

1. New gambling paradigm: electrophysiological correlates of non-predictable gains and losses

Agnieszka I. Chrobok, Daniela Krause, Shari Langemak, Andrea Jobst, Daniel Keeser, Maximilian Maywald, Kristina Adorjan, Oliver Pogarell, Susanne Karch

Department of Psychiatry and Psychotherapy, University Hospital, LMU Munich, Germany

The aim of the present study was to investigate feedback processing regarding gains (reward) and losses (punishment) in healthy individuals. Twenty-nine healthy participants used a new gambling task with feedback given in pseudo-randomised order irrespective of the participants' choice. Subsequently event related potentials (ERPs) and event related oscillations (EROs) were analysed. Left-sided parietal potentials for high gains/losses compared to neutral and small gains/losses were significantly increased. Higher negativity for both gain and loss compared to a neutral condition in fronto-centro-parietal electrodes related to the feedback given was registered. Significantly reduced theta and alpha power for gains and only theta power for losses were recorded. Moreover, increased gamma and beta power in neutral condition and their significantly higher amplitudes in Fz compared to Cz and Pz have been observed. The results suggest that event-related potentials evoked through the new gambling paradigm could be helpful in analysing the reward system patterns in different diseases. Furthermore, EEG frequency variations can be registered depending on the amount of gains/losses, as the wavelet analysis showed.

2. Low frequency magnetic stimulation of prefrontal cortex improves Autism Spectrum Disorder symptoms

Baris Metin, Muammer Aydogdu, Sinem Metin, Bernis Sutcubasi, Nevzat Tarhan

Uskudar University

Autism spectrum disorder (ASD) is characterized by impairments in social communication and behavior. Current treatments in ASD include medications to treat behavioral problems, behavioral therapy and sensory integration therapies. Transcranial magnetic stimulation (TMS) has been used in a number of psychiatric disorders. It offers the advantage of stimulating cortical activity non-invasively. In this open-label study we aimed to test the effect of low frequency stimulation of bilateral dorsolateral prefrontal cortices in children with ASD. Eight children with ASD (age 7-18) were recruited and TMS was applied over 20 sessions. ABC autism checklist were completed before and after TMS treatment by parents. In addition resting EEG was obtained at baseline and after treatment. The results show that, after TMS the children improved in sensory, relating, body and object use, language, and social and self-help skills subscale scores. EEG findings are not yet analyzed but will be presented in the conference. None of the children stopped the treatment due to adverse effects. Although preliminary, our findings indicate that bilateral frontal low frequency stimulation could be used as a safe and effective treatment in Autism Spectrum Disorder.

3. Low Field Magnetic Stimulation Is Associated With Immediate Changes In Brain Function In Healthy Controls Observed With fMRI And EEG

Michael L. Rohan¹, Rinah T. Yamamoto¹, Alexis E. Whitton², Clara B. Wellons¹, Bruce M. Cohen³

¹Imaging Center, McLean Hospital, Belmont, MA

²CSDAR, McLean Hospital, Belmont, MA

³Shervert Frazier Institute, McLean Hospital, Belmont, MA

LFMS is a treatment for depression that uses an induced electric field (1V/m, 1kHz) to produce short-term improvement in mood. Here we report observations of immediate changes in brain network activity made with fMRI and EEG in healthy control subjects. Two 5 min acquisitions of resting fMRI (singleband and multiband) were acquired before and after 20 min of active or sham LFMS in two sessions each in 3 healthy subjects (24 total acquisitions). rACC and bilateral DLPFC regions were used for a seed-based connectivity analysis. Subject results used the sham controlled change contrast (active_post - active_pre) - (sham_post - sham_pre) and a group mean effect is reported. Five-minute acquisitions of resting EEG data were using the same paradigm. EEG data were analyzed using LORETA methods to produce maps of change in power in the gamma band. Group effects were based on the same subject-wise contrast and used permutation methods for inference (sLORETA). Increased fMRI connectivity was observed between the mPFC and insulae along with a decreased connectivity between the mPFC and PCC/PCu. This is consistent with a stronger link between the Salience and Default Mode networks. A reduction in EEG gamma band power in the PCC/PCu region along with an increase in the dmPFC were observed and are consistent with the fMRI results. This response in healthy controls occur in brain regions that are implicated in the response to antidepressant treatment. This could indicate a physical response that leads to a selective antidepressant effect.

Funding: Hospital funds

4. Patients with schizophrenia examined by paradigms of visual, auditory and a bimodal ERP oddball design. Does the use of a bimodal paradigm compared to an unimodal has an impact on the P300 component?

Hendrik Kajosch, Georgios Persefonis, Geerke Steegen, Pierre Fossion, Charles Kornreich, Salvatore Campanella

The P300 is one of the most investigated event-related potentials (ERPs) in the study of psychiatric disorders. Nevertheless it suffers from a lack of specificity and sensitivity. In previous studies (Campanella et al., 2010; 2012), the application of a more ecological bimodal oddball design has shown an increased sensitivity of the P300 component. In the present ongoing study we compare the results of a classic oddball with those of a more ecological bimodal design in a group of patients presenting schizophrenia. Patients were examined at two times: T0: admission: state of psychotic decompensation; T1: discharge: state of partial clinical remission. Patients were assessed through a structured clinical interview, and a completion of different clinical evaluation scales. Patients were confronted to an EEG recording during successive oddball tasks using visual, auditory, and bimodal stimuli. The objectives of this study are twofold: (1) investigate whether the use of a specific oddball task (visual vs. auditory vs. cross-modal) allowed to enhance the discriminative power of the P300; and (2) investigate the correlations between the evolution from T0 to T1 of the P300 and the evolution of the clinical situation of the patient. Indeed, we would like to investigate whether the fact that P300 is considered as a marker of trait of SZ

(Mathalon et al. 2000) is not due to a lack of sensitivity of unimodal oddball tasks. Here we would like to present the results of this clinical study represented by a first group of 13 patients with the diagnosis of schizophrenia.

5. Stereo-motion Perception Research Based on Steady-state Visual Motion Evoked Potential

Chengcheng Han¹, Guhua Xu^{1,2}, Yiming Jiang¹, Sicong Zhang¹, Haochong Wang¹

¹School of Mechanical Engineering, Xi'an Jiaotong University, Xi'an, China

²State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, Xi'an, China

The combination of EEG technology and stereoscopic 3D display technology has gradually become a trend, while EEG-BCI systems based on stereo vision have been used in rehabilitation training and visual medical testing. However, the current EEG-BCI research based on stereo vision mainly stays in the static stereo environment, there are few studies on dynamic stereo vision, which does not effectively utilize the characteristic of the stereoscopic display technology. Therefore, we propose a novel stimulation paradigm based on stereo-motion. It utilized a stereoscopic 3D display presented an image with binocular parallax, and a stereoscopic reciprocating motion stimulation was generated by the periodic changes of binocular parallax and image size. The SSMVEPs (steady-state visual motion evoked potentials) was elicited when gazing at the stereo-motion stimulation. Eight healthy subjects (with normal or corrected-to-normal vision) participated in the experiments. The motion inversion frequency was set at 3.3 Hz, 4.3 Hz, 5.3 Hz or 6.3 Hz. The results showed that the CCA (canonical correlation analysis) coefficients of fundamental frequency response of the SSMVEPs signal elicited by stereo-motion stimulation (3.3 Hz, 4.3 Hz and 5.3 Hz) was significantly higher than that elicited by the stimulation without parallax change (T test, $P < 0.01$), the average increased percent was 28.6%. This demonstrated that the stereo-motion stimulation can induce a stronger EEG response, which is significantly different from non-stereo-motion stimulation response. This technology both has a positive effect on improving EEG-BCI performance in virtual stereoscopic environment, and potential for the application of medical stereo vision detection.

Funding: National Natural Science Foundation of China (51475360); Key research and development plan of Shaanxi Provincial (2018ZDCXL-GY-06-01)

6. The Combined Effects of Caffeine and Menstrual Phase on Visual Selective Attention: A Pilot Study

Kaitlyn Napier, Bronwen Schryver, Krista Hull, Derek J. Fisher

Department of Psychology, Mount Saint Vincent University, Halifax, Nova Scotia, Canada

Selective attention involves enhanced processing of relevant information while inhibiting the processing of irrelevant information. Both caffeine and menstrual phase have been shown to affect visual selective attention abilities; caffeine has been shown to improve accuracy and reaction times on selective attention tasks, while lower levels of progesterone (characteristic of

the menstrual phase) have been associated with worsened selective attention and visuospatial abilities. Employing a double-blind, placebo-controlled design, nine women in their menstrual phase and six women in their luteal phase performed a visual search task in two separate sessions approximately 28 days apart following the administration of caffeine (200mg) or placebo. Behavioural performance measures (% correct, reaction time) were examined along with EEG-derived event related potentials (ERPs), including the P100 (early visual processing), P300 (target detection) and N2pc (attentional orientation). While there were no significant differences in behavioural performance on the visual search task, significantly larger amplitudes of the target P100 following caffeine administration in the menstrual phase. We also report caffeine-associated decreases in N2pc latency during the menstrual phase. These findings suggest caffeine speeds up target classification and enhances early selective attention to target-related information during the menstrual phase.

Funding: Natural Sciences and Engineering Research Council of Canada

7. Potential utility of a multivariate ERP battery in psychosis and bipolar spectrum: some preliminary data

Florence Hanard, Elisa Schröder, Hendrik Kajosch, Salvatore Campanella

CHU Brugmann, Psychiatry Department Université Libre de Bruxelles: Laboratory of Medical Psychology

Actual treatments in psychiatry are mainly based on pharmacological and psychotherapy treatments. However, relapse rate in many psychiatric disorder remains tremendously high. It is therefore of the highest relevance trying to find new add-on tools to enhance the quality of psychiatric care. As many psychiatric diseases are also characterized by cognitive difficulties, our main goal is to propose a complementary approach of treatment based on the identification of these cognitive difficulties to favor their reeducation. Such cognitive rehabilitations are expected to allow better life quality and, maybe, even reduce relapse rate. Such a plan emphasized the need to use an efficient and precise way to evaluate cognitive function in a psychiatric population, in which this evaluation could be difficult. Therefore, we propose that using a multivariate event-related potentials (ERPs) battery could be an appropriate solution to evaluate various cognitive functions in a timely manner. Our objective, as a first step in this process, was to evaluate the applicability of such an ERP battery in psychiatric patients. The ERP battery contained different tasks allowing us to simultaneously evaluate 6 well-studied electrophysiological components: P3a, P3b, NogoN2, NogoP3, MMN and P50. These components are well-known to index specific cognitive functions (from inhibition to memory updating or sensory gating). Here, we would like to present ERP data from 15 patients with psychotic and/or bipolar disorders in order to highlight specific patterns of differences when compared with healthy matched controls. Methodological properties of the ERP battery as well as potential clinical implications will be discussed.

8. Signs of depression in non-clinical states: evidence from brain oscillatory activity

Jaroslav Slobodskoy-Plusnin

Moscow School of Management SKOLKOVO

According to the World Health Organization (WHO), depression is the leading cause of disability worldwide and is a major contributor to the overall global burden of disease. With more than 350 million people affected worldwide, it becomes crucially important to reveal mechanisms underlying the disease. Twenty-seven healthy volunteers (11 males, 16 females, aged 19–51 years) have participated in the study. None of them have had a history of mental illness, brain injury, neurological disorders, history of substance abuse, or other serious medical conditions. 22-channel EEG (referenced to the ear tips) was recorded in the resting state and during the presentation of affective sounds (Achievement, Amusement, Anger, Disgust, Fear, Sadness and Neutral) that participants had to assess by valence (positive – negative) and arousal (low – high), both scales ranging from 1 to 9. Beck Depression Inventory–II (BDI-II) was used to estimate depressive symptoms. Based on the median value (8.0) the sample was split in two groups with scores below median (low BDI scorers, LB) and above median (high BDI scorers, HB). LB scores ranged within “minimal depression” scores, while HB scores landed within or on the borderline of “mild depression”, according to the BDI-II manual. Both behavioral and electrocortical “markers” of clinical depression were apparent at subclinical level. A resting-state EEG of HB revealed increased power in low frequencies (Cohen’s $d = 0.72$), predominantly in the frontal cortical areas, that is in accordance with a “spatio-temporal dysfunction” model of depression. Relatedly, transition from an eyes-closed to eyes-open condition was associated

9. Cerebral correlates of autobiographical memory in MCI and AD

Claudia Frankenberg¹, Johannes Schröder¹, Uwe Haberkorn², Christina Degen¹, Monte S. Buchsbaum³

¹) Section of Geriatric Psychiatry, University Hospital Heidelberg, Heidelberg, Germany

²) Department of Nuclear Medicine School, University Hospital Heidelberg, Heidelberg, Germany

³) Department of Psychiatry, University of California, San Diego, United States

Background: Autobiographical memory (AM) changes are the hallmark of Alzheimer’s disease (AD) and Mild Cognitive Impairment (MCI). In recent neuroimaging studies, AM changes were associated with numerous cerebral sites, such as the frontal cortices, the mesial temporal lobe, or the cingulum. Factor analysis provides statistical methods for evaluating patterns of cerebral changes in regional glucose uptake. Methods: In 115 patients with MCI or mild AD cerebral metabolic rates were determined using positron-emission tomography with [¹⁸F] deoxyglucose. Factor analysis with varimax rotation was used to identify underlying dimensions in 34 cerebral sites involved in AM deterioration. Subsequently, the respective factor scores were correlated with AM performance of 23 patients, which was measured with a structured inventory assessing memories from primary school, early adulthood, and recent years. Results: Factor analysis identified seven factors explaining 69% of the variance (“frontal cortex,” “mesial temporal substructures,” “cingulum,” “occipital cortex,” “left temporo-prefrontal areas,” “anterior cingulum,” “right temporal cortex”). Relative to controls, AD patients showed significantly lower values on the factors “frontal cortex,” “cingulum,” and “left temporal cortex”. The factor “mesial temporal substructures” was significantly correlated with both, episodic memories ($r = 0.612$, $p < 0.05$) and semantic knowledge ($r = 0.646$, $p \leq 0.01$) from primary school, as well as semantic knowledge ($r = 0.616$, $p < 0,05$) from early adulthood. Conclusions: Consistent with previous studies, different cerebral sites were found to be implicated in AD-related AM deterioration. While three of the

factors differed significantly between patients and controls, associations with AM deficits were restricted to

10. High-density electroencephalographic recordings during NREM and REM sleep: An independent component analysis (ICA) based approach

Kathryn M Gill¹, Fabio Ferrarelli²

¹University of Pittsburgh Medical Center

²University of Pittsburgh School of Medicine, Department of Psychiatry

Background: We employed within-sleep stage independent components analysis (ICA) to more efficiently remove noise contamination from high density electroencephalographic (hd-EEG) data acquired during NREM, tonic and phasic REM sleep. Subsequently, power spectral density analysis was conducted, with emphasis on the average spectral power observed in distinct frequency bands, as well as the associated topography. **Methods:** All night hd-EEG sleep recordings (64 channels), along with simultaneous sleep polysomnography, were conducted in 10 healthy control subjects. Sleep staging was performed offline using standard criteria to identify NREM, tonic and phasic REM epochs. EEG data within each sleep stage was independently denoised using the extended infomax ICA algorithm (EEGLAB). Subsequently, spectral power density was computed for each channel. Between stage comparisons were made on the global average power and topographical pattern of activation within specific frequency bands: delta (1-4Hz), theta (4-8Hz), alpha (8-12Hz), sigma (12-16), beta (15-25 Hz), and gamma (25-40Hz). **Results:** When considering average power spectral density, NREM sleep was characterized by distinct peaks occurring at the delta and sigma frequency ranges. In contrast, both tonic and phasic REM exhibited greatest activation occurring at the delta and alpha frequency ranges. NREM activity in the sigma range occurred primarily in frontal-central electrode locations. In contrast, tonic and phasic REM activity in the alpha range occurred predominately in the posterior-central locations. **Conclusion:** Within-sleep stage ICA analysis provides an effective means of identifying and removing artifact activity. Subsequent power spectral density analysis of NREM, tonic and phasic REM stages of sleep reveal unique topographical patterns

11. Emotion Regulation Ability and Levels of Life Stress in Adolescents at High and Low Familial Risk for Depression: Evidence from the Late Positive Potential

Mary L Woody, Cecile D Ladouceur, Lauren M Bylsma
University of Pittsburgh, Department of Psychiatry

There is a well-known reciprocal relation between depression and life stress. Emotion regulation (ER) strategies such as cognitive reappraisal or savoring may play an essential role in managing life stress, especially among those at risk for and/or currently experiencing depression. However, most past research has probed these relations using self-report measures of ER rather than measuring ER ability in the laboratory. Thus, we examined the relation between a laboratory-based measure of ER ability and self-reported stress among adolescents (ages 9-13; 48% female) at high (n = 41) and low (n = 44) familial risk for depression. Adolescents' ability to cognitively reappraise negative images or savor positive images was measured using the late positive potential (LPP), which can index changes in the intensity of emotional response to

affective images. We found that adolescents who exhibited more savoring (i.e., greater LPP enhancement when asked to savor positive images) reported lower levels of life stress ($p=.001$). Notably, this effect was strongest among adolescents with high familial risk for depression who were already exhibiting depressive symptoms ($p=.01$), suggesting that savoring may disrupt the reciprocal cycle between stress and depression. In contrast, adolescents who exhibited more cognitive reappraisal (i.e., greater LPP reductions in response to negative images) reported higher levels of life stress ($p=.01$), an effect that was not moderated by familial risk or depressive symptoms. These findings suggest adolescents' ability to savor positive emotional responses is related to reduced life stress, particularly among high-risk adolescents reporting higher depressive symptoms.

12. Effect of Toluene Chronic Exposure on the Structure of the Hippocampus and Recognition Memory in Adult and Adolescent Rats

Nino Pochkhidze, Mzia Zhvania, Nana Japaridze

Ilia State University, I. Beritashvili Center of Experimental Biomedicine

Toluene and toluene-containing volatile substances are the most widely abused solvents with demonstrative addictive potential in humans. Clinical and experimental studies have demonstrated that the exposure to toluene vapor leads to diverse consequences at the level ranging from the cell to the whole organism. The present study has been undertaken to determine whether toluene chronic exposure provokes immediate and/or persistent effect on the structure of hippocampus, learning and memory in adolescent and adult rats. We exposed male Wistar rats at ages P 28-32 (adolescents) and P 150-160 (adults) to 2000 ppm inhaled toluene for 40 days. The immediate and persisting effects of toluene misuse (immediately after the end of toluene chronic inhalation and 90-day after the end of toluene chronic inhalation, correspondingly) on pyramidal cell loss in the CA1 and CA3 of the hippocampus and exploratory behavior and recognition memory in the open field were evaluated. The results reveal that toluene chronic exposure affects the structure of the hippocampus, exploratory activity and recognition memory in the open field in adolescent and adult rats. In all cases the effect is age-dependent. In particular: in adolescent rats the more significant structural and behavioral alterations were observed immediately after toluene chronic exposure, while in adult rats the most considerable was persisting effect (90 days after withdrawal). Such data indicate that character of alterations depends upon the postnatal age of testing of the animals.

13. High-density EEG during NREM sleep in veterans with and without PTSD

Joanne Chiu¹, Rachel E Kaskie², Fabio Ferrarelli¹, Anne Germain¹

¹University of Pittsburgh School of Medicine, Department of Psychiatry

²University of Pittsburgh Medical Center

Sleep disturbances are a prominent feature of PTSD and likely exacerbate other symptoms observed in the disorder. Nearly all veterans diagnosed with PTSD suffer from sleep disturbances, but the physiological nature of these disturbances is not yet fully understood. In the present study, we used high-density electroencephalography (hd-EEG) to characterize sleep abnormalities in

veterans with PTSD. Methods: Veterans of the Global War on Terrorism (n=34) spent two consecutive nights in a sleep laboratory, during which hd-EEG recordings were collected during sleep from 23:00 to 07:00. Participants were divided into a PTSD subgroup (n=17) and a control subgroup (n=17) based on scores from the PTSD Checklist (PCL-5). Sleep architecture and non-rapid eye movement (NREM) power spectra and power topography were calculated. Unpaired t-tests were calculated to assess differences between the PTSD and control groups. Results: No significant differences were found in sleep architecture between the two groups. Average power spectra also were not significantly different during the night. When examining NREM sleep only, we found a statistically significant decrease in EEG delta (1-4.5 Hz), sigma (12-15 Hz), and beta (15-25 Hz) power in a posterior parietal location in the PTSD group compared to controls. NREM sleep alpha (8-12 Hz) and gamma (25-40 Hz) power did not differ significantly between the groups. Conclusions: These findings indicate that there are unique NREM power deficits in individuals with PTSD. Treatments that specifically target these physiological sleep deficits in individuals with PTSD should be developed and may provide a way to improve treatment outcomes.

Funding: US DoD Defense Health Program managed by the US Army Military Operational Medicine Research Program (MOMRP) Fort Detrick, MD, Log # 112293006 (PI: Reifman), and CSTI NTR001857 (PI: Reis).

14. Entropy Based EEG Biomarker for Major Depression based on Multivariate Empirical Mode Decomposition

R Murat Demirer, Selahattin Gultekin, K Nevzat Tarhan

Uskudar University, Istanbul 34662-TURKEY

Decomposing nonstationary multichannel EEG signals into distinct amplitude and frequency-modulated components lead to represent inherent stationary oscillatory modes upon Nyquist frequency. The Multivariate Empirical Mode Decomposition (MEMD) describes an EEG signal as a linear combination of an equal number of finite set of intrinsic mode functions (IMFs) with estimating the joint information of IMF functions utilizing 10-20 channels of EEG measurements. In our method, multivariate (EMD) method was applied to EEG signals with a normal group and major depression patients and entropic values are associated with Fourier Spectra of mean of IMF components. For EEG paradigms, 10-20 electrodes standard system regarding ear lobes were recorded with removing eye-blinks artifacts through visual inspections. Additionally, EEG signals are analog filtered with an analog band pass filter at 0.5-70 Hz with 12-bit resolution to account for noise of very low frequencies and rejecting 50 Hz power line frequency (notch filter). The sampling frequency is set to 125 Hz. The results showed that inter electrode (common) variance of entropic values of IMF signals are significantly lower in major depression and those values are in the range of narrow range (0.145-0.165) with higher offset across all electrodes for 7 subjects. However normal group showed higher inter electrode variance over electrodes and the entropic values are in the range of (0.090-0.13) for 10 subjects. The mean frequency of instantaneous IMF signals over different bands for all electrodes are significantly lower in major depression patients when compared to normal subjects.

15. Priming rTMS with Lamotrigine: A Case Study Using EEG Markers

Shelly Menolascino, Mitch Belgin, Genevieve Izzo, Austin Conery

Washington Square Psychiatry & TMS

Lamotrigine is FDA-approved for maintenance treatment in Bipolar I, a highly recurrent mood disorder. It protects against recurrence in other highly recurrent neuropsychiatric disorders. With treatment-resistant depression, co-morbid anxiety disorders are the rule, rather than exception. Such comorbidity leads to worse treatment response, as well as less durable recovery, with notable higher risk of relapse and recurrence. Many TMS psychiatrists use lamotrigine as a potential adjunct, often at lower than standard anti-epileptic dosages. Yet some TMS researchers have exclusion criteria which include anticonvulsant medications, due to the potential to limit rTMS efficacy. We present a case study, following EEG changes, documenting “priming” of TMS with lamotrigine. PreTMS (MADRS 34) resting state EEG showed elevated alpha peak frequency (ALF=11.5), reflecting cortical overarousal and hypervigilance. QEEG showed excess slow alpha left-frontally, sourced from rostral ACC, a marker of depression. Prior to rTMS, lamotrigine was initiated, as a potential “primer”, aimed at durable recovery if there was TMS response, given comorbid chronic, persistent PTSD. Six weeks later, on lamotrigine 100 mg, there was no clinical change. She had excellent response to a 4-week course of daily TMS, using HRV state-training. A repeat EEG showed marked diminishment and normalization of APF, a marker of cognitive flexibility and resilience. On QEEG, excess left frontal alpha was gone, and sLoreta showed normalization in the rostral ACC. **CONCLUSION** We argue lamotrigine, often at lower than anti-epileptic dosages, might target hyperarousal in individuals with comorbid depression and chronic PTSD, and thus prime TMS response, rather than hinder such.

16. Complex Mismatch Negativity in Pitch Pattern Tasks is Reduced in the First Episode Schizophrenia-Spectrum

Stormy D Green, Sarah M Haigh, Timothy K Murphy, Dean F Salisbury

University of Pittsburgh Department of Psychiatry

Mismatch negativity (MMN) is an event-related potential elicited by deviant auditory stimuli. In long-term schizophrenia (Sz), MMN to simple sound alterations (simple mismatch: sMMN) like duration or pitch are drastically reduced. Similar reductions do not occur in first-episode schizophrenia participants (FESz). MMN can also be elicited by deviant stimuli that violate complex patterns (complex mismatch: cMMN). cMMN was examined on an ascending tone pattern in FESz participants. Groups of 3 tones were presented to 16 FESz and 17 matched healthy individuals while they watched a silent film. The standard sequence ascended in pitch (50 ms, 330 ms SOA, 90%) while the last tone of the deviant group (10%) descended in pitch, violating the ascending pattern. Patterns were separated by 1000 ms. cMMN was visualized by subtracting the “standard” from the “deviant” ending tone waveforms. FESz showed significant reductions in early cMMN ($p=.03$, effect size $d=0.8$) and late cMMN ($p=.037$, effect size $d=0.76$). In conclusion, early and late demonstrate cMMN reduction among FESz with a large effect size. Whereas sMMN appears to be a biomarker of disease progression (relatively healthy at first episode, becoming progressively worse with disease duration), cMMN appears to be robustly abnormal at first psychosis. Because it is abnormal at first psychosis, it is possible that cMMN reflects the pathology developing before the emergence of psychosis. Thus, cMMN could potentially serve

as a biomarker of disease presence prior to the onset of psychosis. We are currently testing cMMN in clinical high risk individuals.

Funding: NIH MH094328

17. Effects of task duration on EEG indexed sensory gating

T-Jay A Anderson¹, Katie McKearney¹, Phillip Tibbo², Derek Fisher³

¹Dalhousie University

²Nova Scotia Early Psychosis Program

³Mount Saint Vincent University

Sensory gating refers to the ability to filter out extraneous stimuli and represents an extremely early, automatic attentional process. The sensory gating process is a crucial element in the ability to focus attention and has been shown to have deep connections to neurological functioning. However, tasks that probe sensory gating processes vary greatly between studies ranging from 34 to 192 trials per session. During these sessions a participant is either passively listening to clicks or is engaged in another task while clicks are playing while recording neural activity. At the neurophysiological level, sensory gating is typically indexed by the P50 event-related potential, as well as the N100-P200 complex. The test-retest reliability of these measures differs across time as fatigue effects have been observed in the N100 but not the P50. Method: 15 healthy participants reporting no psychiatric diagnoses had EEG recording while passively listening to repeated auditory click pairs for two 64-trial (10-minute) blocks, which were analyzed and compared separately. Results: Participants showed a significant reduction in P50 and N100 sensory gating measures during the last 64 trials compared to the first 64 trials. Conclusions: Sensory gating appears to be influenced by fatigue effects. This should be taken into consideration when using common sensory gating methodologies.

18. EEG for Early Detection of Autism and Neurodevelopmental Monitoring in Primary Care

William J Bosl^{1,2,3}

¹University of San Francisco

²Harvard Medical School

³Boston Children's Hospital

Autism spectrum disorder (ASD) is a complex and heterogeneous disorder, diagnosed on the basis of behavioral symptoms during the second year of life or later. Finding scalable biomarkers for early detection is challenging because of the variability in presentation of the disorder and the need for simple measurements that could be implemented routinely during well-baby checkups. EEG is a relatively easy-to-use, low cost brain measurement tool that is being increasingly explored as a potential clinical tool for monitoring atypical brain development. EEG measurements were collected from 99 infants with an older sibling diagnosed with ASD, and 89 low risk controls, beginning at 3 months of age and continuing until 36 months of age. Nonlinear features were computed from EEG signals and used as input to statistical learning methods. Prediction of the

clinical diagnostic outcome of ASD or not ASD was highly accurate when using EEG measurements from as early as 3 months of age. Specificity, sensitivity and PPV were high, exceeding 95% at some ages. Prediction of ADOS calibrated severity scores for all infants in the study using only EEG data taken as early as 3 months of age was strongly correlated with the actual measured scores. This suggests that useful digital biomarkers might be extracted from EEG measurements. These results will be reported, with additional discussion of the potential for EEG as a neurodevelopmental monitoring tool for use in primary care, well-baby checkups.

Funding: NIH, Simons Foundation