment that influences development of children's autonomic regulation.

Mothers (N = 78) completed the Past Action Report (Narvaez et al., 2016), a questionnaire addressing antisocial behavior in the past year, and we measured respiratory sinus arrhythmia (RSA) in their 6-year-old children at three points: baseline, stress, and recovery. The model included a latent variable of maternal antisocial behavior included viciousness (5 items), superiority (3 items), and social opposition (9 items) and controlled maternal report of recent stress, income, SES, and fulfillment of her basic needs in childhood. Latent growth curve modeling demonstrated that mothers' antisocial behavior predicted children's RSA at baseline and recovery, but not under stress, and did not predict the child's vagal flexibility or dynamic vagal tone. Results suggest that a caregiving environment that includes higher social stress, as

measured by maternal antisocial behavior, predicts development of suboptimal physiological self-regulatory systems characterized by higher general stress levels.

SOC35

POSITIVE AND NEGATIVE FIRST-YEAR CAREGIVING PREDICTS AUTONOMIC REGULATION FIVE YEARS LATER

Mary Tarsha, University of Notre Dame; Lijuan Wang, University of Notre Dame; Darcia Narvaez, University of Notre Dame

Extensive neurobiological immaturity in childhood results in malleability to environmental influences, especially in the first year of life, with neurobiological alterations that often persist into adulthood (Schor, 2019; Champagne, 2018).

In order to examine the influence of early experience on autonomic regulation, a longitudinal study was conducted with mothers and their children ($N = 78$): at 12 months, early life experience—both positive and negative factors—was assessed for the child and for the mother in childhood according to consistency with the evolved developmental niche (EDN), the ecological system of care evolved to foster human health. Five years later, respiratory sinus arrhythmia (RSA) was assessed for both members of the dyad across three conditions: baseline, stress and recovery. RSA is a transdiagnostic biomarker for emotional regulation, psychopathology, and is an online metric of parasympathetic functioning (Beauchaine, 2015). Utilizing latent basis coefficient modeling, a type of latent growth curve modeling, both tonic vagal tone and flexibility (change) of vagal functioning were examined.

For mothers, childhood history of positive home climate predicted higher mean levels of RSA across all conditions whereas childhood social embeddedness predicted both her tonic and flexible parasympathetic regulation. For children, corporal punishment at 12 months predicted lower levels of vagal functioning across all conditions, suggesting a more stressed tonic level of general functioning. The results support the notion that provision of the EDN may promote neurobiological architecture needed for parasympathetic functioning and autonomic flexibility.

This is one of the few studies examining vagal flexibility as a consequence of early experience.

NEURO4

HIGHER LEVELS OF INTERLEUKIN-6 AND TUMOR NECROSIS FACTOR-ALPHA ARE ASSOCIATED WITH SUICIDAL IDEATION IN ADOLESCENTS

Giana Teresi, Stanford University; Rachel Weisenburger, Stanford University; Johanna Walker, Stanford University; Yael Rosenberg-Hasson, Stanford University; Holden Maecker, Stanford University; Ian Gotlib, Stanford University; Tiffany Ho, University of California, San Francisco; Jillian Segarra, Stanford University

Background: Suicidal ideation (SI), a major risk factor for subsequent suicidal-related behaviors and attempts, often onsets during adolescence (ages 13-18). Although studies have shown that pro-inflammatory cytokines are associated with SI in adults with depression, less is known about biological markers of SI in adolescents. Here we examined the association between pro-inflammatory cytokines and current SI in a sample of depressed adolescents and healthy controls.

Methods: 38 adolescents meeting threshold or subthreshold criteria for a DSM-IV depressive disorder and 20 healthy controls (41 female, 16.26±1.21 years) gave a dried blood spot (DBS) sample from which we extracted median fluorescence intensity values for Interleukin-6 (IL-6) and Tumor Necrosis Factor (TNF- α). Participants also completed the Suicidal Ideation Questionnaire (SIQ-JR) and Reynolds Adolescent Depression Scale (RADS-2). We conducted negative binomial regressions covarying for age, sex

Results: In the full sample, higher SIQ scores were associated with higher levels of both IL-6 ($p = 0.018$) and TNF- α (p Discussion: We found that peripheral inflammation is positively associated with levels of SI reported in the past month in adolescents with and without depression. Given the scalability of DBS protocols, these findings could contribute to the identification of risk and treatment targets. Results should be replicated in larger samples, and longitudinal research should examine the causal nature of the relation between inflammation and SI.

STRESS8

A MODEL OF NEONATAL NICU STRESSORS AND THEIR EFFECT ON HIPPOCAMPAL CELL PROLIFERATION AND ADULT REELIN LEVELS

Brian Timmerman, Wayne State University; Sean Mooney-Leber, Penn State University; James Kina, Wayne State University; Alexis Taylor, Wayne State University; Hailee Zarheddine, Wayne State University; Shazal Khan, Wayne State University; Yusuf Yasarlar, Wayne State University; Saadia Taj, Wayne State University; Susanne Brummelte, Wayne State University

In 2018, over 10% of U.S. live births were preterm. Children born preterm often display cognitive and developmental impairments that may be associated with the number of neonatal stressors they experience while they are in the Neonatal Intensive Care Unit (NICU). Utilizing a rodent model, we investigated how two common NICU stressors, namely procedural pain and reduced maternal care, may alter brain development. Male and female rats were bred in-house. The day after birth (postnatal day 1 (PD1)) litters ($n=8$) were culled to 4 male and 4 female pups. Pups received needle insertions into their paws (pain) or paintbrush stimulation (touch control) and were then returned to their cages, either within a tea-ball infuser to reduce maternal care (isolation), or on the nest with littermates (control). This produced four groups within each litter: pain, pain + isolation, touch, touch + isolation. Four sessions of pain/isolation exposure were performed daily from PD1–4. Subjects were sacrificed at PD8 or adulthood. We then immunohistochemically analyzed brains for Ki67 (PD8s and adults), a marker of cell proliferation, and reelin (adults only), a protein involved in neural migration and synaptic plasticity. We found no significant differences in cell proliferation in the dentate gyrus at either age. However, preliminary data suggests neonatal stress may alter the density of hippocampal

reelin-positive cells, which may play a role in the altered stress response and behavior that we previously observed in these animals. Future research will investigate ways to alleviate neonatal stress and its effects on brain development.

STRESS15

DISTRESS AMID COVID-19 AMONG THOSE EXPOSED TO EARLY LIFE STRESS

Emily Towner, University of California, Los Angeles; Bridget Callaghan, The University of California, Los Angeles

Stress during early life is associated with a range of mental health problems later in life (Norman et al., 2012). But how might those exposed to early life stress respond to a collective health crisis, such as the global COVID-19 pandemic? We addressed this question in a college sample ($N = 130$) in the weeks following the global outbreak of COVID-19. We asked participants whether they had experienced a range of adverse early events and about the impact of those events using the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994) and the Childhood Traumatic Events Survey (Pennebaker & Susman, 2013). We found that early life stress was positively associated with both state anxiety and current depression, after controlling for sex, age, subjective social status and prior mental health. Furthermore, early life stress was associated with gastrointestinal distress after controlling for sex, age, subjective social status and prior gastrointestinal distress. These results fit with the idea that early life adversity increases people's risk of distress during stressful events later in life—such as COVID-19. Identifying groups most at-risk during this unprecedented event will help us to target appropriate interventions for those most in need in order to help mitigate the potential negative mental health effects of the pandemic.

S4-1

EMERGENCE OF INDIVIDUAL DIFFERENCES IN FUNCTIONAL BRAIN

DEVELOPMENT DURING THE FIRST YEAR OF LIFE: IMPLICATIONS FOR RISK & RESILIENCE

Sonya Troller-Renfree, Teachers College, Columbia University; Natalie Brito, New York University

A growing body of research highlights the importance of individual differences in infant brain function for predicting later cognitive, social, and emotional outcomes. In this symposium, we will explore the emergence of individual differences in infant brain function and how such differences may be predictive of developmental pathways of risk and resilience. To begin, Dr. Brito will offer opening remarks. Next, Dr. Shuffrey will present her work linking individual differences in neonatal EEG to neurodevelopmental outcomes in toddlerhood. Next, in a preregistered investigation, Dr. Troller-Renfree will examine links between maternal stress during pregnancy and perinatal resting EEG. Building upon Dr. Troller-Renfree's work, Diana Lopera-Perez will present her research linking family's household assets to infant EEG patterns in an older (7 months) and international sample of infants. Finally, Dr. Filippi will present her

work linking individual differences in temperament to amygdala-cingulate connectivity, which may provide insights into the neural origins of anxiety. Presentations will be followed by a lively discussion moderated by Dr. Brito, where audience members will be invited to enter a dialogue with the speakers. The speakers will also discuss unifying theory and gaps in the research. This symposium, consisting of five female researchers from across the United States, showcases innovative work using a variety of assessment tools (behavior, cortisol, EEG, MRI) in both domestic and international investigations. In sum, we will demonstrate the importance of psychobiological assessment in infancy for identifying and understanding how differences in neurodevelopment may result in developmental trajectories of risk or resilience.

S4-3

INFLUENCE OF PRENATAL MATERNAL STRESS ON PERINATAL INFANT EEG: A PREREGISTERED INVESTIGATION

Sonya Troller-Renfree, Teachers College, Columbia University; William Fifer, Columbia University; Jerrold Meyer, University of Massachusetts; Kimberly Noble, Teachers College, Columbia University

Chronic family stress has deleterious effects on child neurodevelopment. Recent research suggests that maternal perceived and physiological stress predict alterations in infant brain function before the end of the first year of life (e.g., Troller-Renfree et al., 2020; Pierce et al., 2019). These alterations have been linked to later deficits in cognitive and emotional functioning, making their early identification paramount for intervention. One gap in this area of research is an understanding of the extent to which these maternal stress-related alterations in infant EEG are related to gestational stress and if they are present shortly after birth. The present study is a preregistered investigation of whether gestational maternal stress (perceived and physiological) predicts alterations in infant brain function at 1 month of age. Perceived stress was measured using the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1994), physiological stress was measured using maternal hair cortisol concentration, and brain activity was measured using resting EEG (frequency bands: theta [3-5 Hz], alpha [6-9 Hz], beta [13-19 Hz], and two gamma frequency ranges [21-30, 31-45 Hz]). Preliminary results from a racially and socioeconomically diverse sample (N=94) suggest that neither perceived ($r = -.193$ -.205, p s = .176-.931) nor physiological maternal stress ($r = -.188$ -.102, p s = .378-.916) reported in the last month of pregnancy (gestational age 35-40 weeks) predict individual differences in infant EEG. Results will be discussed in a broader framework detailing the effects of environmental stress on trajectories of infant brain development during the first year of life and its implications for later functioning.

O3-3

CARDIAC VAGAL CONTROL IN RESPONSE TO ACUTE STRESS DURING PREGNANCY: ASSOCIATIONS WITH LIFE STRESS AND EMOTIONAL SUPPORT

Irene Tung, University of Pittsburgh; Robert Krafty, Emory University; Meaghan Delcourt, University of Pittsburgh; Nadine Melhem, University of Pittsburgh; Kathryn Keenan, University of Chicago; Alison Hipwell, UPMC

Exposure to life stressors during pregnancy can disrupt maternal stress regulation and negatively impact offspring health. Despite the important role of cardiac vagal control in stress regulation, few studies have investigated the influence of life stress on cardiac vagal control (heart rate variability; HRV) during pregnancy. This study aimed to (1) characterize patterns of vagal control in response to a laboratory stressor administered in pregnancy and (2) examine the effects of life stressors and emotional support on resting vagal tone, reactivity, and recovery. Participants included 191 pregnant women (79% Black American) recruited from the community (73% receiving public assistance). HRV was recorded continually during the preparation, task, and recovery periods of the Trier Social Stress Task (TSST) and indexed by the root mean square of successive differences (RMSSD). Participants self-reported recent exposure to life stressors and emotional support. Piecewise growth curve modelling was used to model rates of reactivity and recovery, adjusting for pregnancy week and recent health problems. Contrary to hypotheses, higher levels of life stress predicted greater vagal withdrawal (reactivity: $\beta = -.29$, $p = .01$) and greater vagal rebound (recovery: $\beta = .44$, p high emotional support). Results suggest that pregnant women living with frequent life stressors may exhibit more rapid vagal responses to threat, potentially reflecting physiological adaptation to an anticipated high-stress environment. Emotional support may facilitate these responses, although studies are needed to investigate the long-term health outcomes resulting from this stress response pattern.

SOC9

THE RELATION BETWEEN FINE MOTOR ABILITY AND SOCIAL-EMOTIONAL SKILLS IN PRESCHOOLERS

Taylor Ullrich, DePaul University ; Julie Campbell, Illinois State University; Eliza Nelson, Florida International University; Audrey Mcnamara, Illinois State University ; Kianna Klednworth, Illinois State University

Little is known about the relation between fine motor skills and social-emotional development. Previous research has found that fine motor ability is predictive of a child's ability to understand social situations in which someone displays inappropriate behavior (Tenenbaum & Leonard, 2019). This study examines whether social-emotional interactions can predict fine motor skills as assessed by performance on art projects. Social-emotional development and art skills in 3-5-year old preschoolers ($n = 158$) were examined during 12 weekly, 30-minute art classes. Children observed brief instructions, after which the students worked on their projects using a variety of mediums. Research assistants recorded social-emotional behaviors in real-time using iPads with a custom ethogram. Positive peer behaviors included working together and helping, while neutral and negative behaviors included working alone and conflict. Positive teacher interaction behaviors included focused attention, positive engagement, and guided instruction, while negative behaviors included non-compliance. Photos of each child's art project were taken and scored using a modified formal elements art therapy scale (FEATS; scores vary from 0-8) such that a higher level of detail used indicated more sophisticated fine motor skills. Linear regression indicated a significant relationship between peer interactions and art score ($p < 0.001$). Art score increases by 1.46 for each point increase in positive peer interaction. As positive interactions with teachers increased, preschoolers' art scores decreased by .55 ($p <$

.000). These results indicate that the development of social-emotional behaviors may have a relationship to fine motor skills as assessed by art projects.

O5-5

BEHAVIORAL INHIBITION AND DUAL MECHANISMS OF ANXIETY RISK: DISENTANGLING NEURAL CORRELATES OF PROACTIVE AND REACTIVE CONTROL

Emilio Valadez, University of Maryland, College Park; Sonya Troller-Renfree, Teachers College, Columbia University; George Buzzell, University of Maryland; Heather Henderson, University of Waterloo; Andrea Chronis-Tuscano, University of Maryland; Daniel Pine, NIMH; Nathan Fox, University of Maryland

Background: Behavioral inhibition (BI) is a temperament style characterized by heightened reactivity and negative affect in response to novel people and situations, and is a strong predictor of anxiety problems later in life. However, not all children with BI develop anxiety problems, and mounting evidence suggests that how one manages their cognitive resources (cognitive control) influences anxiety risk. The present study tests whether more (proactive control) or less (reactive control) planful cognitive strategies moderate relations between BI and anxiety. **Methods:** Participants included 144 adolescents (55.9% female) whose temperament was assessed during toddlerhood. In adolescence ($M_{age} = 15.4$ years), participants completed an AX Continuous Performance Test while EEG was recorded in order to disentangle neural activity related to proactive (cue-locked P3b) and reactive (probe-locked N2) control. **Results:** BI was associated with greater total anxiety scores only among adolescents with smaller $\Delta P3b$ s and larger $\Delta N2$ s – a pattern consistent with decreased reliance on proactive strategies and increased reliance on reactive strategies. Additionally, a larger $\Delta P3b$ was associated with greater total anxiety scores. **Conclusions:** BI relates to risk for anxiety specifically among adolescents who rely less on proactive strategies and more on reactive control strategies. Results further suggest that proactive control differentiates a BI-related etiological pathway to anxiety from a more general pathway to anxiety occurring regardless of BI level. Thus, developmental context (i.e., temperament) moderates the association between anxiety and proactive control. The present study is the first to characterize how proactive and reactive control uniquely relate to pathways toward anxiety risk.

S5-5

EARLY PARENTING INTERVENTION EFFECTS ON AT-RISK CHILDREN'S NEURAL REACTIVITY TO FACES

Emilio Valadez, University of Maryland, College Park; Nim Tottenham, Columbia University; Alexandra Tabachnick, University of Delaware; Daniel Pine, NIMH; Mary Dozier, University of Delaware

Early adversity is associated with atypical neurodevelopment and heightened reactivity to potential threat. The present study aimed to test the causal impact of an early parenting intervention (Attachment and Biobehavioral Catch-up; ABC) on children's neural processing of threatening faces in a longitudinal randomized clinical trial. Participants (N = 60, Mage = 10.0 years) included 41 high-risk children whose parents were randomized to receive either ABC (n = 21) or a control intervention (n = 20) while children were infants, in addition to a comparison sample of low-risk children (n = 19). Children viewed pictures of fearful and neutral faces during functional magnetic resonance imaging. Across both types of faces, high-risk children exhibited greater occipital cortex and fusiform gyrus activation than low risk-children, suggesting greater orienting to potential threat. Additionally, children in the ABC group had greater face-related activation than children in the control intervention group in clusters of brain regions including the right orbitofrontal cortex, right insula, and bilateral anterior cingulate cortex & brain regions commonly associated with emotion regulation. There were no group differences in a fearful minus neutral contrast; however, in light of previous findings that maltreated children tend to perceive even neutral faces as more threatening than non-maltreated children, results suggest that early parenting intervention (in this case, ABC) enhances at-risk children's emotion regulation in the face of potential threat.

PS-3

BRAINS IN SYNC PROJECT: MATERNAL PRE- AND POSTNATAL ANXIETY AND MOTHER-INFANT NEURAL SYNCHRONY

Marion van den Heuvel, Tilburg University

Most mothers naturally connect with their infant after birth, but not all do. As a result of pre- and postnatal exposure to maternal anxiety, mother and infant may both develop characteristics, such as maternal hypervigilance and difficult infant temperament, which increases the risk for disturbed mother-infant interactions postnatally. These characteristics are likely to interact, leading to a vicious cycle that is hard to break without intervention.

The aim of the Brains in Sync (BIS) Project is to identify the behavioral predictors and neural bases of mother-infant interaction in the context of maternal perinatal anxiety. The interaction patterns and brain functioning of anxious (N=50) and well-functioning mother-infant pairs (N=50) will be compared by employing innovative techniques such as dual-EEG measurement and experience sampling method (ESM). Dual-EEG will be measured by applying EEG on mother and infant simultaneously during three interaction sessions of 5 minutes: free play, bedtime story (book), and low-contact (mother looks at phone). In this talk, the project will be introduced and preliminary results will be presented.

This project may transform the way we understand how mothers and infants are connected on a biological level and could lead to the identification of a novel brain-to-brain synchrony biomarker for identifying at-risk mother-infant dyads. Importantly, results of this project will not only elucidate how maternal prenatal anxiety can leave long-lasting biological traces on mothers,

infants, and dyads, but also provide unique knowledge on how to get mother and infant back on the same wavelength, both figuratively and literally.

STRESS24

THE BABY-RELATED ANXIETY AND BEHAVIOR INVENTORY (BABI): AN EXPERIENCE SAMPLING QUESTIONNAIRE

Marion van den Heuvel, Tilburg University; Jessica Vergeer, Tilburg University; Myrthe Boekhorst, Tilburg

The mother-infant relationship is foundational for children's socio-emotional and cognitive development. However, not all mothers are able to provide warm and functional interactions. Approximately, 18-25% of mothers display anxiety in the early postnatal period, which could lead to the development of negative maternal characteristics, such as maternal hypervigilance and checking behaviors. These could lead to disturbances in the mother-infant relationship that may result in poorer child outcomes later in life. Since anxious dyadic interactions are likely subtle and only visible with micro-analytic approaches and naturalistic data collection methods, existing questionnaires will not suffice. By utilizing experience sampling methods (ESM) it will be possible to probe maternal-infant interaction patterns at home and more detailed than ever before.

In this study, we set out to develop and validate a novel questionnaire, the Baby-related Anxiety and Behavior Inventory (BABI), specifically targeted to mothers within 0-6 months after birth, related to maternal anxiety, worry about the baby, checking behaviors (i.e., whether the child is still breathing) and mother-infant interaction. To develop our questionnaire, started with screening for useful items in existing questionnaires about anxiety, stress, and worry. We then gathered information on pregnancy vlogs/blogs about additional themes. Next, we ran focus groups to gather input from mothers that have experienced postnatal anxiety in the past. For our final step, we consulted several experts in perinatal mental health. In this presentation, we will outlay our procedure for developing and validating our novel questionnaire and present findings from our focus groups.

SOC42

IDENTIFYING SPECIFIC ATTRIBUTES OF CAREGIVING-RELATED EARLY ADVERSITIES TO PREDICT DIMENSIONS OF PSYCHOPATHOLOGY DURING CHILDHOOD

Anna Vannucci, Columbia University; Ian Douglas, Columbia University; Andrea Fields, Columbia University; Aki Nikolaidis, Child Mind Institute; Jacob DeRosa, Child Mind Institute; Charlotte Heleniak, Columbia University; Paul Bloom, Columbia University; Syntia Hadis,

Columbia University; Michelle VanTieghem, Columbia University; Nicolas Camacho, Columbia University; Lisa Gibson, Columbia University; Tricia Choy, University of California, Riverside; Michael Milham, Columbia University; Nim Tottenham, Columbia University

There is substantial heterogeneity in psychopathology following caregiving-related early adversity (crEA); however, specific links between heterogeneous crEA exposures and mental health outcomes remain under-defined. This study seeks to identify crEA components that are most important for predicting symptom severity on psychopathology dimensions using data-driven, machine learning methods. Participants were 225 children (6-12 years, 122F/103M) exposed to heterogeneous crEAs (abuse, neglect, caregiver separation, etc.). crEAs and child psychopathology were assessed through multiple caregiver interviews and questionnaires. Psychopathology items were clustered through bagging-enhanced Louvain community detection, which identified six stable and reproducible psychopathology dimensions. Random forest models were used to identify crEA attributes that are most important for predicting each dimension. Emotional abuse and crEA timing/duration were top predictors of out-of-sample psychopathology severity across all dimensions, suggesting domain-general risk may be linked to these crEA attributes. However, other crEA exposure types exhibited differential importance in predicting distinct psychopathology dimensions: (a) caregiver separation and instability were among the most important predictors uniquely for anxiety; (b) physical and sexual abuse for disruptive mood dysregulation and antisocial behaviors; and (c) physical and supervisory neglect particularly for inattention and hyperactivity. Planned analyses include cross-validation and permutation tests to assess model robustness and significance. This study highlights the value of applying machine learning methods to disentangle the complex relationship between the early caregiving environment and child mental health. These findings underscore the importance of considering transdiagnostic crEA attributes for identifying domain-general psychopathology links and experience-specific crEA characteristics that are most salient for differentially predicting discrete psychopathology dimensions.

STRESS5

SUBORDINATE SOCIAL ENVIRONMENT DELAYS REGENERATION IN SPINY MICE (ACOMYS CAHIRINUS)

Justin Varholick, University of Florida; Gizelle Godinez, University of Florida; Jacob Corll, University of Florida; Sarim Mobin, University of Florida; Ashley Jenkins, University of Florida; Malcolm Maden, University of Florida

Social adversity can effectively delay growth and development, but whether such phenomena extend to regeneration—a window into the processes of development—remains understudied. Capitalizing on the robust regenerative abilities and social nature of spiny mice (*Acomys cahirinus*), we investigated whether differential social environments are linked to differential rates of regeneration. We hypothesized that *Acomys* exposed to higher levels of social adversity associated with subordinate social status would have delayed regeneration compared to their dominant ranked cage-mates, regardless of sex. After observing two 10-minute periods of activity for 3 consecutive days across 3 consecutive weeks individual dominance status within groups was determined. An ear pinna of each *Acomys* was then injured with a 4mm biopsy

punch and ear-hole closure was measured every 5 days until the dermal tissue was fully regenerated with the biopsy holes closed. All investigators were blinded to dominance rank throughout the study. As hypothesized, subordinate ranked *Acomys* had delayed tissue regeneration compared to their dominant ranked cage-mates, regardless of sex, with an overall delayed time to ear-hole closure. Notably, subordinate ranked male and female *Acomys* engaged in high levels of social avoidance, refraining from stereotypical freezing and supine posturing observed in common laboratory rodents. We also examined differential mRNA expression using RT-qPCR in the liver and adrenal gland to begin understanding differential signaling in the hypothalamic-pituitary-somatotropic and -adrenal axes, respectively. This study lays the groundwork for investigating other modifiable risk factors identified in the field of developmental psychobiology affecting the trajectories of regeneration.

O1-4

LINKS BETWEEN PARENTS' PARASYMPATHETIC REGULATION AND CHILDREN'S OBSERVED PLAY BEHAVIORS IN PRESCHOOL: THE MODERATING ROLE OF ANXIETY

Nicholas Wagner, Boston University; Andrea Chronis-Tuscano, University of Maryland; Christina Danko, University of Maryland; Kelly Smith, University of Maryland; Danielle Novick, University of Maryland; Lindsay Druskin, University of Maryland; Kenneth Rubin, University of Maryland

Behavioral inhibition, a temperament trait characterized by fear in response to novelty,¹ places young children at subsequent risk for emotion regulation² difficulties and eventual anxiety disorders.³ Rubin's transactional developmental model shows that BI and its consequences are reinforced and exacerbated by children's reciprocal interactions with their parents. In this model, parents often perceive their children as highly vulnerable and enact overly protective and controlling behaviors.^{4,5} Although research supports the notion that a parent's response to their child's needs may depend, in part, on the degree to which their physiological regulation supports, rather than undermines, context-appropriate and synchronous responses,⁶ no research has examined the implications of parents' parasympathetic regulation for the play behaviors of children high on BI.

Using baseline data from 151 parents and preschoolers (Mage = 53 months, 49% male) with high BI enrolled in a randomized control trial intervention, the current study examines the associations between parents' respiratory sinus arrhythmia (RSA) while watching their children be exposed to a novel clown (e.g., social stressor), an index of parasympathetic nervous system (PNS) regulation, and children's reticent (e.g., onlooking, shy) play behaviors as observed in their preschool classrooms. Results from a saturated path model suggest that lower RSA during the exposure, controlling for pre-exposure levels, is associated with more observed reticence, but only for children who met criteria for a social anxiety disorder as determined by clinical interview (ADIS-5). Findings suggest parents of socially anxious children may have reduced PNS resources during times of challenge and stress, which exacerbates observed reticent behaviors for anxious children.

NEURO35

RISK FACTORS FOR DEPRESSION FOLLOWING EARLY LIFE STRESS: RECENT LIFE STRESS AND NACC ACTIVATION

Claire Waller, the University of California, Los Angeles (UCLA); Adriana Mendez Leal, UCLA; Yael Waizman, University of California, Los Angeles; Joao Guassi Moreira, University of California, Los Angeles; Emilia Ninova, UCLA; Jennifer Silvers, UCLA

Individuals who experienced previous institutional (PI) caregiving (e.g. in orphanage care) are at heightened risk for mental illness, including depression. Recent stressful events (RSEs) may exacerbate this risk. Institutionalization, stressful events, and depression are all associated with nucleus accumbens (NAcc; linked to reward and motivation) hypoactivation to positive affective stimuli. This pre-registered study examined links between the number of RSEs (Life Events Questionnaire) and depression (Revised Child Anxiety and Depression Scale, depression subscale) in 19 PI (11 females, Mage = 14.47 years) and 26 comparison youth (19 females, Mage = 13.15 years), alongside possible moderation of this relationship by PI status. Additionally, we used a conditional process analysis to examine if PI status moderated the relationship between stressful events and depression through NAcc activation. More RSEs predicted higher depression ($\beta = .275$, $t = 2.392$, $p = .021$), and PI status moderated this relationship ($\beta = .671$, $t = 2.101$, $p = .042$) such that stressful events predicted depression in PI ($\beta = .091$, $t = 3.517$, $p = .001$) but not comparison youth ($\beta = .238$, $t = 1.265$, $p = .213$). NAcc activation to happy faces did not differ between groups ($t = .639$, $p = .527$), nor predict depression ($\beta = -.949$, $t = -1.756$, $p = .087$). We found no evidence that PI status moderated the relationship between RSEs and depression through NAcc activation (index of moderated mediation estimate = .1345, 95% CI -.099 to .511). These findings suggest exposure to recent stress increases depression risk in PI youth, but not as a result of altered NAcc function.

COG3

PROBABILITY OF SHOCK'S INFLUENCE ON ANXIETY IN CERTAIN AND UNCERTAIN CONTEXTS

Emily Weiss, National Institute of Mental Health; Katherine Foray, National Institute of Mental Health; Ryan Philips, National Institute of Mental Health; Monique Ernst, National Institute of Mental Health; Christian Grillon, National Institute of Mental Health

A startle response is objective measure used to assess an involuntary response of fear (in certain context) or anxiety (in uncertain context). However, the precise effect of varying stimulus probabilities on startle responses has yet to be studied in detail and is the focus of the present study. Twenty-two participants performed a 4-arm aversive bandit task, in which they selected the arm perceived to have lowest chance of shock. Participants were instructed to rate their perceived chance of being shocked (expected probability) and then received feedback on their actual chance of being shocked (actual probability). The probabilities of being shocked were divided into quartiles [Bin 1(0.2-0.35), Bin 2(0.35-0.5), Bin 3(0.5-0.65), and Bin 4(0.65-0.8)] to measure differences in startle responses. Startle was analyzed using a one-way ANOVA. The

actual probability of receiving a shock influences the startle response ($t = 6.15$, $p = 0.0004$). Additionally, there is a significant difference between bin 1 ($t = 13.3$, $p = 0.0003$), 2 ($t = 13.21$, $p = 0.0003$), and 3 ($t = 7.2$, $p = 0.0074$) when compared to bin 4, resulting in a quadratic curve where bin 4 produces the largest startle response. The startle response increases sharply after reaches a probability of 0.65, as opposed to a gradual increase as the chance of shock increased. These results suggest that startle is modulated by the actual probability of shock, where startle response increased quadratically as the chance of being shocked increased linearly. Thus, increasing surety of a threat could result in increasingly sharper feelings of fear/anxiety.

NEURO38

ASSOCIATIONS BETWEEN MATERNAL HOSTILITY AND INFLAMMATORY CYTOKINE REGULATION IN ADOLESCENTS

Rachel Weissman-Tsukamoto, Northwestern University; Eric Finegood, Northwestern University; Adam Leigh, Northwestern University; Lauren Hoffer, Northwestern University; Edith Chen, Northwestern University; Gregory Miller, Northwestern University

Epidemiologic research suggests that harsh parenting may detrimentally affect some aspects of physical health in youth. Inflammation is hypothesized to mediate these associations, but most studies have used cursory biomarkers, like C-reactive protein. Here, we took a more in-depth look at the relationship between adolescents' reports of harsh parenting and the regulation of inflammation. In a sample of adolescents assessed in 8th ($n = 271$) and 10th grade ($n = 246$), we stimulated peripheral blood leukocytes with multiple ligands, mimicking exposure to microbial stimuli, tissue damage, and environmental toxicants. In other cultures, we included glucocorticoids and IL-10 to evaluate sensitivity to inhibition. Release of inflammatory cytokines (IL-6, IL-8, TNF- α and IL1b) was measured by immune-assay. We used multiple regression, controlling for income-to-needs ratio, gender, race/ethnicity, age, and puberty. In 8th grade, youth who reported higher levels of maternal hostility displayed larger cytokine responses to the ligands (composite $\beta = .13$, $p = .02$; AGE-BSA $\beta = .15$, $p = .01$; HSP60 $\beta = .14$, $p = .01$; LPS $\beta = .06$, $p = .28$; R848 $\beta = .09$, $p = .14$). Hostility was marginally associated with decreased sensitivity to inhibition by glucocorticoids and interleukin-10 (composite $\beta = -.09$, $p = .10$). In 10th grade, these relationships were not apparent ($p = .43$ and $.22$, respectively). Results suggest that in early adolescence, maternal hostility is associated with more pronounced cytokine responses to triggering stimuli, and with marginally lower sensitivity to anti-inflammatory compounds. This phenomenon was not observed by late adolescence, which could reflect contextual or developmental changes occurring between 8th and 10th grade.

S2-5

SEX-DEPENDENT EFFECTS OF ADOLESCENT STRESS ON DENDRITIC MORPHOLOGY IN ADULT PREFRONTAL CORTEX

Cara Wellman, Indiana University Bloomington

Adolescence is an important period for HPA axis development and synapse maturation and reorganization in the prefrontal cortex (PFC). Thus, stress during adolescence could alter stress-sensitive brain regions such as the PFC as well as the impact of future stressors on these brain regions. Given that women are more susceptible to many stress-linked psychological disorders in which dysfunction of PFC is implicated, and that this increased vulnerability emerges in adolescence, stress during adolescence could have sex-dependent effects. Therefore, we investigated the effects of adolescent social instability stress (SIS) on dendritic morphology of Golgi-stained pyramidal cells in the medial PFC (mPFC) of adult male and female rats. We then examined dendritic reorganization following chronic restraint stress (CRS) with and without a rest period in adult rats that had been stressed during adolescence. Adolescent SIS differentially altered mPFC of males and females, with females showing reduced apical dendritic length and males showing reduced basilar dendritic length. CRS in adulthood failed to produce immediate dendritic remodeling in SIS rats. However, CRS followed by a rest period reduced apical dendritic length in adolescently-stressed adult males, whereas CRS followed by rest produced apical outgrowth in adolescently-stressed adult females. Thus, stress during adolescence differentially alters development of the mPFC in males and females and results in novel stress-induced dendritic changes in adulthood. Such long-term morphological effects likely influence prefrontally-mediated, stress-sensitive behaviors.

SOC26

MATERNAL SENSITIVITY AND INFANT ATTENTIONAL BIASES TOWARDS EMOTIONAL STIMULI

Tabitha Wilbur, University of Denver; Danielle Swales, University of Denver; Benjamin Hankin, University of Illinois at Urbana-Champaign; Elysia Davis, University of Denver; Ella Hennessey, University of Denver; Özlü Aran, University of Denver

Background: Affect-biased attention describes patterns of preferential looking toward certain emotionally salient stimuli such as emotion in faces. These attentional biases are suggested to affect how individuals perceive and respond to their environment, influencing later psychopathology such as internalizing disorders. However, far less is known about how the emergence of these biases are shaped by early experiences, such as sensitive maternal parenting in infancy. Maternal sensitivity, a mother's ability to accurately interpret and appropriately respond to her infant's signals, greatly affects child socioemotional outcomes. However, little is known about how maternal sensitivity shapes affect-biased attention in infants. Objective: This study evaluates the relation between maternal sensitivity and infant attentional biases towards sad, happy, and angry faces. Method: Attentional biases towards emotional faces were analyzed using eye-tracking methodology in 69 6-month-olds. Bivariate correlations were used to assess the relation between time to first fixation, proportion of looking time, and overall looking time for each emotional face with composite maternal sensitivity scores. Results: Overall, infants fixated more quickly on angry faces compared to sad ($t = -4.680$; $p < .001$) or happy faces ($t = -6.186$; $p < .001$), suggesting an initial bias towards the expression of anger. However, sensitivity was not predictive of measures of attentional bias for any of the expressions. Discussion: We find that infants displayed heightened vigilance and initial orientating towards angry faces. However, these attentional biases did not relate to sensitive maternal parenting behaviors.

Further research is necessary to fully understand the development of affect-biased attention and pathological risk trajectories beginning in infancy.

COG2

POST-EXPOSURE ENVIRONMENT MODULATES LONG-TERM DEVELOPMENTAL ETHANOL EFFECTS ON BEHAVIOR, NEUROANATOMY, AND CORTICAL OSCILLATIONS

Donald Wilson, NYU School of Medicine and Nathan Kline Institute; Mariko Saito, NATHAN KLINE INSTITUTE; Justin Apuzzo, NATHAN KLINE INSTITUTE

Developmental exposure to ethanol has a wide range of anatomical, cellular, physiological and behavioral impacts that can last throughout life. In humans, this cluster of effects is termed fetal alcohol spectrum disorder and is highly prevalent in western cultures. The ultimate expression of the effects of developmental ethanol exposure however can be influenced by post-exposure experience. Here we examined the effects of developmental binge exposure to ethanol (postnatal day 7) in C57BL/By mice on a specific cohort of inter-related long-term outcomes including contextual memory, hippocampal parvalbumin-expressing neuron density, frontal cortex oscillations related to sleep-wake cycling including delta oscillation amplitude and sleep spindle density, and home-cage behavioral activity. When assessed in adults that were raised in standard housing, each of these factors was altered by early ethanol exposure compared to saline controls, including memory impairment, decreased hippocampal parvalbumin+ cells, reduced delta oscillation amplitude during both sleep and waking, reduced sleep spindle density, and home-cage behavioral hyperactivity. However, exposure to an enriched environment and exercise from weaning to postnatal day 90 reversed all of these ethanol induced impairments except sleep-related delta oscillation amplitude and home-cage behavioral hyperactivity. The results are discussed in terms of the inter-dependence of diverse developmental ethanol outcomes and potential mechanisms of post-exposure experiences to regulate those outcomes.

SOC40

HOW DOES THE INFANT BRAIN RESPOND TO HARSH MATERNAL CARE?

Emma Wood, Nathan Kline Institute ; Patrese Robinson-Drummer, Haverford College; Rue Wakefield, New York University Langone Medical Center; Regina Sullivan, Nathan Kline Institute & NYU School Medicine; Nini Yu, New York University; Xueting Tu, New York University ; Hyungjin Cho, Cornell University

Early life adversity is associated with increased risk of mental health issues, neurobehavioral deficits that typically emerge in later life, and myriad neurological disruptions in emotion-regulating regions like the amygdala. The goal of this study was to monitor infant brain and

behavior during the actual adversity experience to better understand mechanisms that initiate pathological development. We used the Scarcity-Adversity Model of insufficient bedding for nest building (low bedding, LB) to induce harsh maternal care of pups (e.g. stepping on, dragging, and rough transport) from postnatal days (PN) 8-12, an age range during which behavioral and amygdala pathology is induced if repeated adversity is experienced. We divided 24 Long Evans male and female rat pups into 3 treatment groups: Scarcity-Adversity rearing (100mL bedding) from PN8-12 or PN12 only, or control rearing (4000mL bedding). BORIS ethology software (hand scoring from video) and Ethovision (automated scoring) were used to record and analyze mother and pup behaviors. On PN12 pups were injected with 2-Deoxy-D-glucose (2-DG), returned to nest for videotaping, brains removed after 45min and processed for analysis using ImageJ. Results suggest that compared to controls, mothers experiencing LB showed more harsh treatment of pups and hyperactivity in the nest, although no difference was found between PN12 and PN8-12 LB behavior durations. Pups' response to maternal harsh treatment for 1 and 5 days of LB both differed from controls, although only LB PN8-12 showed significantly enhanced basolateral amygdala (BLA) response ($p < 0.05$).

COG12

MATERNAL PRENATAL INFLAMMATORY BIOMARKERS AND CHILD EXECUTIVE FUNCTIONS: CASCADING EFFECTS THROUGH INFANT COGNITION

Amanda Wylie, University of North Carolina at Chapel Hill; Marie Camerota, RTI International; Jessica Goldblum, University of North Carolina at Chapel Hill; Laurie Wideman, University of North Carolina at Greensboro; Cathi Propper, University of North Carolina at Chapel Hill

Elevated maternal prenatal inflammation has been found to predict alterations in offspring neurobehavioral functioning, including cognition (e.g. Ghassabian et al., 2017). Here, we test whether these relationships persist into early childhood, and whether effects may be mediated through infant cognition. A sample ($N=54$) of African American women were followed from pregnancy through their child's fourth year of life. Inflammatory biomarkers (IL-6, CRP, and $TNF\alpha$) were assayed from plasma samples collected from pregnant mothers during their third trimester. At six months old, infant cognitive ability was assessed using the Bayley Scales of Infant Development ($N=40$). At age four, children ($N=37$) completed a performance-based assessment of executive function (EF). Mother-child dyads were included in the analysis if they had prenatal inflammatory biomarker data and infant or child cognitive data ($N=40$).

Using path analysis and full-information maximum likelihood, we tested for direct effects between individual inflammatory biomarkers and child EF, and indirect effects between inflammatory biomarkers and child EF via infant cognition. Models additionally controlled for maternal education, child's age at each assessment, and premature birth status. While no inflammatory biomarkers were directly associated with child EF, maternal prenatal IL-6 was marginally indirectly associated with child EF via poorer infant cognition (indirect $\beta = -0.21$, $p = 0.07$). Elevated maternal prenatal IL-6 ($\beta = -0.57$, $p < 0.01$), CRP ($\beta = -0.28$, $p = 0.03$), and $TNF\alpha$ ($\beta = -0.48$, $p = 0.02$) were also associated with poorer infant cognition. These findings increase the specificity of our understanding of the downstream correlates of exposure to elevated prenatal inflammation and provide support for prenatal programming hypotheses.

O3-2

INDIVIDUAL DIFFERENCES IN DYNAMIC CHANGES IN 8-MONTH-OLDS RSA DURING A SOCIAL FEAR TASK

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Dynamic shifts in respiratory sinus arrhythmia (RSA) represent adaptive coping efforts to affective demands and behavioral response readiness (Porges, 2007). Individual differences in temperament have been shown to predict toddlers' dynamic RSA during a social fear task (Brooker & Buss, 2010). One regulatory aspect of temperament is soothability, which has been positively associated with infants' physiological regulation (Huffman et al., 1998). However, it is less clear how soothability may be associated with dynamic RSA. In the present study, we examined associations between soothability and dynamic RSA during a social fear task in a sample of 155 8-month-olds. RSA was measured across baseline and three 30-second epochs of the Stranger Approach task, and infant soothability was reported via the IBQ-R (Gartstein & Rothbart, 2003). We fit a multiphase growth model to examine dynamic changes in infant RSA during a Stranger Approach task, with infant soothability as a predictor. The model fit the data well, AIC = 1574.92, BIC = 1631.80, LL = -774.46. Across participants, there was an overall increase in RSA from baseline to the start of the Stranger Approach, and a decrease from start to finish of the Stranger Approach. Infant soothability did not significantly predict baseline RSA or increase in RSA from baseline to task, but lower levels of soothability were significantly associated with less decrease in RSA throughout the task ($b = -0.15$, $SE = 0.05$, $t = -2.55$, $p < .05$). Findings suggest that infants who are less soothable to caregiver-directed regulatory efforts may show diminished psychophysiological regulation when experiencing fear.

O5-2

BASELINE CORTICOSTERONE MODERATES THE RELATION BETWEEN BASELINE HEART RATE AND EXPLORATORY BEHAVIOR IN YOUNG ADULT MALE RATS

Elizabeth Youatt, Penn State University; Elyse McMahon, Penn State University; Sonia Cavigelli, Pennsylvania State Univ

Across animal and child studies, autonomic and hypothalamic-pituitary-adrenal axis functioning are associated with trait-level approach/avoidance behavioral phenotypes. For example, both behaviorally inhibited (BI) rodents and toddlers show greater heart rate (HR) increases to stressful tasks than non-BI rodents and toddlers (Cavigelli, 2018; Garcia-Coll et al., 1984). Additionally, children's temperamental shyness is associated with both higher resting HR and higher baseline cortisol (Schmidt et al., 2007). However, these multi-system trait-level associations aren't well-validated in a parallel animal model, a critical gap for translational research on integrated biological systems underlying individual differences in temperament. The present study examines contributions of baseline HR and corticosterone (CORT) to individual

differences in exploratory behavior using a rodent model of temperament. In a sample of 46 young adult male Sprague-Dawley rats, baseline circulating CORT was measured from rapidly collected blood samples, HR was measured using IITC Life Science Inc. HRBP system, and exploratory behavior was measured in the Novel Physical test. We tested the interaction of baseline HR and baseline CORT to predict latency to explore a novel object. We found that baseline CORT moderated the relation between baseline HR and exploration ($F(3, 46) = 6.55, p < .001$), such that animals with high baseline HR and high baseline CORT (+1 SD) took longer to explore novel objects than animals with high baseline HR but low baseline CORT (-1 SD; $b = .07, t = 2.60, p < .01$). Findings suggest interacting biological systems may underlie trait-level exploratory behavior in rodents, paralleling findings from child studies.

STRESS18

MATERNAL IMMUNE ACTIVITY DURING PREGNANCY AND SOCIOECONOMIC DISPARITIES IN CHILD SELF-REGULATION

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Maternal immune activity during pregnancy has been associated with risk for psychiatric disorders in offspring, but less is known about its implications for children's emotional and behavioral development. This study examined whether prenatal gestational cytokines of mothers were significantly associated with socioeconomic status (SES) and racial disparities in their offspring's self-regulation abilities. Participants included 1,628 women in the Collaborative Perinatal Project (CPP). Seven behavioral items conceptually related to self-regulation were rated by CPP psychologists when children were 4 years old. Concentrations of five maternal cytokines, interleukin (IL)-1 β , IL-6, IL-8, tumor necrosis factor (TNF)- α , and IL-10, were assessed. Covariates included child sex, mother's age, and psychiatric disorders and medical conditions during pregnancy. There were significant SES differences in child self-regulation: $\beta = .18, 95\% \text{ CI } [.11, .25]$, but no racial differences. Of the assessed cytokines, only gestational IL-8 was significantly associated with child self-regulation, $\beta = .09, 95\% \text{ CI } [.02, .16]$. Mediation analysis using bootstrapping indicated that gestational IL-8 significantly mediated the association of family SES with child self-regulation ($\beta = .02, 95\% \text{ CI } [.003, .030]$). About one-tenth of SES disparities in child self-regulation can be attributed to maternal SES differences in gestational IL-8 expression. This study suggests pregnancy as an early sensitive period and maternal immune activity as an important context for child development.

STRESS10

THE EFFECT OF MATERNAL STRESS AND DEPRESSION ON FETAL AUTONOMIC FUNCTION IN THE CONTEXT OF SEX AND STATE

Julia Zavala, Mercy College; Lisa Ecklund-Flores, Mercy College; Michael Myers, Columbia University Irving Medical Center; William Fifer, Columbia University; Chanel Malette, Mercy College

The relationship between maternal stress, depression, and fetal autonomic function were examined in the context of fetal sex and sleep state. Sixty-three mothers and their healthy fetuses (29 females and 34 males) with a gestational age of at least 36 weeks were included in the analysis. Mothers completed the Perceived Stress Scale-14 and the Center for Epidemiologic Studies Depression Scale. Fetal behavioral states of quiet sleep (1F), quiet awake (2F), and active awake (4F) were coded using fetal heart rate and movement tracings recorded with a Doppler ultrasound monitor. Heart rate (FHR) and two measures of heart rate variability, standard deviation of FHR (SD) and beat-to-beat variability (RMSSD) were recorded with a fetal ECG monitor. There was a positive correlation between maternal stress and female fetal RMSSD, $r = .34$, p [Funded by NIH Grants 1P20MD002717, UL1TR000040, U01 HD55155, & U01 HD045935]

COG11

DEVELOPMENTAL AND INTERGENERATIONAL PATTERNS OF INHIBITORY CONTROL FOR 9-YEAR-OLD CHILDREN AND THEIR MOTHERS

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Self-regulation of cognition and attention is associated with an array of developmental outcomes (McClelland et al., 2015). Children's self-regulation develops rapidly across the first decade and is associated with an multiple parent factors (Bridgett et al., 2015). We focused on the inhibitory control (IC) aspects of self-regulation, the ability to override a strong internal predisposition or external lure (Diamond 2013), in typically developing 9-year-olds ($n=280$) and their mothers ($n=235$) to better understand developmental and intergenerational patterns of self-regulation. IC was collected using a computerized Stroop task (color-word for mothers; number for children; Ruffman et al., 2001), as well as from maternal report ATQ, EATQ, and BRIEF questionnaires. Both mothers ($r = -.295$, $p = .000$) and children ($r = -.135$, $p = .024$) showed that Stroop reaction time (RT) decreases as accuracy for incongruent items increases, suggesting the task tapped similar IC processes for mothers and children. Mothers ($M=1079$ ms) were faster than children ($M=2239$ ms; $t=27.122$, $p < .001$); both achieved 96 percent accuracy. Mothers reported on themselves and their children similarly using ATQ/EATQ scales of IC ($r = .126$, $p = .046$) and BRIEF scales of inhibition ($r = .209$, $p = .001$). In contrast, ATQ-IC for mothers was associated with faster RT during Stroop incongruent task block ($r = -.208$, $p = .002$), while EATQ-IC for children was not ($r = -.010$, $p = .869$). Faster RT on Stroop incongruent items was associated with maternal-report working memory (BRIEF) for children ($r = .209$, $p = .000$), but self-reported shifting and initiating (BRIEF) respectively for mothers ($r = .157$, $p = .019$; $r = .159$, $p = .017$). These findings demonstrate differences and similarities between children and mothers in IC performance.

SOC32

HOUSEHOLD INCOME MODERATES HEART RATE SYNCHRONY BETWEEN THREE-MONTH-OLDS AND THEIR MOTHERS DURING A FREE-PLAY INTERACTION

Margaret Zhang, New York University; Nicholas Tong, New York University; Stephen Braren, New York University; Natalie Brito, New York University

The parent-infant relationship is a complex, dynamic system in which parents and infants continuously co-regulate each other for better and for worse. Research and theory suggest that the co-regulation of physiological activity—a process often referred to as synchrony—is an important component of the parent-infant relationship supporting the development of infant's self-regulation. Mother-infant physiological synchrony is dependent on environmental factors such as socioeconomic status, which may be mediated by chronic stress. However, more research is needed to better understand these associations. Thus, in the present study, we investigated the extent to which household income moderated mother-infant physiological synchrony. We recorded electrocardiography (ECG) from three-month-old infants and their mothers (N = 30 dyads) during a five minute semi-structured free-play interaction. Results from multilevel models revealed that there was no significant within-dyad association between mothers' and infants' heart rates, indicating there was no heart rate synchrony on average. However, this association was moderated by income such that there was a strong positive association between mother and infant heart rate at higher income, but no association at lower income. This study provides further support for the idea that mother's and infant's cardiac physiology is interdependent and that heart rate synchrony is contingent on environmental factors. Chronic stress may be a likely mechanism explaining this association. Thus, in subsequent analyses we plan on investigating this by examining associations among household income, maternal hair cortisol, and physiological synchrony.

STRESS9

FOOD INSECURITY AND OBESITY RISK IN YOUNG CHILDREN: A LATENT GROWTH CURVE ANALYSIS

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Background: Food insecurity (FI) is a form of adversity linked to suboptimal health outcomes, including obesity in adulthood. However, limited research has examined the link between FI and obesity among youth. A better understanding of how early FI exposure influences childhood obesity risk is needed to inform intervention development.

Method: This is a secondary data analysis from a three-year randomized controlled trial (NET-Works NCT0166891). Five hundred and thirty-four parent/child dyads (2-4 years of age, 52% Hispanic) were enrolled, with 92% retention at 36 months. Household FI was reported by parents at baseline using the USDA Household Food Security Survey Module-Six Item Short Form.

Child body mass index (BMI) was measured following standardized protocols at baseline, 12-, 24-, and 36-month follow-up. Latent growth curve modeling was used to predict change over three years in BMI z-score (BMIZ) trajectory from household food insecurity at baseline.

Results: Baseline FI was significantly associated with baseline BMIZ ($B=0.246$, $p=0.01$), controlling for race, sex, intervention, participation in the SNAP program, age, and income. Household FI at baseline did not predict BMIZ slope as BMIZ remained fairly stable over the three-year timeframe.

Conclusion: Early exposure of FI may “get under the skin” of children as early as two years old and set them up for a higher BMI for age over the early years of life. Future analyses should examine the impact of FI timing, severity, and duration on children’s growth trajectories.

STRESS20

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Throughout the global outbreak of SARS-CoV-2, there has been a constant inundation of information available about the virus and the progression of the pandemic. This incessant flow of information is comforting for some but distressing for others. In fact, some individuals tend to excessively seek information, while others actively avoid it. In previous national crises, demographic factors (such as age, race, and gender) have been found to moderate a proclivity towards or away from information. The primary aim of this study was to investigate how information seeking or avoidance behaviors may be influenced by an individual’s anxiety and demographic characteristics. Adults ($N=500$) living in the United States completed an online study from April through August 2020. Each participant completed a COVID-19 survey developed by an NIH investigator, as well as standardized, well-validated instruments related to anxiety and mood symptoms. The COVID-19 survey included questions about the propensity for seeking out information vs. avoiding information. Analyses identify predictors of patterns of attitudes towards threat-related information. These predictors could help researchers understand the various coping strategies people use in a threat context. These strategies could be used to better tailor therapeutic interventions for clinically affected individuals.