2013 AMERICAN NEUROPSYCHIATRIC ASSOCIATION ANNUAL MEETING ABSTRACTS

P1. Effects of Smoked Cannabis and Oral Delta-9-tetrahydrocannabinol on Functional Connectivity of Reward Circuitry in Patients With Schizophrenia (R)

Adina S. Fischer, B.Sc., Susan Whitfield-Gabrieli, Ph.D., Robert M. Roth, Ph.D., Mary F. Brunette, M.D., Alan I. Green, M.D.

Background: Cannabis use disorder (CUD) occurs commonly in patients with schizophrenia (SCZ) and substantially worsens disease course. Available treatments for SCZ are rarely successful in limiting cannabis use. Development of effective treatments will be facilitated by a more complete understanding of the basis of their cannabis use. We have proposed that these patients may use cannabis to ameliorate brain reward circuit (BRC) dysfunction. In the present study we investigated the effects of cannabis and dronabinol (delta-9-tetrahydrocannabinol[THC]) on BRC in these patients. **Methods:** Participants included 12 patients with SCZ and co-occurring CUD (abstinent from substance use), and 12 controls. Patients completed fMRI resting scans at baseline and after either smoking a 3.6% THC cannabis cigarette (n=6) or swallowing a 15mg dronabinol pill (n=6). Seed-to-voxel resting state connectivity (rs-fc) of BRC was analyzed using nucleus accumbens (NAc) source regions of interest. The PANSS was used to assess drug effects on symptoms. **Results:** At baseline, patients showed decreased rs-fc between NAc and other BRC regions (amygdala, hippocampus, orbitofrontal and anterior cingulate cortices) relative to controls. Both cannabis and dronabinol administration increased connectivity within BRC. No change in symptom severity was detected. **Conclusion:** Findings indicate that BRC rs-fc is reduced in patients with SCZ+CUD, and that THC agonists improve its connectivity. This supports the use of rs-fc to identify BRC abnormalities and, potentially, to track the effect of pharmacologic agents on this circuitry. Moreover, if confirmed by subsequent study, our findings suggest that dronabinol should be tested as a potential adjunctive treatment for cannabis use in SCZ. **Acknowledgements:** This study was funded by the National Institute on Drug Abuse [R01DA026799-01].

P2. Glutamate and Choline Levels in the Anterior Cingulate are Associated with Measures of Social Cognition in Abstinent Long-Term Alcoholics

Riya B. Luhar, Kayle S. Sawyer, Marlene Oscar-Berman, J. Eric Jensen, and Marisa M. Silveri

Background: Alcoholics have shown deficits in social cognition (conspecific social abilities that are represented in the brain). Although magnetic resonance spectroscopy (MRS) has been used to measure brain metabolite concentrations in recently abstinent alcoholic (ALC) individuals, little is known about metabolite levels after long-term abstinence. **Objective:** Our goal was to assess relationships between measures of social cognition and brain metabolite concentrations of glutamate and choline in the anterior cingulate region (important in emotional and decision-making functions). **Methods:** Participants were 30 ALC (15 men; mean 6.85 years of sobriety) and 29 nonalcoholic (NC) age-equivalent controls (15 men). The Advanced Clinical Solutions (ACS) portion of the Wechsler Adult Intelligence Scale-IV was administered. Proton MRS was employed at 3T (TE=30 ms) to acquire metabolite data from a single voxel in the anterior cingulate region. Metabolites were quantified using LCModel and normalized to creatine levels. **Results:** The groups did not differ on behavioral measures of the ACS. However, relationships between ACS Social Cognition scores and brain metabolite levels differed significantly between groups. Increased scores on five subtests (Social Perception, Social Perception Affect Naming, Social Perception Prosody, Social Perception Pairs, and Faces Spatial) were associated with higher glutamate levels in the NC group than in the ALC group. The interaction of choline levels and groups also was significant for three of the same five Social Cognition measures (Social Perception, Affect Naming, and Prosody). **Conclusion:** These data suggest that brain metabolite levels in abstinent long-term alcoholics are negatively associated with performance on measures of social cognition.

P3. Trajectories of Behavioural Change across Dementia Types

TW Chow, A Kirstein, A Linds, N Grysman, M Freedman, NPLG Verhoeff, G Naglie, U Wolf, W Reichman

Background: Predicting the trajectory of behavioral disturbances due to dementia is a clinical challenge. We previously reported that behavioral variant frontotemporal dementia (bvFTD) was characterized by an inflection point in Neuropsychiatric Inventory (NPI) scores between stage 2 (progressively severe behavioral aberration) and stage 3 (increasing apathy and remission of behavior problems) that occurs at approximately year 6 of illness. In Alzheimer's disease (AD), there was no inflection point. **Objective:** To replicate the prior findings with a new dataset, using the NPI and other clinical measures of

change in function and behavior. **Methods:** The dataset includes 19 mild cognitive impairment who converted to AD, 94 AD, 27 bvFTD, and 14 primary progressive aphasia (PPA) participants with at least 2 sessions of informant based data collection separated by at least one year. Instruments included the Functional Rating Scale, Clinical Dementia Rating scale (FTD), the Frontal Behavioural Inventory (FBI), and the NPI. **Results:** Unlike the prior analysis, patients with AD were significantly older than those with frontotemporal degeneration. Potential inflection points for 1) AD, bvFTD, & PPA groups appear on preliminary graphs of the total NPI and 2) AD and PPA on the disinhibition portion of the FBI. We will transform scores from all 4 instruments to rates of change over time variables for each participant to enter as the dependent variable in multivariate linear regressions. **Conclusion:** These preliminary results support a crescendo-decrescendo trajectory of behavioral symptoms in late-onset AD, bvFTD and PPA that are more easily tracked with the NPI than the FBI.

P4. Atrophy in Distinct Corticolimbic Networks Predicts Specific Social Symptoms in Frontotemporal Dementia (R)

Kevin C. Bickart, Michael Brickhouse, Daisy Sapolsky, Lisa Feldman Barrett, Bradford C. Dickerson

Objective: To develop a new scale measuring the types and severity of social symptoms in Frontotemporal Dementia (FTD); to test the hypothesis that atrophy in specific brain networks correlates with symptom severity. **Background:** Patients with FTD often exhibit progressive impairments in social behavior. Although there are a growing number of performance-based tests of social behavior, there is no existing instrument for clinicians to grade social symptoms in FTD. **Methods:** We developed the Social Impairment Rating Scale (SIRS), rated by a clinician after a structured interview. In a sample of 20 FTD patients, we used the SIRS to study the anatomic basis of social impairments in FTD. **Results:** In support of hypotheses generated from a prior study of healthy adults, we found that the relative magnitude of brain atrophy in three partially dissociable corticolimbic networks anchored in the amygdala predicted the severity of distinct social impairments measured using the SIRS. Specifically, patients with the greatest atrophy in a mesolimbic, reward-related (affiliation) network exhibited the most severe socioemotional detachment, whereas patients with the greatest atrophy in an interoceptive, pain-related (aversion) network exhibited the most severe lack of social apprehension. Patients with the greatest atrophy in a perceptual network exhibited the most severe lack of awareness or understanding of others' socio-emotional behavior. **Conclusions:** Our findings support the validity of the SIRS as an instrument to measure the social symptoms in FTD. Ultimately, we hope it will be useful as a longitudinal outcome measure in clinical trials of putative interventions to improve social functioning.

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P5. Cortical Thickness Developmental Trajectories in Healthy Children and Its Relation to Psychopathology (R)

Authors: *Simon Ducharme, Matthew D. Albaugh, Tuong-Vi Nguyen, Alan C. Evans, Sherif Karama*

Background: Many neuropsychiatric disorders begin during adolescence and early adulthood. However, little is known about normative cortical maturation and alterations associated with developmental psychopathology. Cortical thickness is a potentially important morphometric endophenotype, with initial studies suggesting quadratic ('inverted-U') and cubic growth patterns in healthy children. **Objective:** Determine cortical thickness developmental trajectories in the NIH MRI Study of Normal Brain Development, which is socio-demographically representative of the American population. **Methods:** 384 healthy subjects from age 4.9 to 22.3 years, with up to three MRI at 2-year intervals (total 793 scans). Images were processed with CIVET generating cortical thickness measurements at 81,924 vertices. A visual quality control was performed to exclude subjects with aberrant measurements. Local cortical thickness was regressed against age in cubic, quadratic, and first-order linear models, controlling for gender and scanner. **Results:** Cubic developmental trajectories were predominant in the right dorsolateral prefrontal cortex, bilateral parietal association cortex, temporo-parietal and parieto-occipital junctions bilaterally. Quadratic trajectories were restricted to the left dorsolateral prefrontal, left premotor, and medial frontal cortices. The best fitting model was a negative first-order linear model for all the remaining brain regions, covering over 50% of the surface. In cubic and quadratic trajectories, increase in thickness peaked around age 5-6. **Conclusions:** There was a predominantly linear pattern of cortical thinning between the ages of 5 and 22 years. Previously reported data from our group demonstrating the impact of inattention and anxious/depressed symptoms on these developmental trajectories within specific regions, and potential impact on ADHD and depression will be reviewed.

P6. Differentiating Catatonia from Behavioral Variant Frontotemporal Dementia (bvFTD): A Complex Neuropsychiatric Challenge

Authors: *Simon Ducharme MD MSc, Evan D. Murray MD, Bradford C. Dickerson MD, Bruce H. Price MD*

Background: bvFTD can present with inertia, perseveration, stereotypy, and executive dysfunction. Clinicians must exclude

psychiatric conditions that might better account for behavioral disturbances. Symptoms of catatonia including stereotypy, echophenomena, and mutism overlap with bvFTD. Cases of misdiagnoses of bvFTD as catatonia, and vice-versa have been reported. **Case History:** A 55 year-old male lawyer with bipolar I disorder developed difficulty performing complex tasks, forgetfulness and compulsive sexual behaviors over 2 year. His mood disorder was stable on lithium until 08/2011 when it was stopped due to glomerulonephritis. Patient was started on cyclophosphamide and high dose corticosteroids. He subsequently developed delirium, followed by acute depression. He exhibited retarded catatonia that markedly improved with lorazepam. Over the following year, there were multiple admissions for catatonia and depression. Biochemical and infectious work-up were negative. Neuropsychological testing revealed impairment in executive and visuospatial functions, verbal fluency, and encoding. Brain MRI showed mild diffuse atrophy. EEG was normal. By 09/2012 the patient was maintaining appropriate social conduct. MoCA was 26/30 (improved compared to 09/2011). Frontal Assessment Battery was 9/18, demonstrating impaired performance. There was motor impersistence, perseveration, and stereotypic forced expirations on examination. **Conclusions:** This patient's 2-year history of cognitive decline, frontal lobe deficits and neuropsychological results are suggestive of a neurodegenerative process such as bvFTD. However, residual symptoms of partially treated catatonia are difficult to entirely exclude. We review the clinical approach towards distinguishing bvFTD from catatonia, including neuroimaging studies (MRI, PET-Scan), CSF biomarkers, and useful diagnostic and treatment approaches using benzodiazepines and ECT.

P7. Prognostic Significance of Florbetapir F18 PET Neuroimaging for Future Cognitive Decline Over 36 Months

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Background: β-Amyloid neuropathology may predict cognitive decline in people at risk for Alzheimer's disease (AD). **Objective:** This study examined baseline ^{18}F-florbetapir PET amyloid imaging status and 3-year change from baseline in cognitive performance in healthy older cognitively normal (CN) and recently diagnosed mildly impaired participants (MCI). **Methods:** 52 MCI (<1 year since diagnosis, CDR 0.5, MMSE>24) and 69 CN subjects (MMSE ≥ 29) received florbetapir PET followed by clinical evaluation and psychometric testing at 18 and 36 months. Three nuclear medicine physicians rated images amyloid positive (Aβ+) or negative (Aβ–). ANCOVA (age, baseline score) compared 3-year LOCF change in ADAS-cog (primary) and other psychometric tests as a function of amyloid status. **Results:** In MCI with postbaseline data, 17/47 (36%) classified Aβ+ by majority visual read. At 3 years, ADAS-cog worsened 5.66 points in Aβ+ while improving 0.71 in Aβ– ($p=0.0014$). In MCI and CN, more Aβ+ showed a ≥4-point ADAS-cog decline compared to Aβ- (MCI: 47.1% Aβ+ vs 10% Aβ-, $p=0.0094$; CN: 40% Aβ+ vs 5.3% Aβ-, $p=0.0075$). Baseline amyloid status was significant predictor of worsening at 3 years in MCI and CN on ADAS-cog, CDR-SOB, DSST, MMSE (except in CN), verbal fluency (vegetables). In a stepwise regression with age, education, APOE genotype and baseline psychometric test score, Aβ status remained significant predictor in MCI: ($p<0.05$) all tests except verbal fluency and DSST. **Conclusion:** Amyloid positive florbetapir PET scans were associated with increased rate of progressive cognitive decline.

P8. A Neuropsychiatric Case Study of Early-Onset Familial Alzheimer's Disease (C)

Nand Kishore, Eyal Kimchi, Miles Cunningham, Matthew Frosch, Jeremy Schmahmann

Background: Presenilin 1 (PS-1) gene mutation is the most common cause of early onset Alzheimer's Disease (AD). We describe a PS-1 AD patient without clear family history to highlight the clinical features and management challenges. **Case History:** A 35-year-old man presented with a two-year history of progressive memory impairment, depression, anger and defiance. Examination showed deficient episodic memory with impaired attention and executive function. He demonstrated saccadic intrusions into ocular pursuit, increased tone with cogwheeling, decreased arm swing, hand posturing with stress gait, hyperreflexia and flexor plantar responses, and occasional multifocal myoclonus. Over the subsequent 2 years, he became confabulatory and rageful, language became fragmented and paraphasic, with palilalia and stuttering. MRI over his course was nondiagnostic, and he tested negative for prion, paraneoplastic, Whipple, Hashimoto, and mitochondrial disorders and spinocerebellar ataxia 17. PET showed parietal and temporal hypometabolism. CSF a-beta and tau levels were found to be consistent with AD, and gene testing showed the PS-1 mutation. Myoclonus worsened, with self-mutilation, psychosis, fear, and rage. Gait failed, he became disoriented, incontinent, and mute except for rare phrases and vocalizations. His advanced disease was discovered during a home visit, and he was admitted. He received supportive care with sedation, and soon thereafter died. Autopsy showed high plaque burden and widespread neurofibrillary tangles throughout hippocampus, cortex and brainstem. **Conclusion:** PS-1 AD can present very early with a neuropsychiatric profile that is diagnostically challenging. A multidisciplinary team approach can enhance diagnosis and treatment and reduce anguish for the patient and family.

P9. Adaptation of a Group-Visit Dementia Care Model to a Community Setting

Richard Murphy, Reed Henry, Soo Borson

Background: While the population burden of dementia is increasing, allocation of health care and family support resources is not commensurate with rising needs. Care is often suboptimal, reflecting the lack of available expertise and funding, particularly for minorities, vulnerable adults, and elders living in rural settings. **Clinical Model:** We adapted a group-visit model developed in an academic center to an underserved rural setting. A physician and social worker with expertise in dementia provided bi-monthly 90-120minute sessions over 9 months for 15 patients with mild to moderate Alzheimer's dementia and their family/caregivers. 4-5 dyads attended each visit, and after reminding participants of the visit format and confidentiality, each dyad's concerns and clinical needs were addressed. During most sessions, participants identified a topic for focused education. Physician focus included staging/diagnosis, neurobehavioral symptoms, medical co-morbidities, sleep, safety, falls, prescribing, and ordering clinically indicated tests. Social worker focus included identification and management of family/caregiver stress, dealing with behavioral problems, structuring daily activity and facilitating services such as adult daycare. Providers collaborated to address: education, safety, and referrals for therapy or respite care. All staff had responsibility monitoring for signs of elder abuse. Insurance was billed based on documentation of level 3-4 medical complexity. **Conclusions:** This model addresses problems common in the care of dementia, including suboptimal management of behavioral problems, medical co-morbidities, sleep disturbance and caregiver stress. Comprehensive education, support and care can be provided efficiently to groups of patient/caregiver dyads. Collaboration between the physician and social worker in this model facilitates appropriate care.

P10. Personality and Affective Changes in a Patient With Vascular Dementia: Using Neurocircuitry to Explain Neuropsychiatric Symptoms

Aaron Ritter, M.D., Eric Taylor, M.D.

Background: The case presented in the poster—a patient presenting with metabolic encephalopathy after missing dialysis—is by no means novel, however, relying on neurocircuitry and neuroimaging to describe a patient's behaviors is. The purpose of this case report is to present the concept of the neurocircuit and then use a clinical case to illustrate how a neuroscientist can use this concept to describe neuropsychiatric symptoms. **Case History:** The case involves a 65 year old female with vascular dementia and ESRD who presented to the ED delirious after missing dialysis. When the patient became apathetic and paranoid, despite correction of her metabolic abnormalities, both the medicine and nephrology teams felt compelled to consult psychiatry to rule out "malingering" and an "undiagnosed" psychiatric illness. Imaging was obtained that showed significant white matter disease, but this did little to convince the medicine service that this could account for her "psychiatric" behavior. It was only through the introduction of the concept of the neurocircuit that the family and medicine service could understand the patient's symptoms. The concept of the neurocircuit is an underappreciated concept in psychiatry. The most comprehensive article perhaps comes from Bonnelli and Cummings and is cited in the reference section. Overall, our experience on the consult service at the University of Arizona finds that this is an underappreciated concept. This poster presents the anatomy, clinical correlation, and functions behind three most widely known neurocircuits: the dorsolateral, anterior cingulate, and orbitalfrontal circuits. **Conclusion:** Using the concept of neurocircuits to explain neuropsychiatric symptoms can be very useful in helping physicians in other fields understand their patients' behaviors. Evidence is mounting from both case reports and neuroimaging that neurocircuits exist and are powerful tools to explain behavior.

P11. Association Between the HIV Dementia Rating Scale and Objective Memory Measures

Victoria-Maria Sekunda, Mandy Garber, Maggie Sweitzer, Glen Getz

Background: The HIV Dementia Rating Scale (HDS) is a brief assessment tool used with the HIV population for screening of dementia. Studies are inconsistent regarding the ability of HDS to accurately predict the severity level of dementia. Limited studies have examined the relationship between HDS and performance on objective memory measures. **Objective:** The objective of the study was to determine the relationship of the HDS and performance on objective memory measures in HIV positive patients. **Methods:** Seventeen males and 7 females, diagnosed with HIV were evaluated at a local clinic with the HIV Dementia Rating Scale (HDS), Brief Visuospatial Memory Test-Revised (BVMT-R), and Hopkins Verbal Learning Test-Revised (HVLT-R) as part of a larger neuropsychology battery. **Results:** Multiple correlation analyses indicated statistically significant relationships between the HDS and the HVLT-R as well as the HDS and BVMT-R ($rs = .66$-$.76$; all p's $< .001$). However, utilizing a cutoff score demonstrated limited sensitivity for identifying individuals with borderline performance on the memory tasks, as 35% of individuals classified as intact on the HDS demonstrated borderline performance on the memory tasks. **Discussion:** Our results suggest that the HDS demonstrated statistically significant correlations with objective memory measures. The HDS may be useful as a brief assessment tool in order to be able to quickly screen for severity of memory impairment, particularly

in more severe patients. However, utilizing the HDS may overlook some individuals with less severe memory deficits in HIV. More thorough cognitive testing is recommended in those circumstances.

P12. Comparison of Neuroimaging Modalities for the Prediction of Conversion From Mild Cognitive Impairment to Alzheimer's Dementia (R)

Paula T. Trzepacz, Peng Yu, Jia Sun, Kory Schuh, Michael Case, Michael M. Witte, Helen Hochstetler, Ann Hake, for the Alzheimer's Disease Neuroimaging Initiative

Background: Alzheimer's disease (AD) progresses along a continuum where mild cognitive impairment (MCI) due to AD is the symptomatic predementia phase of AD. Identifying phenotypic/endophenotypic characteristics of persons with MCI who progress to develop dementia could be relevant prognostic information for clinicians and families. **Objective:** This study compared positron emission tomography (PET) using the Pittsburgh Compound-B (PIB-PET) for amyloid imaging, fluorodeoxyglucose (FDG)-PET for metabolism, and structural magnetic resonance imaging (MRI) to predict conversion from amnestic MCI to Alzheimer's dementia using 2-year follow-up data from the Alzheimer's Disease Neuroimaging Initiative (ADNI) cohort. **Methods:** Numeric neuroimaging variables (n=29) generated by the ADNI-funded laboratories for each neuroimaging modality along with apolipoprotein-E genotype were analyzed using univariate and multivariate analytic methods. Performance of these biomarkers for predicting conversion from MCI to Alzheimer's dementia at 2 years was evaluated in 50 late amnestic MCI subjects, 20 of whom converted. **Results:** Multivariate modeling found that among individual modalities, MRI had the highest predictive accuracy (67%) which increased to 76% when combined with PIB-PET, producing the highest accuracy among any biomarker combination. Individually, PIB-PET generated the best sensitivity, while FDG-PET had the lowest. Among individual brain regions, the temporal cortex was found to be most predictive for both MRI and PIB-PET. **Conclusion:** These results suggest that a combination of MRI and PIB-PET can be used to best predict conversion from amnestic MCI to Alzheimer's dementia.

P13. 4-Aminopyridine for Post-Concussion Symptoms

Andrew Hornstein, Katrina Stidham, Steven Lichtman, Glenn Seliger, Brian Quail, Jodi Brangaccio, Michael Lipton, Amanda Muldoon, Tovah Gardin

Background: A subset of patients who have sustained a concussion report persisting, often disabling symptoms. The etiology and specificity of post-concussion symptoms is unclear. Eye movement disorders have been reported to significantly co-occur with other post-concussion symptoms. **Objective:** To examine if 4-aminopyridine reduces post-concussion symptoms. 4-aminopyridine is a potassium-channel blocking agent that improves conduction in demyelinated axons. It has also been reported to stabilize functioning of calcium-channels in cerebellar Purkinje cells, resulting in clinically significant improvement of cerebellar functioning in some congenital ataxias and eye movement disorders. **Methods:** We present a single subject study of a patient with chronic incapacitating post-concussion symptoms and eye movement disorder, with findings on diffusion tensor imaging consistent with traumatic axonal injury. Four years after his mild traumatic brain injury, a trial of 4-aminopyridine was conducted, utilizing a single subject, blinded experimental protocol. Neuropsychological testing, standardized symptom ratings, and videonystamographic examinations were administered. **Results:** The data reinforce clinical impression of beneficial medication effect, e.g. improvement on videonystamography of centrally mediated nystagmus on dix-hallpike maneuver. **Conclusion:** Further study of the potential effect of 4-aminopyridine on post-concussion symptoms appears warranted.

P14. Factors Affecting Time to Recovery from Sports Concussion

Art Maerlender, Wanda Rieman, Gretchen Berrios, Jack Turco, Nicole Scremin, Tracy Purcell, Jeff Frechette

Background: Sports concussions are the focus of much research and opinion. Understanding the factors that affect recovery is not well understood. This pilot study is an attempt to characterize relevant factors in recovery. **Objective:** To determine the effect of specific behaviors and factors on time to recovery. **Method:** 24 clinically identified concussed college athletes (18 female, 6 male) were assessed at injury and through recovery. Variables reflecting pre-injury health behaviors, injury severity, "ambient" physical and mental exertion during recovery, and time to recovery were collected. Physical exertion was measured by actigraphy; mental exertion was measured by self-ratings of amount of studying, and recreational exertion. Recovery was the number of days to the point when symptoms and test scores were back to each individual's baseline. **Results:** Regression analyses assessed the relationship of independent variables on outcome. Categories of variables were first analyzed separately, with significant variables entered into a final model. Significant findings: binge-drinking within 5 days of injury, $p=.05$; symptom score total, $p=.03$ (regression-based z-scores: RBz); and mean daily average of mental exertion, $p=.00$. In the final model, prior binge alcohol, symptom RBz, and mental exertion accounted for significant variance in days to recovery ($R^2 = .71$, $p = .00$). Mental exertion's effect-size, over and above binge drinking and symptom total, was $f^2 = 1.55$. **Conclusion:**

While the findings don't establish a causal link between mental exertion and length of time for recovery, they do provide evidence of a strong relationship that warrants further investigation. As a clinical matter, limiting mental exertion during recovery may be a reasonable target for management.

P15. An Atypical Presentation of Sports-Related Concussion

Jason J. Madey, M.D., Emily Williams, Jeff Bodle, M.D., Nolan Williams, M.D., Rebecca Lehman, M.D.

Objective: This is an atypical presentation of a sports-related concussion in a 14-year-old athlete with post-concussive abulia. **Background:** While the majority of sports-related concussions present as headache, nausea, dizziness, confusion, and unsteadiness, there are other, less common presenting symptoms, such as mood disturbance and irritability. Abuila is a disorder of diminished motivation, with a reduction of spontaneous thought content and initiative. **Design/Methods:** In this case report, we present a 14-year-old male who sustained a sports-related concussion after falling during a high school basketball game. He injured the front of his head and initially complained of headache, nausea, and dizziness, which later progressed to symptoms of abulia. On neurologic examination, he answered mental status questions appropriately, but exhibited a lack of emotion. The remainder of his neurologic exam was unremarkable. **Results:** Our patient underwent a head CT scan that was unremarkable. All of his symptoms improved over the next 3 days, with the exception of his abulia. This persisted for a total of 10 days, and then he spontaneously remitted back to his baseline and was able to begin the return-to-play protocol. **Conclusions:** While abulia is not a common symptom of sports-related concussion, this case illustrates an interesting neuropsychiatric presentation of frontal lobe injury resulting in lack of emotion, apathy, and decreased motivation. It is important to recognize that in addition to the classic symptoms of sports concussions, less common symptoms exist, such as impulsivity, depression, insomnia, and in this case, abulia.

P16. The Incidence and Types of Acute Neuropsychiatric Presentations of Sports Concussion

Nolan Williams, Emily Williams, Jeff Bodle, Jay Madey, Danielle C. Faulkner, Rebecca Lehman, Alvin Lee Lewis, Jonathan Edwards

Background: Sports concussion is a topic of very high interest in public opinion, and is frequently referred to in the media. Concussion is a complex patho-physiological process, induced by traumatic biomechanical forces and resulting in a graded set of clinical syndromes that may or may not involve loss of consciousness. Concussion can result in long-lasting effects on cognition as well as mood and affect regulation. **Objective:** While neuropsychiatric symptoms have been demonstrated in athletes with prolonged post-concussive syndrome, the incidence and type of acute neuropsychiatric presentations of concussion has never been described per our literature review. **Methods:** We performed a retrospective chart review of 128 patients receiving immediate post-concussion care at our Sports Neurosciences Clinic. The charts were reviewed for presence or absence of any of the distinct neuropsychiatric symptoms listed below. **Results:** Of the 128 total subjects, there were 85 players (66%) with a neuropsychiatric symptom as part of their immediate post-concussive symptom constellation. Sleep disturbance was the most common neuropsychiatric presentation (26%). Other neuropsychiatric presentations included irritability (13%), mood lability (7%), increased emotionality (5%), sadness (4%), tearfulness (4%), personality change (6%), fatigue (6%), suicidal ideation (3%), amnesia (13%), memory problems (7%), forgetfulness (2%), feeling "in a fog" (16%), feeling "slowed down" (54%), and cognitive impairment (24%). **Conclusion:** Neuropsychiatric complaints are a common presenting symptom of an acute concussive injury. Recognition of neuropsychiatric sequelae is crucial for return-to-play decision-making, as these are typically the symptoms that go unrecognized in the concussed athlete.

P17. Chronic Traumatic Encephalopathy and Suicide: Current State of the Evidence

Robert D. Shura, M.S., Hal S. Wortzel, M.D., Lisa A. Brenner, Ph.D.

Background: Annually, millions worldwide sustain traumatic brain injuries (TBI), and recent literature has reported that even a single mild TBI can lead to chronic traumatic encephalopathy (CTE). It has been suggested that CTE may lead to death by suicide, specifically in athlete and military/veteran populations, raising important prevention, treatment, and policy implications. **Objective:** To conduct a systematic review of the evidence for a relationship between CTE and suicide. **Methods:** A systematic search of PubMed, PsycINFO, Embase/Medline, as well as input from experts in CTE, TBI, and suicide, and bibliography reviews, yielded 84 unique abstracts. The three investigators, blinded to each other's reviews and using ad hoc inclusion/exclusion criteria, reviewed abstracts and the identified full articles, resulting in two case series for review. **Results:** The two identified case series reviewed autopsies of 17 unique cases, 5 of whom died by suicide. Systematic data collection regarding TBI exposure and/or medical/neuropsychiatric history was not employed in any of the studies. None of the three studies used blinding or control cases in the research design. There were divergent opinions regarding neuropathological elements of CTE across studies/authors. Furthermore, extreme heterogeneity in reported clinical manifestations of CTE and relevant neuropsychiatric/medical comorbidities were noted.

Conclusions: Overall quality of the evidence was rated as very low. Hence, evidence for a relationship between CTE and suicide is lacking. Further studies of higher quality and methodological rigor are needed to determine if any relationship between CTE and suicide exists.

P18. Transient Prosopagnosia: Case Report and Literature Review (C)

C.A. Anderson, K.E. Brega, C.M. Filley

Background: Prosopagnosia is typically chronic, but transient cases occur. We present a case of transient prosopagnosia related to a right temporal astrocytoma. **Case History:** A 59-year-old, right-handed, highly educated sculptor was well until a 1-week period when he could not recognize faces. He was unable to recognize his wife's face, friends' faces, and his own face, although he could identify all individuals by their speech. He also experienced visual hallucinations of bird silhouettes and painted road-surface markings, two brief episodes of perceiving inanimate objects (wadded-up sheets of paper and all-terrain vehicles) to have cheerful personalities, and several periods of confusion. All symptoms resolved spontaneously after 7–10 days. The patient rarely consumed alcohol and used no illicit substances. A week later, two behavioral neurologists found a normal neurological examination, including normal face recognition from current magazines and a family album, visual fields, reading, and color vision. MRI demonstrated a right temporal mass. EEG showed mild diffuse slowing. Laboratory studies were unremarkable. Brain biopsy disclosed Grade III small-cell astrocytoma. Literature review disclosed other cases of transient prosopagnosia related to tumor, but typically as a post-operative complication; stroke, TIA, migraine, and NPH have also been associated with this syndrome. **Conclusions:** Transient prosopagnosia is a rare syndrome that can occur in a variety of neurologic disorders. Right temporal-occipital dysfunction is usually found. In our patient, this syndrome can be attributed to a right temporal astrocytoma, and seizure activity is a plausible explanation.

P19. Donepezil-Induced Confusional State in a Patient with Autopsy-Proven Behavioral-Variant Frontotemporal Dementia

David B. Arciniegas, M.D., FANPA, C. Alan Anderson, M.D., FANPA

Background: Cerebral cholinergic neurons are relatively preserved in bvFTD, and administration of cholinesterase inhibitors to individuals with normal cerebral cholinergic function risks cognitive impairment. Apropos of this concern, we present a case of reversible donepezil-induced confusional state in a patient with autopsy-proven bvFTD. **Case History:** A previously healthy 43-year-old man developed functionally significant apathy, verbal and behavioral disinhibition, perseveration, and executive dysfunction over a 1-year period. His physician offered a provisional diagnosis of dementia (type unspecified) and initiated treatment with donepezil 5 mg daily. Within 2 weeks, attention, processing speed, and executive dysfunction worsened; arousal was intermittently diminished; apathy increased; affective lability developed; and the patient's wife stated that the patient appeared "drunk" at times. Neuropsychiatric consultation further revealed primitive reflexes, ideomotor dyspraxia, transcortical motor aphasia, impaired memory, figural construction difficulties, and executive dysfunction. T1-weighted magnetic resonance imaging revealed moderate bilateral dorsolateral prefrontal and anterior cingulate atrophy and mild orbitofrontal and anterolateral temporal atrophy. A diagnosis of probable bvFTD and a superimposed donepezil-induced confusional state (i.e., delirium) was made. Treatment with donepezil was discontinued, and the patient returned to his pre-treatment baseline over the following month. After a 3-year course of illness, autopsy confirmed the diagnosis of frontotemporal lobar degeneration. **Conclusions:** Treatment with donepezil induced a reversible confusional state in this patient with autopsy confirmed bvFTD. This case extends prior observations of the lack of benefits of cholinesterase inhibitor therapy among persons with FTD and highlights the treatment-associated risk of cerebral cholinergic excess-induced cognitive and behavioral decline.

P20. Delusional Perception and Tilted Vision in a Patient with Confirmed Neurosarcoidosis

Reza Tadayonnejad, Brian P. Gomoll, Amber May, Mersedeh Bahr Hosseini, Maria T. Caserta

Background: Neurological involvement occurs in approximately 5-10% of sarcoidosis patients, with psychiatric symptoms occurring in an estimated 20% of those with neurosarcoidosis. Most of our knowledge of the psychiatric and cognitive manifestations of neurosarcoidosis comes from case reports. **Case History:** We present a case of patient with confirmed neurosarcoidosis with aphasia who was admitted to inpatient psychiatry with acute onset of tilted vision, agitation, and delusional perception, consisting of seeing patterns in objects around her house which she felt were related to her husband's poor health. Cognitive testing redemonstrated impairment in recall, language, and visuospatial functioning. Magnetic resonance imaging (MRI) and single-photon emission computed tomography (SPECT) studies demonstrated extensive white-matter changes, areas of calcification, and decreased perfusion of the left parietal and temporal lobes; laboratory tests on blood and cerebrospinal fluid (CSF) were conducted to rule out other conditions. Her insight remained limited, although improved greatly with discussion of results and link between her current symptoms and her known diagnosis of neurosarcoidosis. She was continued on her medications for sarcoidosis and started on a low dose of risperidone and donepezil , but developed

severe parkinsonian side effects and was eventually switched to ziprasidone, with improvement in mood and agitation, although she continues to struggle with cognitive problems, aphasia, personality changes, and intermittent delusions. **Conclusion:** The psychiatric manifestations of neurosarcoidosis are diverse, with no strong evidence for particular treatments. This case represents an unusual manifestation of neurosarcoidosis resulting in tilted vision, delusional perception of patterns in objects, and personality change.

P21. Post-Stroke Subcortical Aphasia and Neurobehavioral Disturbances Without Overt Sensorimotor Deficits (C)

Elias D. Granadillo, M.D., David B. Arciniegas, M.D.

Background: Aphasia may result from lesions to basal ganglia, thalamus, and capsular/pericapsular white-matter (i.e., subcortical structures). Lesions to these structures that produce language disturbances usually impair motor and/or sensory function(s), as well. Given the neurobehaviorally-salient networks to which these structures contribute, disturbances of executive function, comportment, emotional regulation, and/or motivation also should accompany subcortical aphasias. As this association is uncommonly described, we present a case of acute subcortical stroke producing nonfluent aphasia, apathy, and pathological laughing. **Case History:** A 53-year-old, right-handed woman with history of tobacco use and hyperlipidemia presented 3 days after sudden-onset of reduced spontaneous speech, impaired naming and word-finding, semantic paraphasias, and diminished self-care. Examination revealed reduced phrase lengths, brief, uncontrollable, stereotyped, and contextually inappropriate bursts of laughter, and diminished goal-directed thought, emotion, and behavior. The only elemental neurological abnormality was mild reflex asymmetry at the right triceps. Magnetic resonance imaging (MRI) revealed an acute 1.5-cm lesion involving the left genu and adjoining portions of the anterior and posterior limbs of the internal capsule, medial aspect of the globus pallidus, anterior, lateral, and ventral thalamic nuclei, and ventral striatum. **Conclusions:** The combination of anterior subcortical aphasia syndrome, apathy, and pathological laughing experienced by this patient are explained by an acute lesion involving subcortical gray and white matter structures at the point of intersection between language-related circuits, the anterior cingulate circuit, and descending corticobulbar tracts. Standard assessment methods did not readily identify the neurobehavioral features of this stroke, the clinical implications of which will be discussed.

P22. Case Report: Olanzapine Treatment of Voriconazole-Induced Visual Hallucinations During Fungal Meningitis Therapy

Elizabeth Janopaul-Naylor B.S. (BMS 2014), Colin J. Harrington, M.D.

Background: The anti-fungal agent voriconazole is associated with a range of visual side effects including blurred vision and visual hallucinations (VH). For patients requiring an extended course of voriconazole treatment, hallucinations may be distressing. There are few reports of successful treatment of voriconazole-induced VH. We report a case of successful treatment of voriconazole-induced VH with olanzapine. **Case History:** A 52-year-old man with chronic back pain and no psychiatric history was treated with epidural steroid injections in September 2012. The injected steroid was from a batch associated with a nationwide outbreak of fungal meningitis. He presented 2 months later with headache, photophobia, and neck stiffness. CSF analysis revealed 10 nucleated cells and protein 46 mg/dl. CSF bacterial and fungal stains and cultures were negative. MRI of the spine revealed an epidural abcess at the L1 level and phlegmon at additional lumbo-sacral levels. He was started on IV voriconazole and underwent lumbar laminectomy and abcess drainage. Abcess tissue demonstrated fungal elements. On Day 4 of voriconazole therapy, the patient reported severe VH, worse with eye closure. Cognitive function was normal, and reality-testing remained intact. Hallucinations were disturbing and markedly impaired sleep. Voriconazole blood levels were greater than 5.0 mcg/ml on two occasions. Olanzapine 5 mg was started on Day 6 of treatment and titrated up to 15 mg QHS over 3 days. The patient reported resolution of VH and significantly improved sleep. **Conclusions:** This case suggests effective treatment of voriconazole-induced VH with olanzapine. Potential pathophysiologic mechanisms of voriconazole-induced VH will be discussed.

P23. Neuromyelitis Optica With Severe Behavioral Dysregulation: A Case Report

Cassie Karlsson, M.D., Claire Kim, Harrison Levine, M.D., Teri Schreiner, M.D., John Binder, M.D., Robin Gabriels, Psy.D., Carol Beresford, M.D.

Background: Neuromyelitis optica (NMO) is an autoimmune disease resulting in demyelination of the optic nerves and spinal cord, causing vision loss and paralysis. Psychiatric symptoms are uncommon. **Case History:** We present a 6-year-old girl who developed left-sided paralysis progressing to encephalopathy with neurogenic bowel and bladder, shortly after a viral illness. MRI of brain and spinal cord revealed T2 hyperintensities in the cerebellum, temporal white matter, and cervical spinal cord. Initial tests for NMO antibodies were negative. She was diagnosed with Acute Disseminated Encephalomyelitis (ADEM) and improved with intravenous immunoglobulin (IVIG) and steroids. Following prolonged steroid taper, she developed contralateral hemiparesis and optic neuritis. NMO testing was again negative. At age 8, she presented with encephalopathy and seizures. Brain MRI revealed new T2 hyperintense lesions in the medial thalami. Repeat NMO antibody testing was positive. Steroid taper

resulted in severe behavioral dysregulation, perseveration of thoughts and phrases, and sudden, violent mood swings which improved modestly with steroid increase. Steroids were ultimately tapered due to side effects, and she required a prolonged psychiatric hospitalization. Despite stable neurologic exam, imaging, and effective immunosuppression with rituximab, multiple psychotropic medication trials failed to improve progressively worsening symptoms, including severe unprovoked aggression toward self. **Conclusions:** This case illustrates the importance of repeat antibody testing in cases of intractable symptoms, and the formidable psychiatric challenges that may complicate the course of illness in NMO. We hypothesize that medial thalamic lesions contribute to the patient's significant behavioral changes, representing a novel etiology of neuropsychiatric symptoms in NMO.

P24. Mr. Morgan: Questioning the Role of Frontal Lobe Models of Higher Cognition

Richard Lewine, Mara Hart

Background: The prefrontal lobes are accepted as mediating cognitive functions, especially those of the "executive" type. Contemporary neuroscientists are beginning to question the ability of such reductionistic brain models to account for complex, contextualized psychological phenomena. "Mr. Morgan" serves as a unique stimulus for re-examining our brain-cognition models. **Case History:** Neurological case histories, exemplified by the work of Luria, have generally supported a frontal lobe–executive function link. Mr. Morgan stands in sharp contrast to such traditional case histories. Mr. Morgan had had a radical bifrontal lobotomy (1947) and was assessed in 1994 with MRI and PET imaging, a 13-hour neuropsychological test battery, and sophisticated linguistic and communication ratings of letters written by the patient. This case is unique in the depth, breadth, and sophistication of assessments, including access to private journals and family members. **Conclusions:** Mr. Morgan had virtually no frontal lobes, yet excelled at formally-assessed "executive functions." He was able to communicate both in writing and speaking without difficulty, and had a keen understanding of others. The findings lend substantial clinical support to questions being raised about reductionistic models of complex cognition, as well as raising challenging clinical questions about the impact of our expectations, based on such models, of those without frontal lobes. We raise the possibility that we are unintentionally creating a "stereotype threat" process in which the patient performs more poorly on executive functions because both patient and clinician expect it.

P25. Conversion Disorder in Frontotemporal Dementia

E.A. Lonnquist, S.P. Ringel, C.M. Filley

Background: Conversion disorder is considered exceedingly rare in neurodegenerative diseases. **Case History:** This 43-year-old, right-handed man developed slowly progressive decline of language and mathematical skills, and social withdrawal, beginning at age 41. His father had died with frontotemporal dementia first manifested with behavioral symptoms in his 40s. MRI of our patient showed bilateral orbitofrontal atrophy, somewhat more prominent on the left. Gene testing disclosed a C9ORF72 mutation. Two years after disease onset, he was involved in a low-velocity motor vehicle accident, sustaining no head or other injury. Within 2 weeks, he progressed from leg cramping to leg weakness requiring a wheelchair, and soon thereafter developed bilateral leg numbness and bowel and bladder incontinence. Nerve conduction studies and electromyography were normal, as was MRI of the entire spine; brain MRI showed no new lesion. Neuromuscular evaluation led to the diagnosis of conversion disorder. Neurobehavioral examination disclosed a passive man with mildly agrammatic language, but normal comportment. His score on the Montreal Cognitive Assessment was 15. He had functional paraplegia and pansensory loss below the umbilicus. Reflexes were normal, as were muscle bulk and tone. **Conclusions:** To our knowledge, this is the first reported case of conversion disorder in FTD. Our patient raises questions about the participation of the frontal lobes in conversion disorder, including the possibility that FTD may predispose to conversion disorder. Follow-up will be of great interest, to observe whether this conversion disorder will resolve as the frontal lobes continue to degenerate.

P26. Conversion Disorder in a U.S. Veteran

E.A. Lonnquist, H.S. Wortzel

Background: Conversion disorder is frequently encountered in neurology clinics. Medically unexplained symptoms are thought to occur in as many as 35% of new referrals to academic outpatient neurology clinics. However, there remains little literature regarding conversion disorder in United States Veterans. **Case History:** This 21-year-old, right-handed male Veteran had sudden onset of multiple symptoms, including vision loss, gait impairment, memory loss, right-sided facial twitching, tremors, dizziness, fatigue, speech difficulties, and autobiographical memory loss after a syncopal episode in the setting of heat exposure requiring only minor medical treatment. Over the proceeding few months, he was examined by multiple physicians, with diagnoses ranging from entirely functional symptoms to acquired brain injury (ABI) secondary to heatstroke. Examination was notable for many nonphysiological symptoms, such as breakaway weakness, tunnel vision, and astasia-abasia. Multiple MRIs done were interpreted as normal, and no medical cause has been identified for these symptoms. **Conclusion:** Conversion disorder can be challenging to diagnose, given concern over missing medical illness. A recent study of patients with symptoms somewhat or not explained by neurological disease in a neurology clinic

found that 0.4% were found to have another diagnosis within the next 18 months that explained symptoms. Additionally, a history of TBI may confound the identification of psychologically-based symptoms. In one study, 58% of veterans with psychogenic nonepileptic seizures were thought to have seizures due to TBI. Misdiagnosing symptoms as due to ABI and not conversion disorder leads to a delay in treatment and may affect prognosis in veterans.

P27. A Unique Case of Paraneoplastic Extra-limbic Encephalitis Presenting With Neuropsychiatric Symptoms Subsequent to Biopsy

Katherine Lubarsky, Magdalena Spariosu, Diego Coira

Background: Paraneoplastic disorders of the CNS are a heterogeneous group of neurological disorders associated with systemic cancer, which cannot be attributed to direct effects of the neoplasm. Although there is extensive literature focusing on the neurological manifestations of these disorders, the initial presentation is psychiatric in many instances, and discussion in the psychiatric literature is relatively sparse. **Case description:** We report the case of a 48-year-old woman with no past psychiatric history who presented with neuropsychiatric symptoms immediately subsequent to biopsy and inflammatory breast cancer diagnosis. Patient was initially admitted to the psychiatric unit for suspected acute stress reaction, and later diagnosed with paraneoplastic extra-limbic encephalitis. This case uniquely allows for exploration of how temporal aspects of symptom presentation relate to biopsy procedure and also how psychoneuroimmunological factors may contribute to the development of paraneoplastic disorders. It additionally may help bolster recognition and enhanced characterization of paraneoplastic disorders from within the psychiatric community. **Conclusions:** As early oncologic treatment and immunotherapies improve outcomes, early diagnosis is paramount for both treating the paraneoplastic syndrome and identifying a possible underlying malignancy. Additionally, the time course of symptom presentation raises the intriguing possibility that perturbation of tumor tissues during biopsy may accelerate the immune response to onconeuronal auto-antigens and inflammation-mediated neuronal injury. Lastly, given the patient's acute stress state, the rapid time course of symptom onset, and known connection between psychological stress and autoimmunity, we propose that the immune system stress-response may contribute to paraneoplastic syndrome development.

P28. Partial Agenesis of the Corpus Callosum: A Case Study

Hazel McBride, Geoffrey Duckworth, Kang Lee, and Bell Angus

Background: Studying individuals with partial agenesis of the corpus callosum (AgCC) and intact intellectual functioning could lead to insights into the interhemispheric transfer (IHT) pathways associated with specific cognitive functions. **Case History:** Studies of total AgCC are exploring the role of integrated cerebral functioning in the development of complex high level cognitive, social and emotional functioning. (Paul et al., 2007). However these studies are unable to identify pathways used for specific IHT at different areas of the corpus callosum. "RM," a 34-year-old Caucasian man, has agenesis of the genu and rostrum of the corpus callosum. He is a professional audio technician, a musician, and songwriter. He is unmarried and lives with his father who is schizophrenic. **Supportive Neurodiagnostic Data:** WAIS-IV Scores: Full-Scale IQ: 70th.%ile; VCI: 87th %ile; Similarities: 95th %ile; Vocabulary: 75th %ile: Information: 75th %ile; PRI: 55th %ile; Block Design: 25th %ile; Matrix Reasoning: 91st %ile; Visual Puzzles: 37th %ile; WMI: 87th %ile; Digit Span Forward: 99.6th %ile; Digit Span Backward: 50th %ile; Digit Span Sequential: 9th %ile; Arithmetic: 91st % ile; PSI: 16th %ile; Coding: 25th % ile; Symbol Search: 16th %ile; WRAML: Verbal Memory, 27th %ile; Visual Memory, 0.1st %ile. **Conclusions:** RM processed simple, untimed visual information, effectively supporting the hypothesis that simple information can be transferred between hemispheres in AgCC via other pathways, such as the anterior commissure. RM's significant challenges with visual memory indicates a greater reliance on IHT as complexity increases and a significant role for the rostrum and genu in this transfer.

P29. A Case of Cotard Syndrome in a Woman With a Right Subdural Hemorrhage (C)

David L. Perez, Benjamin H. Fuchs, Jane Epstein

Background: Monothematic nihilistic delusions, first described by Jules Cotard, are rare neuropsychiatric presentations. We report a case of Cotard syndrome after a spontaneous right hemisphere subdural hemorrhage. **Case History:** A 73-year-old, right-handed woman with no prior neuropsychiatric history presented to a tertiary-care psychiatric emergency room insisting that she was "going to die and going to hell." Symptom onset occurred abruptly and persisted for 48 hours prior to presentation. On interview, she denied low mood or other symptoms of depression. Her medical history was notable for hypertension and hypothyroidism, both treated with medication. Mental status examination revealed flat affect, linear thought process, and thought content notable for preoccupation with her impending death. She was alert, attentive, and fully-oriented. She had preserved language abilities, but exhibited short-term memory impairments. Vital signs and neurological exam were unremarkable. Laboratory studies, including basic chemistries, blood counts, liver function tests, coagulation profile, and thyroid-stimulating hormone were

normal. She was found to have a 12-mm acute-on-chronic right frontoparietal subdural hemorrhage on head computed tomography (CT), and frontotemporal theta slowing (without epileptiform activity) on electroencephalogram. Follow-up CT was unchanged, and she improved within 1 week with conservative management. **Conclusions:** Cotard syndrome may present after subdural hemorrhage, with disruption of non-dominant frontoparieto-temporal networks, consistent with previously-reported lesion sites. Right temporoparietal dysfunction has been implicated in disorders of corporeal awareness. Preserved left hemisphere-mediated interpreter functions, together with right hemispheric dysfunction and frontal executive impairments, may contribute to the development of false nihilistic beliefs.

P30. Active Reward-Processing During Human Sleep: Insights From Dreaming and Parasomnias

Lampros Perogamvros, M.D., Sophie Schwartz, Ph.D., Stephen Perrig, M.D.

Background: Exploratory behaviors can be observed during sleep: oriented locomotion, in sleepwalking; eating, in sleep-related eating disorder (SRED); approach behaviors, during dreaming. These complex behaviors are often characterized by high motivational or even compulsive attributes. While mechanisms for motor disinhibition during parasomnias are relatively well understood, there is no sufficient pathophysiological explanation for the variety of behaviors expressed during sleep and dreaming. **Case Histories:** Six subjects, ages from 26 to 61 years old, presented with SRED, sleepwalking, or intense dreaming. We have used video-polysomnography, a dream diary, and neuropsychological examination with reward-related questionnaires (Temperament and Character Inventory, Sensation-Seeking Scale, Form V, Behavioral Inhibition System/Behavioral Approach System Scale), and assessed whether sleep behaviors and dream characteristics were related to the dopaminergic reward profile. **Conclusion:** We found that all patients had elevated exploratory excitability and increased experience-seeking compared to normative data for the reward-related questionnaires. Approach behaviors also characterized SRED episodes (chewing, swallowing, eating), sleepwalking (complex, oriented locomotion), and dreaming. These preliminary findings suggest that increased activation of the reward-seeking network may occur during sleep in humans. Its expression in the form of overt behavior in sleep seems to involve two concomitant conditions: 1) lack of motor atonia or disinhibition of the central pattern generators; and 2) elevated reward-sensitivity. Future studies with large patient and control samples are awaited to further confirm these preliminary findings.

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P31. Case Report: Hallucinogen Persisting Perception Disorder After Exposure to Ayahuasca

John F. Sullivan, M.D.

Background: Hallucinogen persisting perception disorder (HPPD) is a rare syndrome occurring after psychedelic drug exposure. It comprises primarily visual symptoms (e.g., palinopsia, aeropsia, and dyslexia). Sufferers also report anxiety and dissociation. The pathophysiology is poorly understood, but thought to be related to $5HT_{2a}$ receptor sensitivity and impaired sensory gating. The case presented here is the first known report of HPPD from ingestion of ayahuasca, an increasingly common herbal preparation containing the hallucinogenic drug DMT. **Case History:** A 21-year-old Caucasian man with a history of depression and alcohol abuse had exposure to marijuana but not to LSD or other psychedelic drugs before taking a single dose of ayahuasca. Within days, he developed persistent palinopsia, aeropsia, and dissociation. Dissociative symptoms responded to clonidine, and the visual symptoms partially resolved with carbidopa/levodopa. These medications have been described elsewhere as helpful in HPPD, as have benzodiazepines, levetiracetam, and tolcapone. **Conclusions:** Awareness of HPPD and its treatment assists the clinician encountering patients with this rare disorder. If visual disturbances are misinterpreted as hallucinations, treatment with neuroleptics can worsen symptoms. Study of HPPD, a disorder of sensory gating, may inform research into other disorders with impaired sensory gating: schizophrenia, PTSD, conversion disorder, and autism. Response of HPPD to tolcapone suggests involvement of COMT, which has been implicated in sensory-gating disruption in schizophrenia, among other disorders. The bimodal response observed in a small trial of tolcapone with carbidopa/levodopa for HPPD supports the theory that polymorphism in the COMT gene predisposes to sensory-gating disorders.

P32. The Impact of NNZ-2566 on the *fmr1* Knockout Mouse Model of Fragile X Syndrome

Michael J. Bickerdike, Mike F. Snape, Patricia Cogram

Background: Fragile X syndrome is a neurodevelopmental disorder caused by mutation of the fragile X mental retardation 1 (fmr1) gene, and characterized by intellectual disability, social anxiety, attention-deficit hyperactivity disorder, and abnormal physical characteristics, such as macro-orchidism

(enlarged testes). Mutant fmr1 knockout (KO) mice recapitulate this phenotype and represent a preclinical model for assessment of putative drug treatments. **Objective:** NNZ-2566 is a novel, modified tripeptide that is an analog of the terminal region of insulin-like growth factor 1. It readily crosses the blood–brain barrier. NNZ-2566 is currently being investigated in a moderate-to-severe traumatic brain injury study. The objective of this study was to investigate whether treatment with NNZ-2566 would attenuate the physiological and behavioral features of fmr1 KO mice. **Methods:** Fmr1 KO and wild-type mice (C57BL/6J background) were dosed with vehicle or NNZ-2566 (100 mg/kg i.p.) at 14 weeks of age, for 28 days. Various behavioral and anatomic outcomes were assessed after treatment. **Results:** At baseline, fmr1 KO mice manifested numerous phenotypic changes as compared with wild-type mice, including hyperactivity in the open-field ($p < 0.01$) and successive alley tests ($p < 0.01$), decreased contextual-fear conditioned memory ($p < 0.01$), macro-orchidism ($p < 0.01$), increased dendritic spine density, and increased phosphorylation of ERK and Akt ($p < 0.01$). Treatment with NNZ-2566 significantly ameliorated these aberrant features of the fmr1 KO mouse phenotype. **Conclusion:** NNZ-2566 treatment for 28 days appears to normalize the phenotype of fmr1 KO mice, suggesting that NNZ-2566 may have potential as a treatment for Fragile X syndrome.

P33. acr-7: An Antipsychotic Drug Target From An Unbiased Genetic Screen

Edgar Buttner, Taixiang Saur, Bruce Cohen

Background: The molecular mechanisms underlying the therapeutic effects of antipsychotic drugs remain poorly understood. **Method:** We conducted an RNAi screen in C. elegans for suppressors of clozapine-induced larval arrest and identified 40 suppressors, including the nicotinic acetylcholine receptor (nAChR) acr-7. We then showed that an acr-7 knockout also produces suppression. **Results:** nAChR agonists phenocopied the effects of clozapine, whereas nAChR antagonists blocked clozapine's effects. Expression data indicated that ACR-7 acts in the pharynx to mediate the larval arrest phenotype. **Conclusion:** Interestingly, our data suggest that clozapine may activate some nAchRs, a hypothesis that could be tested further following identification of the mammalian ortholog of this gene.

P34. Establishment of the World's First Comprehensive, Multidisciplinary Clinic for Adults With 22q11.2 Deletion Syndrome

Wai Lun Alan Fung, Anne S. Bassett

Background: The multi-systemic clinical manifestations of 22q11.2 deletion syndrome (22q11.2DS) —including numerous neuropsychiatric symptoms—make the provision of comprehensive care for patients challenging. A coordinated, multidisciplinary team approach in the provision of care is recommended in Practice Guidelines. To our knowledge, no such comprehensive center exists for adults with 22q11.2DS. **Objective:** To establish a comprehensive, multidisciplinary clinic for adults with 22q11.2DS. **Methods:** Although a multidisciplinary pediatric 22q11.2DS clinic exists in Toronto, these patients would need to visit healthcare providers at multiple institutions to receive all required elements of care when they become adults. Planning has been underway for a multidisciplinary clinic for adults with 22q11.2DS to be established at Toronto General Hospital in Toronto, with opening scheduled for late 2012. The strategic planning committee for the clinic is composed of physicians, allied health professionals, architects, hospital administration, and infrastructure professionals. The Clinic will be directed by author ASB and co-directed by author WLAF. **Results:** Some key issues identified include 1) clinic design; 2) staffing; 3) mode and hours of clinic operation and service delivery; 4) transitional care; and 5) academic contributions and public education. The overall goal is "one-stop service provision," with easy access to the multidisciplinary medical and allied health professional team members on site at the proposed Clinic. **Conclusion:** To our knowledge, this will be the world's first comprehensive, multidisciplinary clinic for adults with 22q11.2DS. This could become a model for other adult 22q11.2DS clinics and for clinics serving adults with other multi-systemic disorders.

P35. Development of a Movement-Disorder Neuropsychiatry Professional Group With International Membership

Wai Lun Alan Fung, Kevin J. Black

Background: A sizeable number of professionals have long been involved in clinical, educational, and research endeavors related to the neuropsychiatric aspects of movement disorders. There has been no organized professional group representing these practitioners, nationally or internationally. **Objective:** To develop a professional group with international memberships for physicians, other health professionals, and scientists in the emerging field of movement disorders neuropsychiatry (MDNP). **Methods:** In summer 2010, author WLAF had requested a special interest group (SIG) in MDNP to be formed within the American Neuropsychiatric Association (ANPA), with the inaugural meeting of the SIG held during the 2012 ANPA Annual Meeting. Both authors co-moderated the meeting. Also, in March 2012, e-mails were sent to professional contacts of both authors in the field of MDNP, informing them of the establishment of the ANPA MDNP SIG, and inquiring about their interests in participating in the group. **Results:** The MDNP SIG inaugural meeting on March 22, 2012 was attended by professionals from the Americas, Europe, and Asia. Issues such as mandate, scope, involvements

in educational and research endeavors, as well as logistical issues of the SIG were discussed. Attendees expressed strong enthusiasms in the SIG. Professional contacts of the authors throughout Europe and North America had also expressed strong interests in such a professional group. **Conclusion:** To our knowledge, this is the first attempt to establish a professional group with international memberships in the field of MDNP. Over time, the group may play increasingly important roles in promoting the growth of MDNP.

P36. A Potential Phenotypic Expression of Fragile X Gray (or Intermediate) Zone Allele

Mary Reeni M. George, Ph.D., Sherry Sellers Vinson, M.D., M.Ed.

Background: A full mutation in the FMR1 gene located at Xq27.3 can cause the typical cysteine/guanine/guanine (CGG) triplicate pattern in the promoter region of the FMR1 gene to go from the typical 44-or-fewer CGG repeats to >200 such repeats, resulting in Fragile X syndrome. Smaller expansions (approximately 55–200 repeats) may result in an increased transcription rate and are associated with late-onset specific phenotypes (such as Fragile-X-associated Tremor/Ataxia Syndrome and Fragile-X-associated Primary Ovarian Insufficiency). However, CGG repeat number ranging between 41 and 55 is relatively poorly defined with regard to both transcriptional and translational activity and also potential phenotypic effects. This is described as a "gray-zone pattern," which can expand to premutations or full mutations in succeeding generations. **Case History:** The authors report findings from a neuropsychological evaluation, magnetic resonance imaging, and micromal array genetic evaluation of a 15-year-old girl with Fragile X gray-zone allele, who presents with a history of multiple tics, mild inattention, difficulty with fine motor skills, and significant math learning difficulties. MRI findings were unremarkable, while the neuropsychological evaluation revealed specific cognitive difficulties, including constructional praxis and difficulties with visual-spatial, fine motor, and executive skills. To our knowledge, this is the first reported pediatric case of potential phenotypic expression of Fragile X gray (or intermediate) zone allele. **Conclusions:** This case study attempts to understand disease phenotypes of pediatric neuropsychiatric cases in a new way by looking beyond the usual.

P37. APOE ε4 and Depressive Symptoms in Multiple Sclerosis (MS)

Omar Ghaffar, Marty Fiati, Anthony Feinstein

Background: The lifetime prevalence of major depression is 50% in MS patients. While brain imaging data have suggested varying degrees of affiliation with MS-related pathology in fronto-temporal regions, less is known of possible genetic contributions to depression in MS. The APOE ε4 allele was identified as a risk factor for major depressive disorder in a recent meta-analysis of 183 case–control studies of neurologically-normal individuals. In addition, the ε2 allele has been suggested to be protective against depressive symptoms in MS. **Objective:** To determine whether APOE ε4 is associated with depressive symptoms in MS. **Methods:** Using a case–control design, 50 patients with MS with the ε4 allele (ε4+) and 50 ε4-negative (ε4–) patients with MS completed the Beck Depression Inventory (BDI-II). Total BDI scores as well as scores on the Cognitive and Affective Subscales were compared between the ε4+ and ε4– patients by two-sided *t*-tests. Cognition was assessed with the Minimal Assessment for Cognitive Functioning in MS. **Results:** ε4+ and ε4– MS patients were well-matched with respect to demographic variables (age, gender, education) and disease variables (disease course, disease duration, Expanded Disability Status Scale, 25-foot timed walk, 9-hole pegboard test). The two groups did not differ with respect to ε2 allelic frequency. In addition, the groups performed similarly on all cognitive outcomes measures. Total BDI-II scores and scores on the Cognitive and Affective Subscales did not differ between ε4+ and ε4– MS patients. **Conclusion:** This study does not support a role for the ε4 allele in depression in MS.

P38. Neural Correlates of Cognitive Anosognosia in Veterans with Mild Traumatic Brain Injury (TBI)

Mohammed Ahmed, M.D., Jared Rowland, Ph.D., Ruth Yoash-Gantz, Ph.D., Robin Hurley, M.D., Ihtsham Haq, M.D., Stephen Kramer, M.D., Katherine Taber, Ph.D.

Background: Traumatic brain injury (TBI) may result in reduced insight into one's own condition, which significantly interferes with functional ability. About 45% of individuals with moderate-to-severe TBI demonstrate reduced or complete lack of awareness of deficits. Although mild TBI is the most prevalent form of TBI, there have been no studies on cognitive anosognosia in this population. **Objective:** Cognitive anosognosia was assessed in veterans with mild TBI. **Methods:** The study is a retrospective analysis of existing research data. Items were identified from the Frontal System Behavioral Scale (FrSBe) that could be used as self-report ratings for specific cognitive domains (attention, dual task, sequencing, cognitive flexibility, retrieval). From an initial sample of 122 post-deployment OEF/OIF Veterans, 38 participants were identified who had experienced a mild TBI and performed at least one standard deviation below the mean on at least one objective test in the identified cognitive domains. Objective performance was compared with self-report in that cognitive domain. Individuals not self-reporting problems in a cognitive domain, but displaying problems on objective testing, were identified as possibly displaying cognitive anosognosia. **Results:** The following number of participants denied having problems in a cognitive domain, but displayed problems in that domain

on objective testing: attention: 10, dual task: 7, sequencing: 4, cognitive flexibility: 13, and retrieval: 4. Of all individuals displaying problems on objective cognitive testing, the following percentages denied experiencing those problems: attention: 67%, dual task: 88%, sequencing: 67%, cognitive flexibility: 76%, and retrieval: 40%. **Conclusions:** These results suggest that cognitive anosognosia may be present in patients with mild TBI.

P39. Potential of Cognitive Interventions in Neuropsychiatric Illnesses: Evidence for Efficacy

Mohammed Ahmed, M.D., W. Vaughn McCall, M.D., M.S., Sarah H. Lisanby, M.D., Faraaz Khan, M.S.-3, Jared Rowland, Ph.D., Katherine Taber, Ph.D., Robin Hurley, M.D.

Background: Cognitive deficits are defining features of neuropsychiatric illnesses. Managing these deficits is a major challenge to prevent long-term disability. Non-pharmacological cognitive interventions may be valuable in this context. However, the evidence to support transition into a clinical setting remains unclear. Also, there are very few learning aids available for practicing clinicians that present the available interventions in a user-friendly format. **Objective:** The purpose of this project is to evaluate and synthesize the evidence for the use of non-pharmacological cognitive interventions and then to create reference tools that can be used to guide applications in a clinical setting. **Methods:** Literature searches were completed using PubMed and psycINFO to identify randomized, controlled trials and evidence-based systematic reviews to categorize the neuropsychiatric conditions in which non-pharmacological cognitive interventions were found to be efficacious. Then, new teaching tools were created to synthesize the information into a user-friendly format "for the bedside." **Results:** The evidence for clinical improvement for select neuropsychiatric disorders with Cognitive Remediation Therapy, Cognitive Enhancement Therapy, Computer-Assisted Cognitive Retraining, and brain neuroplasticity-based cognitive training were synthesized into new teaching tools for practicing clinicians and trainees. **Conclusion:** Certain cognitive therapies have adequate evidence for empirically-based treatment options in a clinical setting in patients with traumatic brain injury, stroke, and schizophrenia. More controlled trials are needed to support efficacy for other conditions (e.g., Alzheimer's disease, geriatric depression, epilepsy). Novel reference tools appropriate for the adult learner will assist clinicians in applying this information to clinical practice.

P40. The Association Between Posttraumatic Amnesia and Symptoms of Posttraumatic Stress Disorder in Patients With Mild, Moderate, and Severe Traumatic Brain Injury

Abdullah Alozairi, Scott McCullagh, Anthony Feinstein

Background: Studies have shown that a traumatic brain injury is a significant risk factor for the development of posttraumatic stress disorder (PTSD). What is less clear is the association between posttraumatic amnesia (PTA) and PTSD. **Objective:** To explore the relationship between duration of PTA and symptoms of PTSD. **Methods:** A consecutive sample of 1,114 patients between the ages of 18 and 65, within3 months of acquiring a TBI. Data collection included relevant demographic and TBI (Glasgow Coma Scale, PTA, CT brain scan abnormalities) variables. Behavioral measures included the Impact of Event Scale, the 28-item General Health Questionnaire (GHQ), and the Rivermead Post-Concussion Disorder Questionnaire (RPCQ). **Results:** Participants were divided by their duration of PTA into 4 groups: $<$1 hour; 1–24 hours; 24 hours–1 week; $>$1 week. The group with a PTA $<$1 hour had more intrusive and avoidant PTSD-type symptoms ($p < 0.001$ for all) and were more anxious according to the GHQ ($p < 0.01$) than the other three groups. A regression analysis identified PTA and three concussive symptoms (light-sensitivity, noise-intolerance, and difficulties concentrating) as independent predictors of re-experiencing PTSD-type symptoms. **Conclusion:** Our data, representative of the full range of TBI severity, indicate that a brief duration of PTA is a significant risk factor for the development of PTSD symptoms. The persistence of certain symptoms of a post-concussion disorder adds to the risk by possibly acting as a trigger for reminders of the traumatic event.

P41. Neuroendocrine Dysfunction Secondary to Brain Injury: Who Are We Missing?

Lisa Kreber, Mark Ashley

Background: Posttraumatic hypopituitarism, specifically, growth hormone deficiency (GHD), is an often undetected consequence of brain injury (BI). The incidence of GHD in patients with BI is 15%–37%. Symptoms of posttraumatic GHD include fatigue, decreased body mass, increased abdominal adiposity, exercise intolerance, memory impairments, and depression. These symptoms overlap with deficits observed in patients with BI, which may be why a diagnosis of GHD is often missed after BI. Insulin-like growth factor -1 (IGF-1) is considered the best biomarker of growth hormone (GH) currently available. However, total IGF-1 levels in isolation do not reliably predict GH status in patients who have sustained a BI. The only "true" assay of GH levels is through stimulation testing, such as the glucagon stimulation test (GST). **Objective:** Approximately, 50% of adults with GHD have IGF-1 levels within the normal reference range. The objective of the current study was to determine how many patients with BI are "missed" from getting a diagnosis of GHD by relying on various reference ranges for IGF-1. **Method:** 94 patients with a documented history of brain injury were assessed for GHD, using IGF-1 levels and the GST. IGF-1 levels were compared with standardized reference ranges and the

IGF-1 cutoff of 175 ug/l proposed by Zgaljardic et al (2011). **Results:** Preliminary results indicate that by relying on IGF-1 reference ranges in isolation, approximately one-third of patients with IGF-1 levels within the "normal" reference range are actually GHD as determined by the GST. However, by using a cutoff of 175 ug/l and clinical symptoms of neuroendocrine dysfunction, 12 of the patients tested who were actually GHD were missed by these criteria. **Conclusion:** IGF-1 levels alone are not a good biomarker of GHD, and "normal" reference ranges can miss many patients who are actually GHD. It is important to pursue stimulation testing to diagnose GHD and monitor clinical symptoms of GHD in patients with brain injury.

P42. The Neuropsychology of PTSD and Its Impact on Spousal Relationships and Coping

Eva Leven

Background: Neuropsychological theory finds that hyperactivation of noradrenergic networks within the septohippocampal system correlates with hypersensitivity to threats and susceptibility to recurrent traumatic intrusions; such intrusions associate with the psychophysiological arousal typically present in PTSD. The purpose of this research was to enhance understanding of the quality of life and marital satisfaction of PTSD-affected 9/11 first-responders (FR) and their spouses (non-FR wives) after the WTC terrorist attacks. Specific attention has been paid to differing coping mechanisms and perception/appraisal of trauma between FRs and their spouses, as well as to the underlying clinical and biological aspects of PTSD that may effect such varying responses. **Objective:** It was hypothesized that, among FRs, level of traumatic impact would serve as the best predictor for overall quality of life and marital satisfaction; for spouses, psychological distress was hypothesized to best predict these outcomes. **Methods:** 30 couples comprised this quantitative within-group study. All subjects completed self-report measures focusing on traumatic impact and psychological distress/PTSD symptoms. **Results:** Multiple-regression was implemented to examine these factors; findings revealed that psychological distress scores best predicted FRs' quality of life and marital satisfaction, while spouses were most affected by their own psychological distress, as well as by the traumatic impact their FR husbands reported. **Conclusion:** Differences in marital satisfaction and quality of life among PTSD-affected FRs and their spouses are likely due to disparate coping mechanisms and perceptions/appraisals of traumatic events. The overlap between FRs' trauma and spouses' marital satisfaction implies that significant neuropsychological vulnerabilities, and propensities towards PTSD, may exist within traumatically-exposed couples.

P43. Broad-Spectrum Improvements with Neurotherapy for TBI/PTSD in OEF/OIF Veterans

David V. Nelson, Mary Lee Esty, David O. Keyser, Paul E. Rapp

Background: We have previously reported evidence from a small pilot study suggesting that recent developments in neurotherapy may be beneficial to addressing complex trauma spectrum (TBI/PTSD) symptoms in OEF/OIF veterans. **Objective:** To extend the outcome assessment to more objective neurocognitive as well as subjective symptom reports in a new pilot trial of the efficacy of the Flexyx Neurotherapy System (FNS), which uses minute electromagnetic pulses to subliminally stimulate the EEG. **Methods:** Three male OEF/OIF veterans with mixed TBI/PTSD syndromes referred to the Brain Wellness and Biofeedback Center of Washington were treated with an experimental adaptation of FNS for 20 sessions and also seen for pre-/post-laboratory examination at the USUHS Traumatic Injury Research Program. Measures completed pre- and immediately post-treatment included, among others, the ANAM4 TBI Battery, Rivermead Post-Concussion Symptoms Questionnaire, PTSD Checklist–Military Version, Revised Short-Form McGill Pain Questionnaire, and individual treatment session 0–10 ratings of current symptoms (fatigue, cognitive clouding, sleep, pain, anxiety, depression, irritability/anger) and activity levels. **Results:** All ANAM4 measures evidenced marked improvement, along with scores on other questionnaires and checklists. Linear trend analyses indicated significant slopes (betas with all p's <0.001) in evidence for decreases in all current symptom ratings and increased activity levels. **Conclusion:** Objective improvement in neurocognitive processes, other symptoms of TBI/PTSD, and other potentially related symptoms (e.g., pain) appear to improve largely in tandem during FNS treatment. Additional participants are included in the ongoing study, and similar trends are evident. Longer-term follow-up data are also being collected.

P44. A Magnetoencephalography Investigation of the Effect of PTSD on Decision-Making Networks

Jared A. Rowland, Jennifer Stapleton-Kotloski, Katherine H. Taber, Dwayne W. Godwin

Background: Given the large number of individuals deployed during the wars in Iraq and Afghanistan, it is important to understand how deployment-related disorders will affect daily functioning. There is significant overlap between the brain areas associated with PTSD and those involved in decision-making under ambiguous circumstances. Thus, it is likely that individual with PTSD display alterations in decision-making behavior related to changes in those brain regions. **Objective:** Examine differences in brain activity and connectivity during the Iowa Gambling Task (IGT) between post-deployment

veterans with and without PTSD. **Methods:** Post-deployment veterans with PTSD and no other psychiatric diagnosis (n=4) and healthy controls (n=4) were recruited. Brain activity was measured using magnetoencephalography during completion of the IGT. Source series were extracted using synthetic aperture magnetometry from the 2 seconds representing presentation of outcome. **Results:** Beam-formed images demonstrate marked between-group differences in brain activity, while also demonstrating striking within-group consistency. Functional connectivity analyses demonstrate that participants with PTSD show significant increases in connectivity at the left amygdala ($p < 0.01$), left insula ($p < 0.01$), left pregenual anterior cingulate cortex ($p < 0.04$), and the right ventromedial prefrontal cortex ($p < 001$) during IGT outcome. **Conclusion:** These results demonstrate significant differences in brain activity and connectivity between participants with PTSD and healthy controls during completion of the IGT, a non-threatening and non-emotional task. These findings suggest that alterations in brain regions typically associated with PTSD symptoms may also affect decision-making behavior.

Support: This material is based upon work supported in part by a joint W.G. Hefner VAMC and Wake Forest School of Medicine Translational Science Institute pilot award, as well as with resources from the Mid-Atlantic Mental Illness Research Education & Clinical Center, the W.G. Hefner VAMC, Wake Forest School of Medicine Departments of Neurology, and the Center for Biomolecular Imaging.
Human Studies Approval: The W.G. Hefner VAMC IRB approved this study to ensure the privacy of research subjects was maintained and their welfare protected. Full informed consent was obtained before any study activities.

P45. Identifying Brain Activity Associated with PTSD Symptoms, but not Post-Concussive Symptoms

Jared A. Rowland, Jennifer Stapleton-Kotloski, Katherine H. Taber, Dwayne W. Godwin

Background: Estimates suggest that of all individuals deployed during the wars in Iraq and Afghanistan, 11%–30% will develop posttraumatic stress disorder (PTSD), and 12%–22% will experience a mild traumatic brain injury (mTBI), with many individuals experiencing both conditions. There is significant overlap between symptoms of these conditions, making differential diagnosis based on self-report difficult and inconsistent. **Objective:** Identify a diagnostic marker based on brain activity that can differentiate PTSD and postconcussive symptoms. **Methods:** Post-deployment veterans with PTSD and no other psychiatric diagnosis (n=5) and healthy controls (n=5) were recruited. No participant had experienced an mTBI. Brain activity was measured by magnetoencephalography. Source series were extracted using synthetic aperture magnetometry. Results of power spectral analyses were correlated with self-reported PTSD and post-concussive symptoms. **Results:** Participants with PTSD reported significantly higher levels of both PTSD symptoms ($p < 0.001$) and post-concussive symptoms ($p < 0.002$). Correlations between power in the Theta (control $r = -0.17$; PTSD $r = -0.70$) and Beta (control $r = 0.44$; PTSD $r = -0.46$) bands with PTSD symptoms differentiated control participants from those with PTSD. There was no such differentiation for post-concussive symptoms. **Conclusion:** These results indicate that magnetoencephalography-based measures may have potential to distinguish PTSD from TBI. Brain activity in the Theta and Beta frequency bandwidths was able to differentiate participants with PTSD from healthy controls. This differentiation was specific to PTSD symptoms and was not present for postconcussive symptoms. As no participant had experienced an mTBI, these results offers promise for providing additional objective diagnostic information.

Support: This material is based on work supported in part by a joint W.G. Hefner VAMC and Wake Forest School of Medicine Translational Science Institute pilot award, as well as with resources from the Mid-Atlantic Mental Illness Research Education & Clinical Center, the W.G. Hefner VAMC, Wake Forest School of Medicine Departments of Neurology, and the Center for Biomolecular Imaging.
Human Studies Approval: The W.G. Hefner VAMC IRB approved this study to ensure that the privacy of research subjects was maintained and their welfare protected. Full informed consent was obtained before any study activities.

P46. Trajectory of Recovery of Learning and Episodic Memory After Mild Traumatic Brain Injury (mTBI)

Fadi Tayim, Laura Flashman, Robert Roth, Thomas McAllister

Background: Previous works suggests that most individuals with mTBI show recovery of episodic memory within the first year after injury. Some individuals, however, note persistent memory complaints, and increasing concerns have been raised about potential long-term effects of even mild injury. **Objective:** To characterize the recovery of learning and episodic memory 1 and 12 months after mTBI. **Method:** 92 individuals with mTBI (77 mild, 15 complicated-mild) were administered the California Verbal Learning Test - 2nd edition (CVLT-II) on two occasions, 1 month and 1 year after injury, and compared with 40 healthy controls. CVLT-II data were scored normally, using the Item-Specific Deficit Approach (ISDA), a method using CVLT-II item-level analyses to generate indices of episodic memory sub-domains. Repeated-measures ANOVAs, using age and WRAT-4 reading as covariates, were conducted to assess performance at the two

time-points. **Results:** There were no main effects for time, and no time-by-diagnosis interactions using traditional CVLT-II variables or ISDA indices. There was a significant effect of diagnosis for all CVLT-II measures (Encoding: p=0.003; Short: p=0.025; and Long delay: p=0.008; and Recognition Discriminability: p=0.043; as well as ISDA Encoding: p=0.005; and Consolidation [p=0.047] conditions). Post-hoc analyses at 12 months post-injury showed that the mTBI group continued to perform worse than controls on these measures, even when the complicated-mild subjects were excluded from the analysis. **Conclusion:** Although mTBI participants did improve at 12 months, they continue to show deficits in learning and recall, even in the cohort without neuroimaging abnormalities.

P47. Use of the CVLT-II Item-Specific Deficit Approach (ISDA) to Understand Episodic Memory Performance One Month After Mild Traumatic Brain Injury

Fadi Tayim, Laura Flashman, Robert Roth, Thomas McAllister

Background: Although episodic memory deficits have been reported shortly after mild traumatic brain injury (mTBI), the relative contribution of discrete memory sub-processes (encoding, consolidation, and retrieval) has not been well established. The Item-Specific Deficit Approach (ISDA) is a novel method that uses item-level analyses of the California Verbal Learning Test, 2nd Edition (CVLT-II) to generate indices of each of these episodic memory sub-domains. **Objective:** To test the hypothesis that use of the ISDA provides additional information in understanding the profile of episodic memory deficits 1 month after mTBI. **Method:** 93 individuals with mTBI (1 month post-injury) and 40 healthy controls were administered the CVLT-II. CVLT-II results were entered into the ISDA model, providing discrete episodic memory index scores. Univariate ANOVAs were conducted to assess differences in performance between mTBI and healthy controls, with age and WRAT-IV Reading used as covariates. **Results:** On traditional CVLT-II measures, controls performed significantly better than the mTBI group on Total Acquisition (p=0.002), Short-Delay (p=0.019), and Long-Delay (p=0.021), but not Recognition Discriminability (p=0.074). Examination of the ISDA indices indicated that controls performed significantly better than the mTBI participants on encoding (p=0.01), but not consolidation (p=0.084) or retrieval (p=0.064). **Conclusion:** Using *both* traditional and ISDA CVLT-II scores, mTBI participants demonstrated weaknesses in encoding and recall of verbal information. Examination of the ISDA and traditional CVLT-II scores suggests a primary deficit in encoding of new verbal information that may contribute to both subjective and objective "memory problems" observed shortly after mTBI.

P48. Modified Group Dialectical Behavior Therapy for Non-Epileptic Seizures: A Two-Year Feasibility Pilot Study

Nida Mirza, Kim Bullock, M.D., Craig Forte

Background: The biosocial model of dialectical behavior therapy (DBT) may be a useful approach to treating conversion disorder, specifically, Psychogenic Non-epileptic Seizures (PNES). DBT is an evidence-based treatment for borderline personality disorder (BPD). Striking similarities between BPD and PNES exist, including childhood trauma, female predominance, and "difficult-to-treat" characterizations exacerbated by psychosocial stressors. **Objective:** No standard evidence-based psychotherapy treatment exists for PNES; however, cognitive-behavioral therapy (CBT) is usually an important component. We hypothesize that utilizing the highly-operationalized CBT intervention of DBT groups for PNES is feasible, helpful, and easily disseminated. **Methods:** The intervention provided three modules of mindfulness, interpersonal effectiveness, emotion regulation, and distress tolerance skills training. Our multidisciplinary treatment team blended psychiatry, psychology, and social work. Attendance, seizure frequency and severity, mood, childhood trauma, and DBT skills usage measures were collected over 2 years. **Results:** Twenty-one subjects participated with an average group size of 7 across six modules; 5 participants completed full treatment at least once; 7 completed two modules at least once; and 9 completed one module. The majority completing a module continued for additional time, revealing increased retention and compliance over time. Seizure response rates, childhood trauma, BDI, and skills usage over time will be reported. **Conclusion:** DBT is a feasible operationalized treatment for PNES. Behavioral bursts may occur in the first year as part of the extinction of unwanted behavior. DBT's biosocial model is likely applicable to PNES, as emotion regulation may play a key role in symptom development and maintenance, evidenced by the study's behavioral outcomes.

P49. Parkinsonian Features in a Case of Pellagra: A Historical Report

Andrea E. Cavanna, Andrea Nani, Adrian C. Williams

Background: Pellagra is a systemic disease caused by dietary deficiency of niacin (vitamin B3) and clinically characterized by dermatitis, diarrhea, and dementia (the "three Ds"), plus complex neuropsychiatric symptoms and Parkinsonian features. The neuropsychiatric and motor abnormalities reported by pellagrins have received little attention in the modern medical literature, despite their recognition in early descriptions of pellagra. **Case History:** We present the English translation of the first detailed description of an original case of pellagra with Parkinsonian features, reported in a clinical note by Dr. Giuseppe Paravicini one century ago. Felice, the patient,

was gravely tainted with hereditary defects, as documented by his family tree. In addition to pellagra, he presented with a wide spectrum of motor symptoms, including muscular spasms, contractures, tremor, and peculiar gait abnormalities. Paravicini's clinical description provided compelling evidence for the diagnosis of Parkinson's disease. **Conclusions:** Pellagra and Parkinson's disease could share some basic pathophysiological mechanisms at the level of nicotinamide metabolism, resulting in mitochondrial dysfunction and alterations in dopaminergic pathways. Specifically, the manifestation of Parkinsonian features in pellagra are not to be missed: although improved nutritional habits in developed economies have led to a decrease in attention to pellagra and its pathophysiological bases, some cases have recently been associated with alcohol abuse and HIV infection, and there is evidence suggesting that this condition might be on the raise in both developing countries and underprivileged segments of Western society. Paravicini's detailed account of a case of pellagra associated with Parkinsonism still provides useful clinical insights on two conditions showing similarities in both clinical and pathogenetic aspects.

P50. The Most-Cited Works in Epilepsy

Andrea Eugenio Cavanna, M.D., Ph.D., Maryann Wilson, Andrea Nani, Ph.D.

Background: The impact of a scientific article is proportional to the citations it has received. The identification of the most-cited works in a scientific field can help evaluate current research trends. **Methods:** According to the Web of Science database, articles with more than 400 citations qualify as "citation classics." We conducted a search on the ISI Web of Science bibliometric database for scientific articles relevant to epilepsy. **Results:** We retrieved 67 highly-cited articles (400 or more citations), which were published in 31 journals: 17 clinical studies, 42 laboratory studies, 5 reviews, and 3 classification article. Clinical studies consisted of epidemiological analyses (n=3), studies on the clinical phenomenology of epilepsy, including behavioral and prognostic aspects (n=5), and articles focusing on pharmacological (n=6) and non-pharmacological (n=3) treatment. The laboratory studies dealt with genetics (n=6), animal models (n=27), and neurobiology (n=9). The majority (61%) of citation classics on epilepsy were published after 1986, possibly reflecting the expansion of research interest in laboratory studies, driven by the development of new methodologies in the fields of genetics and animal models. Consequently, clinical studies were highly cited both before and after the mid-80s, while laboratory researches became widely cited after 1990. **Conclusions:** The main drivers of scientific impact in the field of epileptology have increasingly become genetic and neurobiological studies, along with research on animal models of epilepsy. These articles are characterized by high numbers of citations in relatively short time-spans and suggest potential directions for future research.

P52. Integrating Neuropsychology, Neurobiology, and Phenomenology: A Critique on ADHD-OCD Comorbidity Across the Lifespan

Amitai Abramovitch, Andrew Mittelman, Reuven Dar

Background: The concept of comorbidity between ADHD and OCD has been discussed for two decades. However, stark contrast in the phenomenology, neurobiology, and pharmacotherapy of these disorders, taken alongside the high variability in reported co-occurrence rates, demands a comprehensive examination. **Objective:** We reviewed studies reporting ADHD-OCD co-occurrence rates in children and adults, critically examining methodological, phenomenological, and etiological issues. **Methods:** Medline and ISI databases were searched for relevant keywords. We recorded prevalence rates, age, gender, recruitment characteristics, and exclusion criteria. This review includes 45 samples, spanning 22 years, and 4,042 subjects. **Results:** Unusually high variability of co-occurrence rates was identified (range: 0–55%). Studies suffered from a variety of methodological problems, including very few community samples and inconsistent exclusionary criteria. Etiological (i.e., genetic) backing has been provided only for a pediatric comorbidity. Also, inflated rates of ADHD-OCD co-occurrence may be mediated by the presence of tic disorders. Moreover, some evidence of impaired neuronal maturational processes in pediatric OCD may lead to transient phenotypical expressions that resemble ADHD symptomatology. **Conclusion:** Unusually high variability in co-occurrence rates was identified. Average sample age was negatively correlated with co-occurrence rates. Methodological concerns and lack of an etiological account for adult ADHD-OCD comorbidity might weaken the validity of this comorbidity. Neurobiological and clinical differences may be masked by similar neuropsychological impairments. Clinicians should consider the possibility that ADHD-like symptoms associated with OCD-specific symptomatology may be misdiagnosed as ADHD. Recommendations for practitioners and for future research are discussed.

P53. Role of Nucleus Accumbens Core (NAc) in Pathogenesis of Obsessive-Compulsive Disorder (OCD) in the Quinpirole-Sensitization Animal Model

Javier Ballester González, Anna Dvorkin-Gheva, Henry Szechtman

Background: Models of OCD neural circuitry include the nucleus accumbens as an important nodal point but little is known of its importance in the pathogenesis of OCD. **Objective:** Given the therapeutic potential of nucleus accumbens deep brain stimulation for OCD, we examined

whether a lesion of the NAc prevents development of an OCD profile in the quinpirole sensitization model of compulsive checking. **Methods:** The D2/D3 dopamine agonist quinpirole (QNP) induces compulsive checking behavior in the rat as characterized by exaggerated preoccupation with one location in the environment to which the rat returns repeatedly, assessed by 4 criteria measures. Such behavior in the rat is similar to OCD checking in the human, according to four lines of evidence. A 2x2 fully crossed factorial design was employed, with one factor being Dose of Chronic QNP Treatment (0 vs 0.5 mg/kg) and the other being a Lesion factor (Sham lesion vs NAc lesion). Naive male rats (N=168) received bilateral NMDA or sham lesions and following a 2-wk recovery period underwent the standard chronic treatment protocol for the induction of compulsive checking (twice weekly injections in a large open field x 10). **Results:** In saline-treated rats, a lesion of the NAc induced locomotor hyperactivity but did not induce compulsive checking. In contrast, chronic QNP treatment induced locomotor sensitization and compulsive checking in sham and NAc lesion rats. **Conclusions:** While DBS suggests a NAc role in expression of OCD, animal model findings suggest that NAc is not necessary for OCD pathogenesis.

P54. Ictal Coprolalia in a Patient With Temporal Lobe Epilepsy (C)

Sara Panunzi, Francesco Cardona, Paola De Liso, Mario Brinciotti, Andrea E. Cavanna

Background: The association between epilepsy and behavioral symptoms has attracted the attention of neurologists and psychiatrists since the nineteenth century, however many aspects of this relationship remain controversial. We report the case of an 8-year-old girl with temporal lobe epilepsy who presented with ictal coprophenomena, as well as multimodal hallucinations and aggressive behaviors. **Case history:** "A.B." was referred to the Department of Pediatrics and Child Neuropsychiatry at the age of 8 years for pharmaco-resistant epilepsy. Following normal psychomotor development, at the age of 6 she developed polymorphic seizures, mainly characterized by absences and drop attacks. One year later, A.B.'s epilepsy worsened, as she developed ictal coprolalia and copropraxia, occasionally associated with visual and auditory hallucinations, plus prolonged motor manifestations, including forced touching and aggressive outbursts. Electroencephalographic video monitoring documented the association between temporal sharp-waves and ictal coprolalia. Magnetic Resonance Spectroscopy revealed an increase of Cho (Cho/Cr) at the level of both temporal lobes and a peak of mI in the right temporal lobe, without significant reductions in the concentration of NAA. Following antiepileptic medication review, A.B.'s seizures gradually improved with the introduction of lamotrigine. **Conclusions:** A. B.'s clinical phenomenology, neurophysiological abnormalities, and metabolite profiles alterations suggest an evolving pathological process affecting the mesial temporal lobe and resulting in an unusual clinical presentation. Specifically, the presence of coprolalia and copropraxia as ictal epileptic phenomena has rarely been reported in middle childhood. This case highlights possible shared pathways for the expression of complex partial seizures, ictal alterations of consciousness, and socially inappropriate behaviors.

P55. Mother–Child Agreement on Behavioral Ratings in Tourette Syndrome: A Controlled Study

Andrea E. Cavanna, Chiara Luoni, Claudia Selvini, Valentina Bandera, Umberto Balottin, Clare M. Eddy, Cristiano Termine

Background: In Tourette syndrome (TS), motor and phonic tics are often associated with a spectrum of psychiatric disorders, which can pose considerable diagnostic challenges. **Objective:** As proxy-report is commonly used to assess children with TS, we investigated the relationship between child and mother ratings of behavioral problems. **Methods:** Participants were 28 children (25 boys; mean age, 13.9 years) diagnosed with TS according to DSM-IV-TR criteria, and 61 gender and age-matched healthy controls (HC) (55 boys; mean age, 14.7 years). Clinicians completed measures of tic severity, plus a structured psychiatric interview (K-SADS) with both patients with TS and their parents. All children completed the Youth Self-Report (YSR) version of the Child Behavior Checklist (CBCL), while mothers completed the CBCL. **Results:** Children with TS showed higher scores on most subscales of the CBCL than the HC. In the TS group, YSR scores were significantly lower than mothers' CBCL scores across the majority of subscales. In contrast, mother and child ratings only differed for HC for the Externalizing behavior subscales. Competence was rated lower by mothers than children for both groups. **Conclusion:** While the CBCL is a sensitive instrument to behavioral problems in children with TS, we found clinically relevant differences between self and mother ratings of certain behavioral problems (especially affect and somatization). This suggests that the self-report form of this instrument fails to capture the severity of these symptoms. Alternatively, mothers' may perceive behavioral problems as more stressful and therefore more severe than their children.

P56. Brain Changes in Gilles de la Tourette Syndrome: A Systematic Literature Review of Morphometric MRI Studies

Shanthi Yogeswaran, Caroline Selai, Andrea Eugenio Cavanna

Background: Gilles de la Tourette syndrome (GTS) is a neurodevelopmental disorder characterized by chronic vocal

and motor tics. Although the exact pathophysiology of GTS is poorly understood, preliminary evidence points towards alterations within the cortico-striato-thalamo-cortical pathways. **Objective:** Based on the hypothesis that functional abnormalities could reflect structural changes, we conducted a systematic literature review of morphometric MRI studies in children and adult patients with GTS. **Method:** Our systematic literature review followed the instructions provided by the Prisma guidelines and included computerized literature searches of relevant databases (PubMed, Sumsearch, Cochrane, Web of Science). **Results:** Thirty-seven papers were identified, and review of findings showed a number of brain regions to be potentially involved in GTS pathophysiology. Most studies identified structural changes in specific cortical areas including (sensorimotor, prefrontal, temporal, parieto-occipital cortex plus cingulate gyrus, and operculum), basal ganglia (caudate and lenticular nuclei), thalamic nuclei (ventrolateral, ventroposterior, ventroposterolateral, pulvinar), corpus callosum, midbrain and cerebellum, with variable morphological features across different studies. **Conclusions:** The results of our systematic review suggest, that specific structural brain changes are detectable in groups of patients with GTS; however, these abnormalities appear to be widespread and inconsistent across different studies. Most studies are limited by the relatively small sample sizes and the lack of rigorous protocols for data collection and analysis. Future morphometric investigations should include standardized clinical characterizations and longitudinal protocols, in order to account for the presence of co-morbid psychiatric disorders and the variability in the clinical course of GTS.

P57. Deep Brain Stimulation (DBS) and Tourette's Syndrome: Emerging Targets and Stimulation Paradigms

Amit Chopra, Bryan Klassen, Matt Stead

Background: Tourette syndrome (TS) is a complex neurological disorder manifested chiefly by disabling motor and phonic tics. Deep brain stimulation (DBS) is being increasingly recognized as surgical treatment when tics become disabling or self-injurious despite optimal medical therapy. **Objectives:** We review the current literature on emerging DBS targets and stimulation paradigms in treatment of TS. **Methods:** A PubMed database search was performed to identify all articles discussing DBS and TS. **Results:** The majority of TS patients ($n < 100$) received thalamic stimulation (centromedian nucleus and substantia periventricularis), with fewer patients receiving globus pallidus internus stimulation, and occasional cases with anterior limb of the internal capsule, subthalamic nucleus, and nucleus accumbens stimulation. DBS has been associated with variable improvement in tics in a majority of patients, with fewer surgery-related complications. Continuous DBS stimulation is the preferred stimulation mode, with scheduled DBS stimulation being a promising approach, as well. **Conclusion:** DBS is an effective in treatment of medically refractory TS, although the comparison between different DBS targets should be done with caution due to methodological variability in existing studies. Multicenter, randomized, sham-controlled studies with larger sample sizes are still lacking to help determine optimal DBS target in TS.

P58. Enhanced Physiological Awareness and Inhibitory Dysfunction in Tourette Syndrome

Clare M. Eddy, Andrea E. Cavanna

Background: Most individuals with Tourette syndrome (TS) report that their motor and phonic tics are commonly preceded by specific sensory phenomena. These premonitory sensations are likely to play a critical role not only in the subjective experience of TS, but also in the success of behavioral therapy for tics, which, in turn, may be related to inhibitory functioning. **Objectives:** In this study, we investigated whether TS is associated with broader alterations in the awareness of internal physiological sensations, and whether changes in physiological awareness may be linked to inhibitory dysfunction. **Method:** Awareness of bodily sensations and inhibitory functioning were investigated in 18 adult patients with "pure" TS (mild-to-moderate tic severity, no comorbid conditions) compared with 18 healthy controls. Relationships between the aforementioned factors, tic severity and awareness of premonitory sensations were also explored. **Results:** TS was associated with significantly higher scores on the Private Body Consciousness (PBC) scale and impaired performance on both traditional and emotional Stroop tests. Inhibitory functioning was negatively related to scores on both the PBC and Premonitory Urge for Tics Scale. Complex relationships were apparent between inhibitory functioning and tic severity. **Conclusions:** Patients with TS exhibit increased private body consciousness and deficits in the inhibition of neutral and affect-related stimuli. Furthermore, aspects of inhibitory functioning appear to relate to level of physiological awareness, the experience of premonitory sensations, and tic severity. These findings highlight complex interactions between neuropsychological and neurophysiological mechanisms in TS that could affect both tic severity and the success of behavioral treatments.

P59. Prevalence and Predictors of Trichotillomania in Tourette's Disorder

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Background: Trichotillomania (TTM) is a psychiatric disorder typically beginning in late childhood/early adolescence, defined by recurrent hair-pulling, noticeable hair loss, and

resulting distress. Quite heritable, TTM is proposed to share genetic susceptibility and underlying pathophysiology with obsessive-compulsive disorder (OCD) and Tourette's disorder (TD). **Objective:** To determine the prevalence of TTM in a cohort of TD patients with and without other common co-occurring disorders, including OCD and Attention Deficit Hyperactivity Disorder (ADHD). Also, to identify factors most predictive of TTM in patients with TD, using DSM-IV and proposed DSM-5 criteria. **Methods:** Subjects included 464 TD probands recruited from specialty clinics for a multi-center genetic study of TD. Subjects were assessed using standardized, semi-structured interviews. Clinical diagnoses were determined by TD clinical investigators, using a best-estimate consensus approach. TTM prevalence rates were calculated using DSM-IV and proposed DSM-5 criteria. Clinical predictors of TTM in TD patients are being evaluated using regression modeling in STATA. **Results:** In our cohort of 464 subjects with TD, 3.2% had TTM, based on DSM-IV criteria, and 4.7% met criteria based on proposed DSM-5 guidelines. Potential predictors of co-occurring TTM in TD patients, such as comorbid OCD, ADHD, age at onset, and tic severity will be reported. **Conclusion:** The prevalence of TTM is higher in TD patients as compared with published rates in the general population (1%–2%), consistent with the previously proposed relationship between the two disorders. This study should help to direct future research of TTM risk factors in relation to other childhood-onset neuropsychiatric disorders.

P60. Bilateral Shoe Deterioration as a Result of Complex Motor Tics in Tourette Syndrome

James W. Mitchell, Andrea E. Cavanna

Background: Tourette syndrome (TS) is a neurodevelopmental condition characterized by motor and phonic tics, commonly presenting with comorbid behavioral problems. We report the case of a patient with TS who presented with salient complex motor symptoms, namely treatment-refractory kicking resulting in bilateral shoe deterioration. **Case History:** "A.B." was referred to our specialist clinic for adults with TS at the age of 18, following an 11-year history of tics, which started with mouth opening. He subsequently developed more complex motor tics and phonic tics, as well as echolalia, echopraxia, palipraxia, coprolalia, and copropraxia. He scored 65% on the YGTSS, indicating marked tic severity, and had a concomitant diagnosis of obsessive-compulsive disorder, experiencing obsessional thoughts and performing counting rituals. As part of his tic repertoire, this patient presented with repetitive, bilateral kicking, which was associated with arithmomania. The repetitive movement was most apparent when walking, and caused marked shoe damage, particularly at the tip. The frequency and severity of this repetitive movement resulted in this patient's requiring new pairs of shoes almost every week. This symptom also caused hip and toe pain, and at one time led to dislocation of the knee joint. Interestingly, the kicking tic did not respond to antidopaminergic medication, unlike the other motor and vocal symptoms, which showed marked improvement on aripiprazole. **Conclusions:** The repetitive and stereotypical nature of complex motor tics in the context of TS can result in self-injurious movements. The compulsive nature of these symptoms can contribute to their refractoriness to conventional antidopaminergic treatment.

P61. Modulation and Assessment of Cerebrocerebellar Connectivity Through Transcranial Magnetic Stimulation (TMS) Combined With Electroencephalography (EEG) in Healthy Subjects and Patients With Schizophrenia

Faranak Farzan, M.A. Halko, A. Pousada-Casal, J.D. Schmahmann, A. Pascual-Leone

Background: Preliminary clinical studies in patients with schizophrenia have demonstrated that intermittent theta-burst TMS (iTBS) applied to the cerebellar vermis leads to amelioration of emotional and cognitive impairments (Demirtas-Tatlidede, 2010). These studies arise out of the dysmetria of thought theory linking the cerebellum to emotion and cognitive regulation (Schmahmann, 1991, 2000). The theory postulates that the cerebellum exerts regulatory control over higher-order behavior via reciprocal cerebrocerebellar loops with paralimbic and association areas, including the prefrontal cortex (PFC). **Objectives:** Our overarching aim is to examine the human cerebellum–PFC connectivity and the neurophysiological effects of cerebellar stimulation, which remain relatively unexplored. **Methods:** TMS combined with EEG permits the measurement of PFC and motor cortex dynamics in patients and healthy controls (Farzan, 2010). We employed TMS-EEG to probe cortical processes in the PFC and motor cortex before and after one session of active and sham iTBS applied to the posterior cerebellar vermis in 7 healthy controls and 3 patients with schizophrenia. **Results:** Our results to date suggest that active cerebellar iTBS modulates PFC cortical dynamics compared to sham, a mechanism that may explain the therapeutic efficacy of cerebellar stimulation. **Conclusion:** The methods and results presented here may ultimately help identify patients who would benefit from cerebellar stimulation therapy.

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P62. Modulation and Assessment of Cerebrocerebellar Connectivity through Intermittent Theta-Burst Transcranial Magnetic Stimulation (iTBS TMS) Combined with Resting-State Functional Connectivity Magnetic Resonance Imaging (rs-fcfMRI)

M.A. Halko, F. Farzan, A. Pousada-Casal, J.D. Schmahmann, A. Pascual-Leone

Background: Increasing evidence points to the cerebellum as a universal modulator of cortical activity, via connections with motor and non-motor cortical areas that are organized topographically throughout the cerebellum (Schmahmann 1991; Schmahmann and Pandya, 1997). Understanding how the cerebellum modulates non-motor cortical networks is central to understanding the cerebellar role in cognition and neuropsychiatric disorders. Modulation of the cerebellum with iTBS could potentially serve as a therapy for schizophrenia (Demirtas-Tatlidede, 2010). rs-fcMRI has recently emerged as a tool to investigate network function and dysfunction, allowing for study of complex network functions in humans. iTBS combined with rs-fcMRI can be used to characterize dynamics in large-scale brain networks (Eldaief 2011). **Method:** We applied this technique to evaluate the role of cerebellar modulation on cortical network function. Healthy subjects received iTBS to vermal or lateral cerebellar targets. Network activity was assessed before and after stimulation, using rs-fcMRI. **Results:** Preliminary data from 7 subjects suggests that vermal stimulation differentially modulates functional connectivity from the medial frontal cortex, when compared to lateral or sham stimulation. These data are compared with 2 schizophrenic patients undergoing a week of vermis iTBS treatment. **Conclusion:** These results suggest modulation of cerebellar function with iTBS may have utility to assess and characterize network-level abnormalities.

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Conflicts of interest: MAH, FF, APC, and JDM have no conflicts of interest. APL serves on the scientific advisory boards for Nexstim, Neuronix, Starlab Neuroscience, Allied Mind, Neosync, and Novavision, and holds intellectual property on the real-time integration of transcranial magnetic stimulation (TMS) with electroencephalography (EEG) and magnetic resonance imaging (MRI).

P63. Naloxone-Reversible Modulation of Pain Circuitry by Left Prefrontal rTMS (R)

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Background: A 20-minute session of 10 Hz repetitive transcranial magnetic stimulation (rTMS) of Brodmann Area (BA) 9 of the left dorsolateral prefrontal cortex (DLPFC) can produce analgesic effects on postoperative and laboratory-induced pain. This analgesia is blocked by pretreatment with naloxone, a μ-opioid antagonist. **Objective:** The purpose of this sham-controlled, double-blind, crossover study was to identify the neural circuitry that underlies the analgesic effects of left DLPFC rTMS and to examine how the function of this circuit, including midbrain and medulla, changes during opioid blockade. **Methods:** Fourteen healthy volunteers were randomized to receive intravenous saline or naloxone immediately prior to sham and real left DLPFC rTMS on the same experimental visit. One week later, each participant received the novel pretreatment but the same stimulation paradigm. Using short sessions of heat on capsaicin-sensitized skin, hot allodynia was assessed during 3T functional magnetic resonance imaging (fMRI) scanning at baseline, post-sham rTMS, and post-real rTMS. Data were analyzed using whole-brain voxel-based analysis as well as time series extractions from anatomically-defined regions of interest representing midbrain and medulla. **Results:** Consistent with previous findings, real rTMS significantly reduced hot allodynia pain ratings. This analgesia was associated with elevated BOLD signal in DLPFC and diminished BOLD signal in the anterior cingulate, thalamus, midbrain and medulla during pain. Naloxone pretreatment largely abolished rTMS-induced analgesia as well as rTMS-induced attenuation of BOLD signal response to painful stimuli throughout pain-processing regions, including midbrain and medulla. **Conclusion:** These preliminary results suggest that left DLPFC rTMS drives top-down opioidergic analgesia.

P64. Seeing the Trees But Not the Forest in High-Functioning Autism

Tandra Allen, Asha Vas, Nyaz Didehbani, Sandra Chapman

Background: Despite high intelligence, young adults with high-functioning autism (HFA) struggle in social-cognitive processing, limiting their contribution to society. Whereas existing measures characterize social abilities in HFA, limited research has focused on elucidating the disparity between

intact intellect and impaired social functioning. **Objective:** The current study compared cognitive performance between young adults with HFA (n=10) to age- and IQ-matched healthy adults (n=10). Specifically, cognitive performance was measured in the domains of memory, detail-level processing, and processing a generalized level of meaning. **Methods:** Select measures from WMS-III, WAIS-IV, and Test of Strategic Learning were administered to both HFA and healthy adults. Memory was measured on face memory, spatial memory, and auditory memory for textual details. Processing information at a detail level was examined on face-emotion recognition and inferring meanings from spoken phrases. Processing information at a generalized level included abstracting emotional intent from verbal phrases and constructing synthesized meanings from a complex textual reading. **Results:** Comparable performance was found between the two groups on memory performance and processing detail-level information. However, HFA performed significantly lower at processing information at a generalized level: abstracting emotions ($p < 0.05$) and synthesizing meanings from textual information ($p < 0.05$). **Conclusion:** This study provides preliminary evidence that despite intact abilities to process and retain explicit information at a level comparable to healthy controls, young adults with HFA have difficulty deciphering generalized meanings, an essential skill to everyday life. These findings motivate examining whether targeted interventions can enhance generalized-level processing of complex meaning and emotional intent to ultimately improve real-life social functioning.

P65. The Role of Magnesium in Autism Spectrum Disorders

Hannah Davis, Joseph P. Horrigan, M.D.

Background: Magnesium is essential for proper neuronal synaptic and receptor function. It plays a critical role in the functioning of gutaminergic pathways, which have been linked to the pathophysiology of autism spectrum disorders (ASD). However, few investigations have systematically examined the relationship of magnesium imbalances to ASD. **Objective:** The goal was to critically evaluate the quality of evidence in the medical literature that either supports or refutes a relationship between prenatal magnesium imbalances and the risk for ASD, as well as the utility of magnesium supplementation as a therapeutic agent for individuals affected by ASD. **Methods:** The review utilized a comprehensive set of magnesium and ASD search terms in several electronic libraries (e.g., MEDLINE, PsychINFO, EMBASE, and Cochrane Library). Relevant publications were rated in terms of quality, using standardized rating schemes (e.g., Jadad scale criteria). **Results:** High-quality clinical evidence is lacking with regard to defining the relationship between prenatal magnesium imbalances and ASD risk. Similarly, despite face validity in utilizing magnesium as a potential therapeutic agent for individuals with ASD, especially those with seizures, the quality of the evidence is inconsistent, in part due to substantial methodology differences. **Conclusion:** Magnesium supplementation remains a popular therapeutic approach, most commonly instituted by patients and families of their own accord, rather than upon direct medical advice. Nonetheless, the quality of the evidence to support this remains tenuous. In light of this, hypothesis-driven studies are strongly recommended, especially in the clinical realm, to better define the role of magnesium in ASD risk and remediation.

P66. Selection and Prioritization of Visual Information in Children With Autism Spectrum Disorders

Rebecca McLean, Ph.D., Elisabeth Moes, Ph.D., Matthew Jerram, Ph.D.

Background: Individuals with autism spectrum disorders (ASD) have been shown to have impairment in higher-order visual and attentional processes, with research suggesting they are less likely to filter out irrelevant background stimuli and to integrate features to see the global whole. **Objective:** This study was designed to examine the thesis that the attentional gating mechanism that serves to filter out irrelevant stimuli from relevant ones does not function correctly in children with ASD, causing them to fail to prioritize sensory input according to importance. Also, the ability of children with ASD to use top-down strategies to guide visual processing in a global manner was examined. **Methods:** Participants were high-functioning children with Autism Spectrum Disorders (ASD; n=17) and neurotypical controls (n=18), matched for age (8 to 11) and Matrix Reasoning scores (M=10). A recognition task was created to gauge the extent to which participants processed distractor (non-target) items from a visual search task. Participants were also asked to copy the Rey-Osterrieth Complex Figure (ROCF). **Results:** Children with ASD were better at recognizing previously irrelevant foils, suggesting they attended to the irrelevant foils more than controls. Unlike controls, they did not endorse more social than non-social foils. No differences were found between groups in their approach to copying the ROCF, as both groups took a part-oriented approach. **Conclusion:** Failure to prioritize visual input according to importance may contribute to the pattern of specific strengths and deficits in visual and attentional processing seen in children with ASD.

P67. Parietal Lobe as the Substrate of Thought Disorder in Schizophrenia: Longitudinal Study of Gray-Matter Volume

T. Hosokawa, R. McCarley, M. Shenton, M. Niznikiewicz, D. Salisbury

Background: Schizophrenia studies suggest progressive gray-matter (GM) volume reduction in frontal and temporal lobe. However, few studies have evaluated parietal lobe, despite

its important roles in attention, memory, and thought, which have been reported to be abnormal in schizophrenia. **Objective:** To clarify how parietal lobe is involved in pathology of schizophrenia, we performed longitudinal studies in first-episode schizophrenia (FESZ) and first-episode affective psychosis (FEAFF) patients. We examined GM volume changes and analyzed correlations with clinical symptom measures. **Methods:** 1.5-Tesla magnetic resonance imaging scans were obtained from 21 FESZ and 24 FEAFF at first hospitalization for psychosis and 23 matched healthy controls (HC). They underwent follow-up scans 1.5 years later. We segmented parietal lobe into angular gyrus (AG), supramarginal gyrus (SMG), postcentral gyrus (PCG), superior parietal gyrus (SPG), and precuneus, and performed gyri-based manual drawing to measure the volumes. **Results:** Group comparisons revealed that bilateral AG, PCG, and precuneus GM volumes in FESZ were significantly smaller than those of HC and FEAFF at the initial scans as well as the follow-up. Longitudinally, the decrease in bilateral AG is significantly larger than other subregions. Some changes of clinical scores of BPRS and PANSS, including thought disturbance, correlate with the volume changes. **Conclusion:** FESZ showed smaller bilateral AG, PCG, and precuneus GM volumes even at early stage of the illness, and progressive reduction in inferior parietal lobe particularly localized to AG. Inferior parietal lobe is the brain region plays a critical role as biological substrate of thought. Inferior parietal lobe and precuneus belong to a default mode network corresponding to self-referential thought. This finding contributes to comprehensive understanding of neural substrates of thought disorder in schizophrenia.

P68. Evaluation of Somatoform Conditions Seen by a Neurological Consultation Service in a Tertiary-Care Pediatric Emergency Room

Claudio DeGusmao, Rejean Guerriero, David Urion, Jeff Waugh

Background: Somatoform symptoms are frequently the basis for neurologic consultation in the acute care setting. In children, the frequency, severity, and best management practices for these symptoms are unknown. **Objective:** To assess the number of neurology consultations in which a somatoform condition is considered, to identify population characteristics, and management practices associated with improved clinical outcome. **Methods:** Over a 3-month period, patients seen in a tertiary-care children's hospital by Neurology residents in which a somatoform condition was suspected were prospectively collected. Conditions documented included conversion, undifferentiated, and somatoform disorder NOS, and non-headache pain disorders. Data collected included demographic characteristics, risk factors (psychiatric/medical comorbidities, social/academic stressors, physical or sexual abuse), and management practices (admission and ER utilization, outpatient referrals). Finally, outcome measures were assessed, including symptom duration, return visits, satisfaction with care provided, and lost days of school and parental work. **Results:** Of the 19 subjects analyzed, 58% were female, and 53% were 12–21 years old; 58% had no recognized trigger; 10% had family stressors; and 21% had academic stressors. None were believed to be victims of sexual or physical abuse. **Conclusions:** In most children presenting to the emergency room with somatoform conditions, a single precipitating stressor is not found. This supports proposed revisions to the DSM that remove this feature from diagnostic criteria. Also, access/utilization of continuing care is limited, placing patients at risk of non-improvement. Increased education for providers and resources for patients with somatoform conditions is needed, particularly in the outpatient setting.

P69. Development of a Pediatric NeuroPsychiatry Assessment Tool (PNPA)

Nilda M. Gonzalez, M.D., Susan Turkel, M.D., Jay Salpekar, M.D.

Background: Neuropsychiatric assessments such as the MMSE and MOCA have been used mostly in older adults to screen for early cognitive changes seen in dementia. These instruments were not developed for patients with intellectual disabilities (ID) and other developmental disorders. In children and youth, there is a paucity of comprehensive screening tools that take into consideration the age and developmental phase of the patient. Neuropsychological testing, although valuable, is not readily available in many communities. The Pediatric and Developmental Disabilities Special Interest Group of the ANPA has recognized the need for both assessment and training of neuropsychiatrists working with these special populations. **Case History:** An assessment tool was developed to provide a practical approach to working with pediatric neuropsychiatric illness. The PNPA compiles observations in a structured way to assess major areas of impairment recognized in ADHD, Autistic Disorders, and other developmental disorders. Brief tasks that can be completed in an office or bedside setting to assess attention, working memory, language, motor, and visuospatial skills were identified. When available, norms for age and educational levels were incorporated as guidelines. The current version of the PNPA will be presented, accompanied by video vignettes and a wide range of paper/pencil examples from clinical cases. Highlights of the tool and applicability for pediatric neuropsychiatric practice will be demonstrated. **Conclusion:** The PNPA may be used as a screening instrument to identify patient strengths and weaknesses in developmentally-impaired pediatric populations, and ultimately may be expanded for use in other ages and developmental conditions.

P70. Assessment of Adaptive Living Skills and Symptom Severity as a Means of Determining Quality of Life in Infantile and Juvenile GM2 Gangliosidoses

Amy Morgan, Jessica Pan, Florian Eichler

Background: GM2 gangliosidoses (GM2) are rare autosomal recessive disorders caused by deficiency of beta-hexosaminidase, resulting in neurodegeneration and death. Treatment with gene therapy is being developed. We set out to obtain first measures of adaptive living skills in childhood GM2 and correlate them with an existing symptom severity rating scale. **Objective:** To determine the relationship between affected children's symptom severity and adaptive living skills in order to assess quality of life in children with GM2. **Methods:** Twelve patients with GM2 were recruited at Massachusetts General Hospital. The mean age of children with the infantile phenotype (n=6) was 18 months, and children with the juvenile phenotype (n=6) was 4 years and 7 months. All patients received a neurological examination; symptoms were documented using the Clinical Severity scale, and parents completed the Vineland Adaptive Behavior Scale-2nd Edition (VABS). **Results:** For the infantile phenotype, there was a significant relationship between symptom severity and interpersonal skills ($p < 0.05$). For the juvenile phenotype, there were significant relationships between symptom severity and receptive ($p < 0.01$) and expressive communication ($p < 0.01$), interpersonal ($p < 0.01$), and play skills ($p < 0.01$) and fine motor skills ($p < 0.05$). For all children, the presence of seizures had a significant effect on socialization skills ($p < 0.05$). **Conclusion:** Adaptive skills in GM2 are significantly affected by neurological decline and the child's ability to interact with others, thereby affecting quality of life for both patients and their parents.

P71. Evaluating and Helping the Whole Child: Applying the Results of Integrated Neuropsychological and Psychological Assessments

Daniel Reinstein

Background: Pediatric neuropsychological evaluations, as currently conducted, attempt to elucidate the relationship between neural structure and function. When conducted either within the context of an academic environment or privately, for the purpose of helping a child in school, evaluation results are relevant only to the extent that they help teachers and parents develop accommodations and supports that effectively improve a child's experience. Even with thorough evaluations geared toward this purpose, however, there is too frequently little attempt to fully explore the impact of a child's neurologically-based vulnerabilities on their emotional capacity to manage the academic milieu. **Case Reports:** Through the use of two case studies, we will present evidence strongly arguing that a complete neuropsychological evaluation must not only include a battery of tests that evaluates a child's neurological status, but must integrate the data from traditional neuropsychological assessments with data from tests of psychological and emotional functioning to describe the whole child. Armed with this information, it is then possible to more accurately describe the child and develop a curriculum that addresses his or her academic, social, behavioral, and emotional needs. We will present these cases as examples of how an evaluation of the whole child can reframe an understanding of the causes of a child's difficulties in school and redirect resources to ensure a better outcome, not only in their academic performance but in their overall mental health.

P72. Improvements in Neuropsychological Functions in Children With Moyamoya Disease After Encephaloduroarteriosynangiosis

Yen-Hsuan Hsu, Meng-Fai Kuo, Mau-Sun Hua, Chi-Cheng Yang

Background: Selective neuropsychological impairments are suspected in Moyamoya disease due to the frequent involvement of bilateral internal carotid arteries. However, previous studies of Moyamoya disease in pediatric populations mostly focused on general intellectual function that provides less information about the underlying neuropathology. Revascularization surgery (encephaloduroarteriosynangiosis [EDAS]), has been proven effective in improving blood circulation and brain perfusion. However, its effectiveness in improving specific cognitive function domains has not yet been sufficiently examined. **Objective:** The present study aimed to investigate the neuropsychological profile of children with Moyamoya disease and to monitor the change after EDAS. **Methods:** Children diagnosed with Moyamoya disease, ages from 6 to 17 years old, were recruited. Intelligence scale and standardized neuropsychological tests were given before and after EDAS. **Results:** Preoperatively, age-appropriate intellectual level with selective neuropsychological impairments in episodic memory, executive function, and processing speed were found. Onset age was associated with memory performance and symptom duration to processing speed. Postoperatively, there was significant improvement in intellectual function and memory performance. **Conclusions:** Children with Moyamoya disease may have selective neuropsychological impairments despite normal intellectual level, especially in those with younger age and longer symptom duration. EDAS seemed effective in improving overall cognitive ability and may have additional benefit in specific cognitive domains.

P73. Outcome Measures for Parkinson's Disease Dementia

Keith Baker, Benzi Kluger, Brice Mcconnell

Background: Parkinson's disease dementia (PDD) is a common cause of dementia, and the leading cause of nursing home placement in Parkinson's disease. There is a great need for clinical trials of pharmacological and other interventions for PDD, as current treatment options are extremely limited. To

design such trials, we need to determine the most appropriate outcome measures for PDD interventions. **Objective:** To review potential PDD clinical trial outcomes with the objectives of optimizing future clinical trial design and/or suggesting areas where further outcomes research may be needed. **Methods:** We performed a literature review of all PDD clinical trials, with a focus on outcomes measures and of clinically significant change if assessed. For potentially relevant measures not used in clinical trials, we reviewed observational studies of PDD. **Results:** We divided outcomes measures into cognitive, behavioral, functional, and global, and analyzed these outcomes on the basis of sensitivity to change over time, relevance to PDD deficits, ecological validity, and empirical data, to guide determination of clinical significance of change scores. Several measures demonstrated sensitivity to change and clinical relevance, including the Alzheimer's Disease Assessment Scale – Cognitive, the Mattis Dementia Rating Scale, the Neuropsychiatric Inventory, and the Alzheimer's Disease Cooperative Study – Clinician's Global Impression of Change. There are few data on interpreting the clinical significance of change scores. **Conclusion:** There are several potentially relevant outcome measures for PDD clinical trials. Future research is needed to determine the clinical significance of change scores, an important consideration for trial design.

P74. Acquired Sociopathy: A Case Review and Review of the Literature

Brad Bobrin

Background: There is a burgeoning literature about acquired sociopathy mostly led by DiMasio. Now there is renewed interest, led by Mendez, in the subject as relates to frontal temporal dementia. This literature mostly describes the phenomenology and neuroanatomy of this disorder. However, what appears to be missing is a practical summary of this disorder for the practicing clinician, especially the acute inpatient psychiatrist, and what treatment exists and what legal pitfalls may complicate the treatment of such patients. **Case History:** With the brief review of the literature as above as background, we present the case history of a patient with a history of recurrent MDD, who now presents with a recent history of threatening behavior and property destruction, and was admitted with suicidal threats. This patient scored 30/40 on the Hare Sociopathy Scale. We describe his treatment both behaviorally and with medication, the legal issues we faced, and his eventual disposition and the issues we faced in making this decision. He also underwent MRI, EEG, and MOCA, along with a battery of lab tests, which we will include in the poster. **Conclusions:** We found that a patient with an acquired sociopathy presents unique treatment and ethical issues when such a patient presents to an acute psychiatric unit, and we would like to share our experience, as this type of patient, we are sure, is not unique to our area.

P75. Visual Hallucinations That Only Occur on Eye Closure

Brad Bobrin

Background: Visual hallucinations (VH) in late life are usually caused by a small number of factors. These may be due to a dementing/neurodegenerative process, delirium/medications, and visual disconnection syndromes. We describe a case where the patient only hallucinates on eye closure, not limited to sleep/wake. The theoretical underpinnings of this may help elucidate the mechanisms by which disconnection causes visual hallucinations, as eye closure could be thought of as a type of disconnection between the eye and the environment. This has not been reported in the literature as an isolated phenomenon. **Case History:** A widowed woman in her 80s who lived with her sister came into the hospital with visual hallucinations that she found to be disturbing. She claimed that these occurred only when she closed her eyes and it was not only associated with falling asleep or awakening. They were also well formed and included people attempting to attack her. The history was corroborated with her sister. She had no previous history of mental illness, no previous diagnosis of eye disease, a relatively normal head imaging, and the hallucinations were only extant for the past 6 months. She responded to 0.5mg of Risperdal with a resolution of the hallucinations and a reduction in the anxiety caused by them. A review of the literature shows two cases of VH with eye closure, but these were associated with the effects of medication; our patient's was not. **Conclusions:** Given that VH in old age is usually associated with some sort of neurologic condition, the presence of VH only associated with eye closure without any other condition or without the presence of VH with eyes open represents an interesting phenomenon. Whether this is the herald of a future neurological condition for this woman is unknown. It is interesting that it did respond to Risperdal. This case certainly brings into question the true incidence and prevalence of such occurrences. If this were not to be an isolated incident and this occurs with more frequency, then the mechanism of VH may need re-exploring. The fact that VH in this case, and in Charles Bonnet syndrome, can be treated with Risperdal does lead one to think that such disconnection leads to a dysfunction in dopamine neurotransmission.

P76. Parkinson's Disease Presenting as Intractable "Anxiety": An Old Friend in Old Clothing Possibly Forgotten

Brad Bobrin

Background: It is well known from the literature and clinical practice that there are many non-motor symptoms of Parkinson's disease. It is also well known that almost half of Parkinson's patients have depression or anxiety. What is not clear from the literature is how many people present with

depression or anxiety as the chief complaint instead of motor symptoms. We present a patient who first came to attention as a mental health patient but who finally responded to Stalevo. **Case History:** As mentioned above, the literature states that neuropsychiatric disorders can manifest as a consequence of PD, but it is not clear on how often psychiatric disorders are the presenting symptoms. We present the case of an elderly gentlemen who presented to the ED and then to the psychiatric unit with a complaint of intractable anxiety. He had two admits to Adult Psych without any relief but a diagnosis or anxiety and a mood disorder. I met him on the C-L service, where he represented with intractable anxiety and motoric restlessness. I thought he might be in withdrawal from Ativan and phenobarb, but he did not respond to several hundred milligrams of diazepam and, after several days of no change in condition or vital signs, the patient was treated with antipsychotics and mood-stabilizers in an attempt to change his condition; this did not work. Since nothing was working, a re-consideration of the diagnosis was done where his behavior resembled akathesia and the patient was thoroughly examined for PD (Note: patient had been seen by neurology without a consideration of PD). The patient exhibited bilateral cogwheeling, stooped posture, shuffling gait, en bloc turning, mild tremor, and positive glabellar. He was taken off his regular psych medications, and treatment with Stalevo was initiated. After about a week of treatmemt, the patient's symptoms had greatly decreased; he was able to rest and sleep, and was eventually transferred to Physical Rehab. **Conclusions:** The obvious conclusion is that in elderly patients with an unusual presentation of anxiety and initially atypical PD symptoms, a search for PD symptoms by history and exam should be undertaken, and, if the psych symptoms do not resolve with usual therapy, then a trial of L-dopa should be considered.

P77. The Clock-Drawing Test-Copy: Validity to Screen for MCI and Dementia in Parkinson's Disease, Using Three Different Scoring Methods

Maxime Doiron, Evelyne Matteau, Marine Simard

Background: The Clock-Drawing Test-Copy (CDT-C) is largely used in various settings, and can detect Mild Cognitive Impairment (MCI). **Objective:** The goals were to determine the sensitivity/specificity of CDT-C for screening MCI (PD-MCI) and dementia (PDD) in Parkinson's Disease (PD), and to compare three scoring methods. **Methods:** CDT-C from 22 PD-MCI, 16 PDD, and 18 healthy controls (HC) were scored, using the Rouleau (10-point), Cahn (10-point), and 18-point scoring systems (Babins *et al.*, 2008) by two independent examiners blind to diagnoses. Intra-class correlations were calculated to assess inter-rater fidelity. Diagnoses of MCI and dementia were made according to recent criteria, after a thorough neuropsychological evaluation. Receiver Characteristic Curves analyses were drawn to estimate the areas under the curve (AUC), sensitivity, and specificity values. **Results:** Intra-class correlations were high: 18-point: 96.5%; Cahn: 95.6%; Rouleau: 89.5%. For PD-MCI screening, the Cahn's system had the largest AUC (0.77), followed by the 18-point system (0.72), and Rouleau's system (0.66). The best cutoff for Cahn's and Rouleau's systems was ≤9/10, with sensitivity/specificity values of 91%/53% and 57%/77%, respectively. The 18-point system's optimal cutoff was ≤16/18 (sensitivity: 67%; specificity: 70%). For PDD screening, the AUC were (0.98); for Cahn's system, (0.95) for Rouleau's system, (0.95), and (0.89) for the 18-point system. Sensitivity and specificity values for PDD were, respectively, 81%–100% and 88%–94%. **Conclusion:** CDT-C cannot replace an exhaustive neuropsychological evaluation. Nevertheless, the findings suggest that it is a suitable test to screen for MCI and dementia in PD, especially using the Cahn's scoring system.

P78. The Clock-Drawing Test-Command: Validity to Screen for MCI and Dementia in Parkinson's Disease, Using Three Different Scoring Methods

Maxime Doiron, Evelyne Matteau, Marine Simard

Background: The Clock-Drawing Test-Command (CDT-Com) is largely used in clinical settings. It has been recently shown to detect patients with Mild Cognitive Impairment (MCI). **Objective:** The goals were to investigate the sensitivity/specificity of the CDT-Com to screen for MCI (PD-MCI) and dementia (PDD) in Parkinson's disease (PD), and to compare three scoring methods. **Methods:** CDT-Com from 22 PD-MCI, 16 PDD, and 18 healthy controls (HC) were scored using Rouleau's (10-point), Cahn's (10-point), and 18-point's scoring systems (Babins, *et al.*, 2008) by two independent examiners blind to diagnoses. Intra-class correlations were calculated to assess inter-rater fidelity. Diagnoses of MCI and dementia in PD were made according to most recent criteria, after an exhaustive neuropsychological evaluation. Receiver Characteristic Curves analyses were drawn to estimate their areas under the curve (AUC), sensitivity, and specificity values. **Results:** Intra-class correlations were high for all scoring systems: Cahn: 97.8%; 18-point: 96.4%; Rouleau: 93.8%. For PD-MCI screening, the Cahn's system had the largest AUC (0.75), followed by Rouleau's system (0.74), and 18-point system (0.65). Using the cutoff score ≤9/10, Rouleau's system had the best sensitivity (85%)/specificity (44%). Using a cutoff of ≤8/10, Cahn's system had sensitivity: 80%/specificity: 44%. For PDD screening, Cahn's system had the largest AUC (0.98), followed by Rouleau's (0.97), and 18-point system (0.97). Sensitivity and specificity for PDD were, respectively, 86%–100% and 89%–94%. **Conclusion:** Results confirm that CDT-Com can screen for MCI and dementia in PD patients. However, given the low specificity for PD-MCI, further investigations are required to minimize false-positive diagnoses.

P79. Functional Neuroanatomy of the Placebo Response

Donald Eknoyan, Robin A. Hurley, Katherine H. Taber

Background: The placebo response has long been observed in treating patients. A placebo is an inert substance or inactive treatment that can evoke the expectation that beneficial effect might occur. Concerns about placebo response in clinical trials led to the development of double-blind, randomized studies. Growing evidence of placebo-related changes in the brain make this an area important to neuropsychiatry. **Objective:** The purpose of this exhibit is to synthesize recent experimental evidence for the anatomic/physiological basis of the placebo response and to create teaching materials that present color-coded functional neuroanatomic maps of brain areas involved. The application of this new understanding to treatment of neuropsychiatric disorders will be emphasized. **Methods:** The relevant scientific literature was reviewed and synthesized for information related to the neurobiological mechanism(s) of the placebo response in the treatment of depression, pain, and Parkinson's disease. Particular focus will be given to functional neuroimaging studies. **Results:** Research supports the ability of both positive and negative expectations to alter brain activity. Multiple brain regions and networks are involved in the placebo response. The context (e.g., patient–provider relationship, ritual of receiving intervention) may be of great importance. Neuroimaging studies indicate the importance of the frontal cortex and ventral striatum in this phenomenon. **Conclusion:** Positive expectations can evoke the placebo effect; negative expectations can evoke the opposite. These are neuropsychiatric events that results in changes in the brain. Clinicians should keep these powerful effects in mind to maximize treatment response while causing minimal harm.

P81. Oxytocin: Role in Developing and Healing Psychopathology

Francis L. Stevens, Omri Wiesman, Ruth Feldman, Robin A. Hurley, Katherine H. Taber

Background: Knowledge about the oxytocin (OT) system in the brain has greatly increased over the past decade. Synthesized primarily in hypothalamic neurons, the major route of release is via the pituitary gland. Modulation of other brain areas has also been implicated in OT's actions, which include a major role in affiliative behaviors. **Objective:** Evidence relevant to the influences of OT on normal behavior, psychopathology, and therapeutic interventions was assessed. **Method:** Human functional imaging and experimental studies, animal research (particularly nonhuman primate), and clinical literature were reviewed and synthesized to elucidate the roles OT may play in development and treatment of psychopathology. **Results:** Both genetic and environmental factors are important modulators of the OT system. Evidence indicates that disruption of the OT system might play a major role in individuals' ability to securely attach to others, and dysfunction in this system has been implicated in some neuropsychiatric disorders. Administration of OT has been shown to facilitate a wide range of social functions (e.g., empathy, theory of mind, trust, altruism, attachment bonding) and may have therapeutic potential. The human literature is unclear in many areas, including differentiating between central and peripheral effects of OT. **Conclusion:** There is growing evidence that OT contributes in important ways to both normal behavior and psychopathology. OT may actively contribute to psychotherapy through facilitating empathy, pair-bonding, and neurogenesis. Speculations are being made as to whether psychotherapy may readjust maladaptive OT activity. Although promising, there are many areas of controversy requiring further research.

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P82. Diffusion Tensor Imaging of OEF/OIF Veterans With and Without Exposure to Primary Blast Forces

Katherine H. Taber, Rajendra Morey, Susan D. Hurt, Robin A. Hurley

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Background: History of exposure to explosive forces (primary blast) emanating from bombs and other devices is common in post-deployment veterans. White-matter (WM) effects of mild traumatic brain injury (mTBI) from blast exposure with other injuries have been documented. Primary blast exposure without secondary injuries or clinical symptoms at the time has not been studied. **Objective:** Residual effects on neuroimaging metrics of exposure to primary blast insufficient to meet criteria for mild TBI were assessed. **Methods:** Post-deployment veterans without mTBI, with (n=20) and without (n=18) primary blast exposure were assessed with diffusion tensor imaging (DTI). WM-specific registration followed by whole-brain voxel-wise analysis of fractional anisotropic (FA) diffusion was conducted in all subjects. **Results:** Loss of WM integrity in primary fibers ($p < 0.05$; corrected) was associated with blast-exposed veterans who did not meet criteria for mTBI when compared with non-blast-exposed veterans in a widely distributed pattern of major fiber bundles and smaller peripheral tracts, including the forceps

major, superior longitudinal fasciculus, anterior thalamic radiations, inferior fronto-occipital fasciculus, and the cortico-spinal tract. **Conclusion:** Diffuse WM changes were found in veterans with a history of exposure to primary blast forces that, based on self-report of symptoms, was not sufficient to cause mTBI. These results may indicate that primary blast forces are able to trigger injury processes in the brain without causing clear alteration in consciousness. Alternatively, WM integrity may have been affected by other mechanisms.

P83. Volume Transmission in the Brain: Synapse and Beyond

Katherine H. Taber, Robin A. Hurley

Background: Traditionally, communication in the brain that occurs at synapses (wired transmission) receives most of the attention. However, there is growing evidence that the actions of the modulatory neurotransmitters, gliotransmitters, and many other neuroactive substances (e.g., nitric oxide, peptides, adenosine, neurosteroids) are mediated in great part by volume transmission. **Objective:** The purpose of this exhibit is to synthesize recent experimental evidence for the anatomic/physiological basis of volume transmission as an important mode of communication in the brain. Application of this new understanding to the etiology of neuropsychiatric disorders and their treatments will be emphasized. **Methods:** In-vitro and in-vivo studies were reviewed and synthesized to create color-coded anatomical and physiological displays and diagrams. Aspects of volume transmission considered included origins and targets for volume-transmitted signals, routes and modes of substance movement, short- and long-distance chemical signaling, and implications for psychiatric medications. **Results:** The new data regarding volume transmission was reviewed and synthesized in relation to influences on neuronal function, with particular emphasis on the emotion/memory circuits and stress-related responses. The possible role of this system in pathophysiological conditions, and the therapeutic potential of pharmacological modulation are presented. **Conclusion:** Recent studies indicate a prominent role of volume transmission in local modulation of neuronal activity. This communication mode has been implicated in many aspects of brain function with neuropsychiatric significance. These models and color-coded schematics serve as visual "external memory" to aid in teaching and disease research, and in better understanding this major mode of communication in the brain.

P84. The Effect of ECT on Executive Functioning in a Man With Treatment-Resistant Depression

Glen Getz, P.V. Nickell, Ben Edner

Background: Electroconvulsive therapy (ECT), an effective treatment for major depressive disorder, is frequently administered to medication-resistant depressed patients. Although the precise neurophysiological effects of ECT are unknown, evidence exists that metabolic reduction occurs in the prefrontal cortex after ECT (Nobler et al., 2001). The prefrontal cortex is integral in controlling executive functioning (EF), including problem-solving, inhibition, and self-monitoring. Although studies have demonstrated that memory remains intact after ECT treatment (Datto, et al. 2001), the effect on EF is unclear. This case examines EF in an individual before and after receiving an index course of ECT. **Case History:** A 42-year-old married Caucasian man who underwent 4 unsuccessful trials of antidepressant medications received an index course of ECT over 4 weeks, utilizing right unilateral lead placement. Baseline and post-index ECT cognitive evaluations examined areas of EF, memory, and attention. Objective measures included the Stroop Color Word Test, Wisconsin Card Sorting Test, Verbal Fluency, Trail-Making Test, and the Wechsler Memory Scales. The Behavior Rating Inventory of Executive Functioning and the Beck Depression Inventory were administered to provide subjective functioning measures. **Conclusions:** Results indicate clear cognitive improvement on objective measures of EF, attention, and memory after ECT, but continued elevated impairments on the subjective questionnaire examining behaviors thought to be controlled by executive functioning. This case provides evidence of improved EF on objective measures, but continued subjective complaints regarding cognitive functioning. This case supports the need for objective measurement pre-ECT and post-ECT treatment to determine the changes in cognition.

P85. Acute- vs. Chronic- Methadone Interacts Differently With Some Antidepressants in Mice

S. Schreiber, S., A. Hostovsky, Y. Barak, V. Rubovitch, C.G. Pick

Background: Depression is highly prevalent among chronic-pain patients and methadone maintenance treatment (MMT) patients. Controversy regarding effective antidepressant treatment for these patients persists. **Objective:** Assessing the two models in mice, using the hotplate assay. **Methods:** In the model of depressed pain patients, the impact of low, sub-threshold doses of six antidepressants with different mechanisms of action (fluvoxamine, escitalopram, reboxetine, venlafaxine, desipramine, clomipramine) on the anti-nociceptive properties of a single (acute) dose of methadone. In the model of depressed MMT patients, the impact of low, sub-threshold doses of three antidepressant drugs with different mechanisms of action (escitalopram, desipramine, clomipramine) on the anti-nociceptive properties of chronic treatment with methadone. **Results:** After injection, acute methadone elicited analgesia in a dose-dependent manner. Fluvoxamine and desipramine, each at a sub-threshold dose, induced a synergistic effect with methadone. Escitalopram, reboxetine,

venlafaxine, and clomipramine, given separately at a sub threshold dose, induced no interaction. After 2 weeks of methadone administration (through an implanted mini-pump, i.p.), injection of escitalopram did not elicit any analgesic effect; desipramine augmented the analgesic effect of methadone; whereas clomipramine reduced it notably. **Conclusion:** Possible clinical implications are that while escitalopram, reboxetine, venlafaxine, and clomipramine do not affect acute methadone's anti-nociception in mice and are safe to be given together with methadone, fluvoxamine, and desipramine, notably augment methadone-induced anti-nociceptive effects and should be avoided because of the risk of inducing opiate overdose. Possible clinical implications of chronic methadone remain to be determined, as tricyclic antidepressants' cardiac effects may prevent their use in MMT patients.

P86. Schizophrenia and Cognitive Enhancement

Lokesh Shahani, M.D., M.P.H., Chad Noggle, Ph.D., Seleena Shrestha, M.D.

Background: Schizophrenia has been commonly associated with neuropsychological deficits; however, subgroups of patients with normal neuropsychological functioning have been reported. Of greater interest is the fact that some patients present with superior intellectual levels. **Case History:** A 13-year-old boy was evaluated for auditory hallucinations, paranoid delusions, and ideas of reference associated with withdrawal symptoms. A medical work-up for the patient's symptoms was negative. The patient's school reports showed him scoring 99% on his exams. He further developed interest in extracurricular activities with documented evidences showing his skills well beyond his chronological years. The patient was diagnosed with paranoid schizophrenia and started on risperidone with good symptom relief. Neuropsychological testing suggested fairly focal intrapersonal weakness in general cognitive efficiency and processing speed. This was seen in context of very high intelligence and general sparing of attention, language, memory, visuospatial, and executive functioning, as well as academic achievement. Consequently, outcomes demonstrate generally preserved neurocognitive functioning. **Conclusions:** Our patient with schizophrenia, although young, still has intelligence in the superior level and well-preserved neurocognitive functioning. The case is interesting on two main fronts: Not only does it demonstrate the potential of heightened neurocognitive abilities despite presence of schizophrenia, but, in the case of this patient, while such early onset would most commonly suggest poorer outcome, which is most commonly associated with greater neurocognitive compromise, the reverse pattern is seen in this case. In reality, the connectivity between these heightened abilities and presence of schizophrenia may be explained from a neurological standpoint.

P87. Discrepancies Between Depression and Anxiety on a Computer-Based Task of Verbal Memory

Lokesh Shahani, Chad A. Noggle

Background: Depression and anxiety remain the most prominent clinical manifestations in psychopathology, which also demonstrate considerable comorbidity with one another. Neurocognitive deficits have been associated with both, although such issues are more commonly associated with depression, particularly in the area of verbal memory. **Objective:** The current study sought to determine whether computer-based assessment is sensitive enough to demonstrate differences between depression and anxiety in verbal memory. **Methods:** Participants included 1,065 individuals diagnosed with depression and 343 individuals diagnosed with anxiety disorder. Participants were assessed with CNS Vital Signs, with comparisons being made between groups on verbal memory and sustained attention. **Results:** The results of this study suggest that individuals with depression (mean: 90.18; SD: 24.09) perform significantly worse than individuals with anxiety (mean: 93.81; SD: 22.49); $t[1,406]=2.560$; $p < 005$. No such difference existed between groups in sustained attention, suggesting that this was not the basis for differences in verbal memory. **Conclusions:** Findings are two-fold. First, results suggest that depression is associated with a greater potential for verbal memory impairment than anxiety, which is not simply explained by lower attention capacity. Second, results demonstrate the sensitivity of computer-based assessment, in particular CNS Vital Signs, in detecting differences between such clinical groupings, which has implications for both clinical and scientific pursuits.

P88. Impulsive Aggression in Youth: Reduced Re-Hospitalization With the Use of Amantadine HCl

Dan Matthews, M.D., Larry Fisher, Ph.D., Glenda Matthews, M.D.

Background: Amantadine HCl has been used effectively to reduce frontal lobe symptoms in children with traumatic brain injury (Williams, 2007), and to improve impulsivity in Attention Deficit Hyperactivity Disorder in boys (Horrigan & Barnhill, 2002). Amantadine HCl has also been used, off-label, for impulsive aggression in youth (Fisher et al., 2011; King et al., 2001). **Objective:** The current study explores the effect on re-hospitalization rates for impulsively aggressive youth, 6 months post-discharge from residential treatment, by comparison of cases that were compliant with a protocol that included amantadine HCl versus those who were non-compliant. **Methods:** Subjects were 190 explosive juveniles (130 male, 60 female; ages 5–17; diagnosed Mood Disorder, or Intermittent Explosive Disorder), discharged from a residential treatment program on amantadine HCl and other medications. Re-hospitalization rates were computed separately for those compliant (C group) with amantadine HCl, versus those non-compliant (Non-C group), measured by a mail survey of

caregivers 6 months post-discharge. **Results:** For the C group, the percentage of those requiring re-hospitalization was 13.70% (20 out of 146). In contrast, for the Non-C group, the percentage of those requiring re-hospitalization was 52.27% (23 out of 44). Using a Fisher's exact chi-square analysis, there was a significant relationship between re-hospitalization and compliance (df: 1; two-tailed $p < 0.0001$). **Conclusion:** The results indicate that, for youth at 6 months post-discharge from residential treatment for impulsive aggression, significantly lower re-hospitalization rates can occur when there is compliance with a protocol that continues the use of amantadine HCl, suggesting that further controlled studies are needed.

P89. Explosive Aggression in Youth: Medical Management With the Use of Amantadine HCl

Dan Matthews, M.D., Larry Fisher, Ph.D., Glenda Matthews, M.D.

Background: In randomized, controlled trials (RCTs) of amantadine HCl for youth with ADHD, autism, or traumatic brain injury, symptom improvements were noted (Donfrancesco, et al, 2007; King, et al, 2001; Kraus, M.F. & Maki, P.M., 1997; Karli, et al., 1999; Meythaler, et al., 2002; Williams, S. E., 2007). However, only limited case studies have shown the effectiveness of amantadine HCl for the treatment of explosive aggression in youth. **Objective:** The current study explores the management of explosive juveniles discharged from residential treatment on a protocol that included amantadine HCl and other medications. **Methods:** Subjects were 190 explosive juveniles (130 male, 60 female; ages 5–17), diagnosed with Mood Disorder or Intermittent Explosive Disorder, discharged from a residential treatment program on amantadine HCl and other medications. Outcomes for the compliant (C group), where amantadine HCl was continued, versus the non-compliant (Non-C group), where amantadine HCl was discontinued for reasons other than side effects or intolerance, were measured by a mail survey of caregivers 6 months post-discharge. **Results:** For the C group, positive outcome was 73.29% (107 out of 146) while for the Non-C group, positive outcome was 56.82% (25 out of 44); Fisher's chi-square analysis (df: 1; two-tailed $p=0.0430$) was significant. **Conclusion:** Although this is not an RCT of the efficacy of amantadine HCl, the data suggest that significantly better positive outcome for explosive youth can occur, 6 months post-discharge from residential treatment, if outpatient physicians are compliant with a protocol that continues the use of amantadine HCl.

P90. Neuromodulatory Effects of Repetitive Transcranial Magnetic Stimulation (rTMS) in Depression (R)

Oludamilola Salami, M.D., Yagna Pathak, Zhimin Li, Christopher R. Butson, Ph.D.

Background: Major depressive disorder (MDD) is a clinical syndrome that causes significant impairment in several domains of functioning. Treatment-resistant depression is associated with high levels of disability to individuals and lost productivity. rTMS is a non-invasive therapeutic procedure for management of treatment-resistant depression. Beyond the use of electromagnetic induction to stimulate neuronal activity and long-term cortical excitability, there is limited understanding of the neural circuitry involved in depression or mechanisms via which rTMS exerts its therapeutic effect. **Objective:** To assess the effects of rTMS on the underlying neural activity in MDD over the course of treatment and to correlate treatment response to neuromodulation and functional connectivity. **Methods:** rTMS was administered to the left dorsolateral prefrontal cortex (L-DLPFC) of participants, based on approved IRB protocol. Clinical outcome measures, including electroencephalography and the Montgomery-Asberg Depression Rating Scale (MADRS), were administered at various points over the course of treatment. Magneto-encephalographic (MEG) data were recorded before the rTMS session and after the treatment course. **Results:** There was reduction of symptoms over the treatment course. However, symptoms tended to recur at 4–6 weeks after completion of treatment. MEG results illustrate that rTMS has acute and sustained effects. Overall brain activity increased after treatment. Longitudinal results showed an initial hemispheric asymmetry in the alpha band, which changed with an increase in activity in the left parietal region at completion of treatment. **Conclusion:** rTMS is effective in depression and may mediate its effect by excitation and equalizing neuronal activity across hemispheres.

P91. The American Academy of Neurology Family Questionnaire to Assess Driving Safety: Psychometric Properties and Relationship to Cognitive Screening Measures

Janessa O. Carvalho, Rachel A. Bernier, Beth A. Springate, Jennifer D. Davis

Background: The American Academy of Neurology (AAN) updated their practice parameters in the evaluation of driving risk in dementia (Iverson et al., 2010). They described four elements associated with decreased driving ability in dementia patients: history of crashes/citations, informant-reported concerns, reduced mileage, and aggressive driving. A survey was designed with these elements, although the scale has not been quantitatively examined. **Objective:** We explored the factor structure of the informant-reported AAN Caregiver Driving Safety Questionnaire and examined associations between these factors and cognitive screening instruments. **Methods:** Participants were 80 caregivers of patients diagnosed with Mild Cognitive Impairment ($N=46$) or early Alzheimer's disease ($N=34$), who completed an outpatient neuropsychological evaluation. **Results:** Exploratory principal-component factor analysis with direct Oblimin rotation was conducted. A four-component structure was found, with eigenvalues >1

(77.18% variance). Results revealed four factors: history of crashes/driving citations, caregiver safety concerns, reduced mileage, and aggressive driving, consistent with the measure's initial design. Poorer global cognition on the MMSE was correlated with increased caregiver safety concerns (r=0.39) and reduced mileage (r = –0.41). Caregiver safety concerns also were correlated with poorer DRS-2 Initiation/Perseveration (r = –0.32) and Memory (r = –0.26) scores. Poorer visuoconstructional skills were correlated with reduced mileage (r = –0.30) and increased aggression (r=0.26). **Conclusion:** Results support the presence of four factors from the AAN Caregiver Driving Safety Questionnaire and significant associations between collateral report of driving safety and cognitive skills related to driving. This is the first known quantitative exploration of the scale. Future work should explore its relationship to on-road test performance and accidents.

P92. Correlations Between Self-Report and Executive Functioning Measures

Benjamin Edner, Joseph Black, Ryan Stocker, Glen Getz

Background: Traumatic brain injury (TBI) can lead to various deleterious outcomes, including cognitive, psychosocial deficits, and decreased self-awareness. Decreased self-awareness is related to reduced motivation pertaining to rehabilitation. These deficits may hinder individuals' autonomous functioning in their home, school, community, and/or job. **Objective:** The goal is to study the relationships between accurate self-awareness regarding aspects of executive functioning (i.e., inhibition, planning/organizing, and mental shift) and objective cognitive performance. **Methods:** A group of 92 subjects with TBI were administered the Behavior Rating Inventory of Executive Functioning (BRIEF). They were separated into self-report (62) and informant-report (30) groups. Using objective executive functioning measures as predictive indicators, accuracy of the BRIEF global executive composition scores for both groups were assessed. Measures of executive functioning included the Stroop (color-word), Neurological Assessment Battery – Mazes Form A, and Trails B. **Results:** Multiple-regression analyses revealed that objective executive functioning measures were predictive of BRIEF global executive composition scores for the informant-report group (R^2=0.268; F[3, 30]=3.302; p=0.035). However, objective executive functioning measures were not predictive of BRIEF global executive composition scores for the self-report group. **Conclusion:** Our results suggest that individuals with TBI have a diminished ability to accurately assess their level of executive functioning skills. This may suggest a decrease in self-awareness. Clinically, patients with discrepant self-reported vs. objective impairment may need special treatment considerations concerning level of frustration and therapeutic adherence. Additional self- vs. informant reports should be examined to better establish potential relationships with objective assessment measures.

P93. Self-Report Neuroscience Rating Scale Guides Rational Psychopharmacology to Document Cognitive Improvement in 121 Outpatient Mental Health Center Individuals

David Torres

Background: In Colorado, there is a movement to replace civil state hospital beds allocated for mental health center use with individuals undergoing forensic competency evaluations. This movement has led to a lack of available psychiatric beds at the state level, increasing the need for rapid psychopharmacologic stabilization of individuals in emergency rooms and mental health centers. Innovative, evidenced-based treatment algorithms driven by self-report scales utilizing electronic health records are necessary for optimal treatment of severe neuropsychiatric illness. **Methods:** Rapid pharmacologic assessment and treatment are part art and part science. Innovations of previously-established treatment protocols are necessary to provide optimal care. A neuropsychiatric scale designed in 2009 called the Colorado Cycling Mood Rating Scale, (CMRS) used to assess and guide medication management of mentally ill individuals seen in a mental health center system in the frontier areas of Southeastern Colorado, has shown positive results in its first 5 months of implementation. The CMRS combines select questions from the Young Mania Rating Scale, the Hamilton Rating Scale for Depression, the Adult Attention-Deficit Disorder Self-Report Scale, and questions related to mood-stabilizer toxicity. Each of these validated scales have strengths; however, a global assessment of thought, behavior, and functioning is necessary before psychopharmacologic recommendations can be made. The self-rating scale is 60 questions long, takes 3 minutes to fill out, and needs corroboration from a third party. The goals of treatment were to have all individuals enter remission rapidly and to treat comorbid illness, including vasomotor symptoms, pain, potential seizure activity, and substance abuse concurrently. Treatment was initiated without the use of benzodiazepines, anticholinergics, or opiates, to preserve cognitive functioning. **Results:** The use of a universal neuropsychiatric screen to assess and guide medication management resulted in improvement from baseline of 10% to 50%. Almost all individuals were treated to remission. Most of the improvement seen was in those individuals with depressive symptoms. Those individuals who were treated with stimulants and wake-promoters showed benefit in the realms of attention, concentration, and focus. Statistically significant improvement was show in level of functioning, memory, attention, concentration, and executive functioning at the 0.05 level of confidence. **Conclusions:** The Colorado Cycling Mood Rating Scale provides guidance regarding percentile dose reductions

of mood-stabilizers when side effects are present. The scale has clinical utility when used in consultation with primary care offices and emergency rooms, when recommendations regarding medication management are required. The scale guides medication management when one-time test dosing of atypical antipsychotics and stimulants are used. The scale enables rapid psychopharmacologic assessment and treatment of mentally ill individuals and documents cognitive improvement in the electronic medical record.

No funding was provided for this study.

P95. Effects of Cognitive Training on Behavioral and Psychological Symptoms in Alzheimer's Disease: A Systematic Review of the Literature

Laurence Brunelle-Hamann, Marine Simard, Stephanie Thivierge

Background: Behavioral and psychological symptoms in dementia (BPSD) are found in 90%–98% of patients with Alzheimer's disease (AD). Cognitive training studies in AD patients provide mostly cognitive results, whereas BPSD data are still scarce. BPSD may play a role in the success or failure of cognitive training programs; therefore, it is important to investigate them as well in this type of study. **Objective:** This systematic review aims to assess the effect of cognitive training on BPSD of AD patients. **Methods:** PsycINFO and MEDLINE/PubMed databases were searched from 2000 to 2012, using the following keywords: *cognitive, stimulation, training, rehabilitation, remediation,* and *Alzheimer*. To be selected for this review, studies had to: 1) conduct cognitive training in mild-to-moderate AD; 2) measure at least one BPSD, using valid and reliable instruments; and 3) use a randomized, controlled design. **Results:** Twelve studies were found that included 14–201 patients (mean: 61). Participants were administered 5–103 training sessions, each lasting, on average, 60 minutes**.** No articles reported adverse effect on BPSD. Five studies found significant reduction of depressive (mean: 9.5%), anxiety (mean: 10.2%), and apathy (mean: 11%) symptoms. The remaining studies showed either no change (3) or a non-significant improvement (4) on symptoms of depression (2), anxiety (1), apathy, and irritability (1). Only four articles evaluated all BPSD. **Conclusions:** Results showed that cognitive training can maintain or improve some BPSD, especially mood- and motivation-related symptoms, in mild-to-moderate AD patients. However, the evaluation of all BPSD is still neglected in these studies.

P96. A Successful Treatment of Cognitive Disorder with Immunotherapy (C)

Bhargavi Devineni, MBBS, Arun Venkatesan, M.D., Ph.D., Vani Rao, M.D.

Background: Autoimmune encephalopathy encompasses a complex group of disease with diverse immunological associations, clinical manifestations, and therapeutic outcomes. A personal and family history of autoimmunity further increases suspicion for autoimmune encephalopathy. **Case History:** A 31-year-old woman with 1-year duration of insidious onset of cognitive difficulties came to our psychiatric clinic. She started forgetting things, conversations, and names, had impaired new learning and recognition, was easily overwhelmed. Once, she could not understand what a "2-hour delay" meant when explained multiple times by multiple people. She had bradyphrenia, intermittent episodes of vertigo, decreased balance, increased clumsiness, and often dropped things. Her performance at work and home declined. She had an episode of depression, in remission for 3 years, before onset of cognitive difficulties. Two months after onset of cognitive problems, depression returned. Venlafaxine 75 mg/day improved depression, but cognitive problems persisted. 3MS was 100/100. Neuropsychological testing revealed deficits in memory, processing speed, and unilateral motor speed. She had IDDM and Grave's disease, which prompted a referral to a neurologist. Brain MRI was normal. Autoimmune work-up was significant for Thyroid-Stimulating Immunoglobulin: 526%, Anti-GAD: 65 $>$ 30, ANA+ (1:80, speckled), CH-50$>$60, and elevated CSF albumin. She received IVIG infusion for 4 days, $\sim$ 30 months after onset of symptoms. In 2 months, she had marked improvement of cognitive symptoms and work performance. **Conclusion:** A good response to immunotherapy in our case illustrates importance of a high index of clinical suspicion and empirical treatment, as our understanding of immunologic pathogenesis of CNS disorders is still evolving.

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P97. Tinnitus: a Circuit-Based Clinical Approach

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Background: Tinnitus is a neuropsychiatric disorder that affects 8%–15% of the population and is defined by the perception of a simple sound in the absence of an external source. It has a variety of etiologies, both peripheral and central, and most commonly presents with comorbid Axis I disorders. **Case History:** We present a review of human translational neuroscience research and propose a circuit-based framework to understand tinnitus as a neuropsychiatric syndrome with core perceptual, affective, behavioral, and cognitive symptoms. The pathophysiology of tinnitus is not limited to disruption of

the VIII cranial nerve, but includes broader changes in cortical and subcortical pathways beyond the auditory/vestibular system. This formulation is useful not only because it helps clinicians approach the work-up and management of tinnitus from a systems perspective, but also because it sustains the rational exploration of novel brain stimulation treatment strategies, such as Transcranial Magnetic Stimulation (TMS). **Conclusions:** Tinnitus is a complex neuropsychiatric disorder with core perceptual, affective, behavioral, and cognitive symptoms that can be explained by structural and functional changes at the circuit level. As we further our understanding of its pathophysiology, this paradigm sets the stage for treatment development using device-based neuromodulation strategies.

P99. The Effect of Zumba on Cognition in Healthy APOEe4 Carriers and Noncarriers

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Background: Exercise has been shown to protect against cognitive decline. Zumba provides aerobic conditioning while requiring sustained attention for changing dance steps. **Objective:** To test the hypothesis that spatial working memory would improve after 6 months of twice-weekly Zumba. **Methods:** Participants were cognitively normal women, 55 to 80 years old, randomized to either Zumba or Control home-based exercise for 6 months. At baseline, 3 months, and 6 months, participants underwent a battery of neuropsychological tests, quality-of-life, and physical activity measures. Our primary outcome measure was the Groton Maze Learning test (GMLT) total errors, which assesses visuospatial working memory and error-monitoring. **Results:** Subjects did not differ in baseline characteristics. Zumba participants (n=30) reported higher quality-of-life measures at 3 months than the Controls (n=23**;** SF-36 Physical Composite score mean 53.4 vs. 49.5 (pooled SD: 5.7; *t*-test p=0.02), SF-36 Mental Composite score mean 55.3 vs. 50.7 (pooled SD: 6.6; *t*-test p=0.02), but this difference did not persist at 6 months. At last follow-up, more women in the Zumba group improved in GMLT Total Errors (Pearson chi-square test p=0.04) and response-inhibition scores (Pearson chi-square test p=0.04) than the Control group. No differences were observed in other measures. A stratified analysis by APOEe4 status showed no interaction between APOE status and group outcome. **Conclusion:** In this study, 6 months of Zumba dance is associated with improved measures of working spatial memory and response-inhibition. This may be related to the repeated practice of learning and inhibiting dance moves in Zumba.

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P100. Cognitive Memory Training for Healthy Older Adults: Can it Benefit Impaired Older Adults? Results from a Case Study

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Background: Memory training can be useful in various aging populations. Many studies evaluating the efficacy of memory training focus on healthy older adults experiencing benign age-related forgetfulness. A multi-factorial approach to memory training incorporating specific memory techniques (e.g., visual imagery, cuing, clustering) and non-memory techniques (e.g., relaxation, psychoeducation) seems to be the most beneficial. **Case History:** An 8-week, multi-factorial memory training group was offered to healthy adults 65 years and older. Pre-intervention and post-intervention assessments were administered in order to assess the program's effectiveness. Despite the inclusion criteria, an exception was made allowing one client with greater than benign impairment to participate (Global CDR & CDR Memory=1; MMSE=21). At the time of intervention, this participant was a 74-year-old Caucasian woman tentatively diagnosed with pre-Alzheimer's disease by a neurologist, taking 5 mg of Aricept daily. Pre-intervention assessment of this individual revealed a number of memory-related limitations. Although the training group was designed specifically for healthy older adults, her performance significantly improved on two standardized measures of memory (WAIS-IV Digit Span and the Brown Visual Memory Test) and on a series of prospective memory tasks, relative to her baseline. She reported lower levels of anxiety and an improved perception of her own memory subsequent to training. **Conclusion:** In contrast to literature indicating that memory training specifically for healthy older adults is generally ineffective for those with more significant impairment, these findings at least suggest a potential for such programs to benefit individuals with greater-than-expected age-related memory decline.

P102. Neural Substrates Underlying Modalities of Awareness in Mindfulness Practice

David Vago, Hong Pan, David Silbersweig, Emily Stern

Background: The field of psychiatry has been adopting mindfulness into current treatment protocols; however, mechanisms by which mindfulness functions are currently unclear. The authors have developed a systems-based neurobiological model that can be empirically tested. **Objective:** The aim of this study is to identify neural substrates supporting specific modalities of mindfulness practice in expert meditators. **Methods:** fMRI protocol contrasted a default, non-meditation state, with four modality-specific states of mindfulness meditation that include concentration on the absence of mental imagery, inner speech, viscerosomatic, and emotional sensations. Expert meditators (n=15), age 27–55 years, meditation experience: 1,052–10,981 hours, participated in the fMRI

protocol. The activation paradigm consisted of 4 runs (32.5 minutes each) with 4 pseudo-randomized meditative states (5 min.), alternating with blocks of non-meditation (2.5 min.). Finger presses were used to indicate achieving peak states of phenomenal clarity. **Results:** A whole-brain, voxel-wise general linear model was utilized to examine the effect sizes of the key condition contrasts via measuring the plateau magnitudes in BOLD signal during the peak states against the default state. Preliminary results on 2 subjects illustrate modality-specific activation along with significant activation in the integrative fronto-parietal control network, basal ganglia, primary sensory, and somatic cortices. Decreases were found in the self-reflective, hippocampal-cortical-memory network. **Conclusions:** Initial data provide preliminary support for 1) the model of mindfulness proposed by Vago & Silbersweig (2012); 2) specific functional and anatomical substrates for stable attention and affect across multiple modalities. Further analyses will be reported and can inform areas for potential therapeutic relevance in neuropsychiatric disorders.

P103. An fMRI Study of Self-Regulatory Fatigue During Inhibitory Control of Eye Blinking

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Background: The capacity to regulate urges is an important human characteristic associated with a range of neuropsychiatric disorders and health outcomes. Self-regulatory capacity has limited reserve, which, when depleted, leads to failure. **Objective:** We set out to investigate the neural mechanisms of self-regulatory fatigue. We hypothesized this would involve altered activity in prefrontal cortical subregions and interoceptive processing areas. **Methods:** fMRI was used to detect brain activations during effortful inhibition of eye-blinking in a block design. A General Linear Model was used for contrast analyses, with increase in number of blinks during blink-inhibition used as covariate of interest. Independent Component Analysis (ICA) was carried out to identify relevant functional networks. **Results:** There was an increase in the number of eyeblinks escaping inhibitory control across blocks. Inhibition of blinking activated a wide bilateral network including IFG, DLPFC, dorsal ACC, frontal eye fields, SMA, and caudate. There were also activations in inferior parietal, anterior insula, precuneus, and sensory association areas. Deteriorating performance was associated with activity in OFC, ventromedial PFC, rostroventral ACC, precuneus, somatosensory, and parietal areas. ICA identified task-related synchronized activations and deactivations in the above areas. The strength of such networks decreased over time, and this was associated with worsening performance. **Conclusion:** Effortful eyeblink control resulted in activation of prefrontal control areas and regions involved in urge and interoceptive processing. Worsening performance resulted in overlapping urge-related areas and in regions involved in affective salience-attribution and craving. Self-regulatory fatigue was associated with decrease in strength of prefrontal cortical networks.

P104. Relationships of Pain With Subjective and Objective Sleep Measures in Women With Advanced Breast Cancer

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Background: Individuals with cancer experience more pain and sleep disturbance than the general population. However, few studies have examined the relationship between their pain and both subjective and objective sleep measures. **Objectives:** We studied pain and sleep disturbances to assess their relationship in metastatic breast cancer (MBC) survivors. **Methods:** Individuals with MBC (n=102) were 57.6 (SD: 7.5) years and predominately white (86%). We measured subjective and objective sleep disturbances, using actigraphy, polysomnography (at-home, lab), and assessed pain with the Brief Pain Inventory (BPI). Spearman's correlations and regression analyses were used. **Results:** Women with higher scores in BPI-severity and BPI-interference indexes had significantly poorer subjective sleep measures, although there were no significant relationships between objective sleep measures and pain. BPI-severity index was significantly correlated with daytime sleepiness (r=0.337) and nighttime awakenings (r=0.198). BPI-interference index was significantly correlated with daytime sleepiness(r=0.36), sleep-onset latency (r=0.226) and greater medication use for pain (r=0.327). After controlling for age, education, degree of metastasis, and medications affecting pain and sleep, BPI-severity index remained significantly associated with daytime sleepiness (ß=0.413), and BPI-interference index remained significantly associated with daytime sleepiness (ß=0.338) and sleep-onset latency (ß=0.237). **Conclusion:** We found that pain interference was associated with both daytime sleepiness and nocturnal sleep latency, while pain severity was associated with daytime sleepiness. The interference of pain with daily activities, rather than absolute amount of pain, may be more clinically relevant when assessing the relationship between pain and sleep and may be important to be assessed in order to provide better treatment for pain in this population.

P105. A Comparison of Medical and Behavioral Care Indices in Adults With Intellectual Disabilities, With and Without Pica, Residing at a State-Operated, Intermediate-Care Facility

Jeffrey Bennett, Alexis Palumbo

Background: Pica constitutes a prevalent problem with significant health risks to adults with intellectual and developmental disabilities, resulting in higher medical and associated costs. Associations with Kluver-Bucy syndrome, mineral deficiencies, autistic spectrum disorder, and other neuropathology suggest

that surveying attributes in the intellectually disabled adult population diagnosed with and without pica may provide information on causes. **Objective:** This study was undertaken to define associated health characteristics of adult clients with intellectual disability diagnosed with pica and those without this diagnosis. **Methods:** An IRB-exempt retrospective chart review of 26 adult clients at a state-operated intermediate-care facility for developmental disabilities (ICF/DD) diagnosed with pica and 50 randomly-selected clients without this diagnosis, was undertaken comparing various health attributes. These data were analyzed for differences by parametric tests. A review of the literature in this and other populations was undertaken, and a hypothesis regarding this condition was generated. **Results:** Fifteen percent of the total population within the facility carried a diagnosis of pica. Clients with pica were significantly more likely to have a comorbid diagnosis of autistic spectrum disorder. **Conclusion:** This study lends support to the view that pica is a significant behavioral and health risk among adults with intellectual disability residing in state-operated developmental centers and is highly associated with autistic spectrum disorder. Autistic features (social reciprocity deficits, obsessive and repetitive behavior, expressive and receptive language anomalies) and their link to oral exploratory behavior and pica suggest an association with other neuropathology found in pica.

P106. Pharmacologic Management of Agitation in Adult Patients With Mental Retardation

Durga Roy, Pamela Hoffman, Melissa Dudas, Alan Mendelowitz

Background: Agitation is a common behavioral problem seen in patients with developmental disabilities and mental retardation (MR/DD). The safety and efficacy of second-generation antipsychotics (SGAs), mood-stabilizers, and antidepressants in the management of agitation in these individuals have minimally been studied. **Objective:** This review aims to identify current findings in the pharmacologic treatment of agitation in adults with mental retardation. **Methods:** PubMed searches using the MeSH database were conducted using the following terms: mental retardation, agitation, aggression, behavior disorder, treatment, and management. Analyses were done by class of medication: SGAs, mood-stabilizers and antidepressants. The primary outcome measure was reduction in aggressive or self-injurious behaviors as measured by each individual study. **Results:** The SGA showing largest the reduction in aggression in a randomized, controlled trial (RCT) was risperidone. One RCT done with lithium as an add-on to a first-generation antipsychotic (FGA), and two studies with valproate as add-on to FGAs showed reduction in aggression. Carbamapezine showed no difference in reduction of aggression as compared with placebo. Clomipramine showed reduction in compulsive behaviors; paroxetine, as an add-on to an FGA, showed improvement in self-injurious behaviors, but no reduction in aggression. **Conclusions:** Limitations of most of these studies are that subjects received other medications with variations in types and dosing, and that comparisons were not done blindly. Two studies were found using a randomized, controlled paradigm, one with risperidone and one with lithium, both showing effective reduction in agitation.

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P107. Age-Related Changes in Sleep-Dependent Consolidation of Visuo-Spatial Memories

Akshata Sonni, Rebecca Spencer

Background: Sleep plays an important role in memory consolidation in young adults: after sleep, recall is enhanced relative to wake, and memories are resistant to subsequent interference. Healthy aging, however, is associated with diminished sleep quality, which might contribute to reduced memory consolidation and cognitive decline. **Objective:** We tested the hypothesis that sleep-dependent memory stabilization is reduced in older adults relative to young adults. **Methods:** Participants were asked to recall the locations of 20 images on a computer screen after a 12-hour period spent awake or an equivalent interval with overnight sleep. We tested 49 older adults (mean: 66 years; SD: 7.4 years) and 102 young adults (mean: 21 years; SD: 3 years). To probe the stability of the memory, in a subset of participants ("interference" condition), participants learned 20 new locations for the images before recall of the image locations in Session 1. **Results:** In the no-interference condition, performance of the Sleep group was significantly superior to the Wake group in young adults ($F[1,53]=5.053$; $p=0.029$) and trended toward significance in older adults ($F[1,23]=4.035$; $p=0.056$). In the interference condition, the Sleep vs. Wake comparison trended toward significance in young ($F[1,45]=3.178$; $p=0.081$), but not in older adults ($p=0.566$). Older adults also had significantly higher Wake After Sleep Onset (WASO; $t[24] = -3.116$; $p=0.015$) and spent more time awake during the night ($t[24] = -2.966$; $p=0.018$). **Conclusion:** These results suggest that in older adults, although spatial memories are passively protected from memory decay over sleep, they are not actively strengthened, possibly due to age-related changes in sleep physiology.