APSARD
The American Professional Society of ADHD and Related Disorders

APSARD 2024

ABSTRACT BOOK

RENAISSANCE ORLANDO

JANUARY 18 - 21, 2024

Orlando, Florida

THURSDAY, JANUARY 18, 2024

ADHD 201

1:00 P.M. - 5:45 P.M.

1. ADHD 201

Chair: Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

Presenters:

Co-Chair: Jeffrey Newcorn, Mount Sinai Medical Center

Jeffrey Newcorn, Mount Sinai Medical Center

Gregory Mattingly, Midwest Research Group

Margaret Sibley, University of Washington

David Goodman, Johns Hopkins at Green Spring Station

Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

Overall Abstract: Introduction: Attention-deficit/hyperactivity disorder (ADHD) symptoms may begin as early as the preschool years and continue through adulthood. ADHD may present differently in younger children compared to adolescents and adults. As patients age, diagnostic and treatment considerations become more complicated. Psychiatric and medical comorbidities must be identified and incorporated into the treatment plan.

Objectives: At the end of the presentations, attendees will be better able to identify complex ADHD throughout the lifespan. Additionally, participants will learn when to use various pharmacologic and nonpharmacologic treatment for patients in multiple age groups.

Methods: Experts will discuss diagnosis and treatment of ADHD in children, adolescents, and adults. ADHD diagnostic criteria will be briefly reviewed and applied to patients in different age groups. Evidence-based data for the use of stimulants and non-stimulants for ADHD will be presented. Psychosocial treatments across the lifespan will be discussed.

Learning Objective 1: Identify complex ADHD throughout the lifespan.

Learning Objective 2: Understand evidence-based use of pharmacologic and nonpharmacologic treatments for ADHD.

1.1 PHARMACOLOGIC TREATMENT OF ADHD: WHEN DO I CHOOSE A NON-STIMULANT

Jeffrey Newcorn, Mount Sinai Medical Center

Individual Abstract: Background: Although highly effective, psychostimulant medications have limited clinical utility for a subgroup of individuals with ADHD. Some patients do not achieve optimal symptom reduction, or they do not tolerate stimulant treatment well. Stimulants are inherently short-acting medications, and even the long-acting formulations may not cover the entire day adequately for some individuals. In addition, stimulants are Schedule II controlled substances, have documented potential for abuse, and there is a substantial amount of misuse and diversion, particularly among college students and young adults. Finally, recent shortages of many stimulant formulations have limited availability of these medications. Identification of nonstimulant medications for ADHD that have comparable or near

comparable efficacy to stimulants, a favorable tolerability profile and consistent effects throughout the entire day is a high priority for the field.
Method: Targeted review of the literature.

Results: There are two classes of FDA-approved nonstimulant medications for ADHD—the selective noradrenergic reuptake inhibitors and the a2 adrenergic agonists. In addition, several other medication classes have been used off-label with reported efficacy, and several more are being developed. Currently approved nonstimulants have moderate effect sizes, lower on average than for stimulants. However, there is considerable variability in response. More robust response is seen in a subgroup of those treated, and recent data suggest that it is possible to predict ultimate response for Viloazine ER and Atomoxetine within 2-3 weeks. Duration of action of nonstimulants is typically longer than for stimulants. Nonstimulants can be used in monotherapy or combined treatment. Combining nonstimulants with stimulants can be an effective strategy for extending duration of coverage, improving efficacy, treating comorbidity, and limiting side effects of both medication classes.

Conclusion: Although the nonstimulant medications are, on average, not as broadly or robustly effective as the psychostimulants, they can be very helpful in treating certain patients with ADHD (and associated comorbidities)—either as monotherapy or as adjunctive agents. Controlled clinical trials comparing nonstimulant and stimulant medications, which examine not only the impact on core symptoms but also a range of associated clinical and contextual variables, will be essential to better understand how to best use these medications.

1.2 EXPLORING THE IMPACT OF COMORBID CONDITIONS ON ADHD CARE

Gregory Mattingly, Midwest Research Group

Individual Abstract: The majority of children, adolescents and adults with ADHD struggle with comorbid mental and physical conditions. Comorbid conditions are impacted by a combination of shared genetic underpinnings, environmental stressors, impaired neurologic connectivity and diagnostic overlap. Comorbid conditions have been shown to dramatically increase mortality and predict negative health outcomes. A holistic approach for management of ADHD and comorbid conditions will be considered in this seminar.

1.3 EVIDENCE-BASED BEHAVIORAL TREATMENT

Margaret Sibley, University of Washington

Individual Abstract: This presentation will review the common elements of psychosocial treatments for ADHD across childhood, adolescence, and adulthood. We will review the evidence for which domains of functioning are impacted by psychosocial treatment and discuss best practices in implementing psychosocial treatments in school, community, telehealth, and clinical settings.

1.4 DIAGNOSIS AND TREATMENT OF ADHD IN WOMEN AND OLDER ADULTS

David Goodman, Johns Hopkins at Green Spring Station

Individual Abstract: While ADHD in adults and its supportive research has increased awareness amongst clinicians and the public, there are unique aspects of adult ADHD that stand in contrast to childhood ADHD. Special clinical populations include ADHD which co-occurs with psychiatric and medical illnesses. The focus of this presentation will be the presence of ADHD in specialty populations: Women and hormonal fluctuations over the lifespan, ADHD

and chemotherapy with the focus on women and breast cancer, and older adults and associated cognitive disorder differential diagnoses.

1.5 PHARMACOLOGIC TREATMENT OF ADHD: CHOOSING A STIMULANT

Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

Individual Abstract: Background: American Academy of Pediatrics and American Academy of Child and Adolescent Psychiatry Guidelines recommend using a United States Food and Drug Administration approved agent when choosing medication treatment for attention-deficit/hyperactivity disorder (ADHD). The most data supporting treatment exists for stimulants (amphetamine and methylphenidate.) During the past two decades multiple formulations of stimulants have been marketed and there are currently more than 30 available compounds. With all of the choices, deciding which stimulant to use for a particular patient may seem to be a daunting task.

Objectives: Understand differences between onset and duration of efficacy of various extended-release stimulant formulations and when to use them.

Methods: Amphetamine and methylphenidate pharmacology will be discussed. Technologies that make formulations unique, onset and duration of effect, and differences in route of administration will be discussed. Examples demonstrating when particular formulations would be most beneficial will be given.

FRIDAY, JANUARY 19, 2024

ADULT ADHD GUIDELINES TOWN HALL AND BREAKFAST

8:00 A.M. - 8:45 A.M.

2. ADHD GUIDELINES UPDATE

Chair: David Goodman, Johns Hopkins at Green Spring Station

Presenters:

David Goodman, Johns Hopkins at Green Spring Station

Overall Abstract: This presentation will provide and update on the progress of the APSARD U.S. Guidelines for the diagnosis and treatment of ADHD in adults. Topics to be covered will be 1) the conflict of interests management process that evolved directly from the Institute of Medicine and the American Psychiatric Association, 2) listing the members of the Task Force, 3) consideration for DEI and stakeholder representation on the Task Force, 4) content areas for working groups and examples of clinical guidelines, 5) the voting on guidelines and its status, 6) the APA review process for guidelines generated outside the APA, 6) comment on the potential impact of these guidelines on clinical education, patient care, and policy decisions.

Learning Objective 1: Understand the complexity of conflict of interests management under IOM and APA guidance.

Learning Objective 2: Be able to explain the clinical content areas to be a focus in APSARD guideline development.

Learning Objective 3 Identify the sequence of APA committees for guideline review and considered endorsement.

Learning Objective 4 Appreciate the potential impact of these U.S. Guidelines on clinical education, patient care, and policy implications.

2.1 UPDATE: APSARD U.S. GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF ADHD IN ADULTS

David Goodman, Johns Hopkins at Green Spring Station

Hypothesis/Objective This presentation will provide and update on the progress of the APSARD U.S. Guidelines for the diagnosis and treatment of ADHD in adults. Topics to be covered will be 1) the conflict of interests management process that evolved directly from the Institute of Medicine and the American Psychiatric Association, 2) listing the members of the Task Force, 3) consideration for DEI and stakeholder representation on the Task Force, 4) content areas for working groups and examples of clinical guidelines, 5) the voting on guidelines and its status, 6) the APA review process for guidelines generated outside the APA, 6) comment on the potential impact of these guidelines on clinical education, patient care, and policy decisions.
Methods N/A
Results N/A
Conclusions The National Academy of Science (formerly Institute of Medicine) and the American Psychiatric Association has established parameters under which clinical practice guidelines are to be developed. Following these parameters requires conflict of interests management, an extensive literature search, a grading of scientific research and rating of clinical consensus guidelines, and a public comment forum. The APSARD Task Force is following these processes to ensure the highest quality of research findings and clinical guidelines available to date. Once understanding the complexity of the process and the level of expertise involved, it becomes clear that APSARD's commitment has required the dedication of a great many people who wish to improve patient care and clinical training in this country.

OPENING CONFERENCE PLENARY: WHAT ARE THE BOUNDARIES OF ADULT ADHD

9:00 A.M. - 10:30 A.M.

3. WHAT ARE THE BOUNDARIES OF ADULT ADHD

Chair: Margaret Sibley, University of Washington
Presenters:
Luis Rohde, Federal University of Rio Grande do Sul
Margaret Sibley, University of Washington

Overall Abstract: The last several years have seen unprecedented rises in help-seeking among self-referring adults presenting with concerns of ADHD-like symptoms (Danielson et al., 2023). Factors contributing to increased ADHD help-seeking may include a rise in ADHD's visibility due to the neurodiversity social justice movement and increased online information about ADHD on platforms such as TikTok as well as increased demands and stress associated with the COVID-19 pandemic and the increasingly complex modern world. In this context, clinicians may struggle with challenging diagnostic questions such as whether symptoms might be better explained by another condition, if adult-onset ADHD symptoms are possible, and whether self-identified symptoms are severe enough to warrant diagnosis and treatment. In this plenary, we review the literature on the boundaries of adult ADHD including continuity from childhood, variable courses of symptoms over time, and the incidence of ADHD-like symptoms in general and clinical populations. Finally, we will discuss this current landscape

and how clinicians navigate contemporary dilemmas in the diagnosis of late-identified adults with ADHD.
Learning Objective 1: The participant shall be able to list multiple courses of ADHD from childhood to adulthood.
Learning Objective 2: The participant will be able to consider multiple factors when building a working case conceptualization of a newly presenting self-referred adult with ADHD.

3.1 NEW INSIGHTS ON ADHD TRAJECTORIES

Luis Rohde, Federal University of Rio Grande do Sul

Abstract In this talk, I will briefly review the well-defined traditional ADHD trajectories found in population studies in the literature that supported the conceptualization of ADHD as a neurodevelopmental disorder for a long time. Recent findings suggesting a late-onset form of the disorder as well as a fluctuating course challenging traditional views of ADHD trajectories will be presented. Areas of uncertainty will be reviewed. In addition, predictive models for ADHD trajectories from childhood to adulthood will be discussed. Clinical implications of the data presented will be highlighted.

3.2 WHEN ARE ADHD SYMPTOMS SEVERE ENOUGH TO DIAGNOSE AND TREAT?

Margaret Sibley, University of Washington

Abstract Help-seeking for ADHD is on the rise in adults (Danielson et al., 2023) and may be partially fueled by an increase in help-seeking among individuals with mild or transient attentional concerns. Clinicians are often left unsure of whether to provide a diagnosis or treatment to these cases. This presentation will review the literature on the incidence of ADHD symptoms in general populations of adults, as well as factors that are scientifically linked to fluctuations in attentional difficulties, hyperactivity, and impulsivity within an individual. Finally, the literature on the impact of subthreshold ADHD symptoms on daily life functioning will be reviewed to inform conversations about whether diagnosis of ADHD should be necessary to warrant treatment of symptoms.
Discussant: Anthony Rostain, Cooper University Health Care

CONCURRENT SYMPOSIA

10:45 A.M. - 12:15 P.M.

4. UNDERSTANDING THE COMORBIDITY OF READING DISORDERS AND ADHD

Chair: Steven Pliszka, UT Health Science Center at San Antonio
Presenters:
Erik Willcutt, The University of Colorado Boulder
Lauren McGrath, University of Denver
Michelle Y. Kibby, Southern Illinois University-Carbondale

Overall Abstract: Reading is a critical part of child development and academic success. It requires good attention to master its many aspects. Children with ADHD frequently have comorbid Reading Disorder (dyslexia). Both clinicians and researchers need to have a deeper understanding the how the two disorders overlap. Dr. McGarth will provide an overview of the neuropsychology of ADHD and RD based on data from a large (greater than 500) sample

from the Colorado Learning Disabilities Center (CLDRC), with a focus on how Processing Speed and Executive Function are shared risk factors in the disorders. Dr. Kibby will present results from neuroanatomical studies suggesting children with ADHD and RDave unique morphological changes compared to those with only ADHD or RD. Dr. Willcutt will discuss the clinical implications of the comorbidity, with twin studies showing ADHD and RD to have shared genetic influences. Overall discussion will focus on better identification and treatment of children with ADHD and reading problems.

Learning Objective 1: Understand how prevalent RD is in individuals with ADHD.

Learning Objective 2: Discuss the nature of the genetic influences on ADHD, RD and the ADHD/RD

Learning Objective 3 Understand neuroanatomical differences between those with ADHD, RD and ADHD/RD

Learning Objective 4 Discuss the implications for prognosis and treatment of the comorbidity of RD in those with ADHD.

4.1 COMORBIDITY BETWEEN ADHD AND READING DISABILITY: PREVALENCE, ETIOLOGY, AND CLINICAL IMPLICATIONS

Erik Willcutt, The University of Colorado Boulder

Hypothesis/Objective: In addition to symptoms of inattention and hyperactivity-impulsivity, many individuals with ADHD also meet criteria for Reading Disability (RD), a common childhood disorder that is defined by significant and unexpected underachievement in reading. This study was conducted to clarify the prevalence, genetic and environmental etiology, and clinical implications of this common comorbidity.

Methods: Separate community samples of 1,850 individuals and over 4,000 twins were recruited in collaboration with 22 public school districts. Parent and teacher ratings of DSM-IV ADHD symptoms were collected for each participant, and each individual completed a battery of cognitive measures that included multiple measures of word reading that were then used to define RD in this study.

Results: Between 25 and 35% of children with ADHD also met criteria for RD in the two samples. Comparisons of identical and fraternal twins indicate that comorbidity between RD and ADHD is largely explained by shared genetic influences, whereas other genetic and environmental influences contribute independently to each disorder. In comparison to individuals with ADHD without RD, individuals with comorbid RD exhibited elevated symptoms of anxiety and depression, higher levels of academic and psychosocial difficulties in both childhood and adolescence, and more frequent occupational difficulties in in late adolescence and early adulthood.

Conclusions: ADHD and RD frequently co-occur across development, and this comorbidity is due primarily to shared genetic influences. Children with ADHD with comorbid RD exhibit higher levels of functional impairment than children with ADHD alone, with particular difficulties on academic tasks. These results underscore the importance for comprehensive clinical assessments of ADHD to also screen for RD and other learning difficulties. When ADHD and RD co-occur, interventions are likely to be needed for both disorders.

4.2 THE NEUROPSYCHOLOGY OF COMORBIDITY: ADHD AND DYSLEXIA

Lauren McGrath, University of Denver

Hypothesis/Objective: ADHD is known to be comorbid with a wide range of neurodevelopmental and mental health disorders. Dyslexia is one of the most common comorbidities of ADHD with 25-40% of children with ADHD also qualifying for a Dyslexia

diagnosis. The comorbidity of ADHD and Dyslexia has been studied across levels of analysis (genetic, neuroimaging, neuropsychological) and findings are coalescing in support of a multiple factors model of both disorders. The multiple factors model predicts that comorbidities are pervasive because of shared risk factors between disorders. Thus, identifying these shared risk factors is important for understanding the mechanisms underlying comorbidity. This talk will focus on the neuropsychological evidence supporting the multiple factors model.

Methods: Previous work on the ADHD/Dyslexia comorbidity has largely focused on identifying unique risk factors that distinguish children with single disorders vs. combined ADHD/dyslexia. While identifying unique aspects is important, shared features are likely to provide more insight into the causes of comorbidity. This talk will focus on a large sample of children (N greater than 500) from the Colorado Learning Disabilities Research Center (CLDRC). The CLDRC is a population-based sample of twins who completed an extensive battery of cognitive, attention, and academic measures. Using structural equation modeling, we have been able to isolate the unique vs. shared characteristics that contribute to the ADHD/Dyslexia comorbidity.

Results: Our studies have consistently identified Processing Speed as a cognitive construct that is associated with both ADHD and Dyslexia and accounts for a substantial portion of their comorbidity. While Executive Functions (EF) have also been identified as shared risk factors for both ADHD and Dyslexia, our studies have found that the speeded aspects of EF are most strongly associated with the comorbidity.

Conclusions: The identification of shared cognitive risk factors like Processing Speed is most consistent with the multiple factors model where shared risk factors contribute to the ADHD/Dyslexia comorbidity. These findings support the idea that children with this comorbidity have true forms of both disorders that co-occur. These findings are not consistent with the common misconception of the ADHD/Dyslexia comorbidity that one disorder causes manifestations of the other. Clinically, the comorbidity of ADHD and Dyslexia is common enough that we recommend that children with one diagnosis are at least screened for the other diagnosis. In terms of treatment, the research strongly supports an approach that targets both disorders simultaneously. It is clear from the literature that treatment for one disorder does not impact symptoms of the other making it essential that treatment approaches for ADHD and Dyslexia proceed in parallel for the most optimal outcomes.

4.3 NEUROANATOMICAL CONTRIBUTORS TO THE COMORBIDITY BETWEEN ADHD AND DYSLEXIA

Michelle Y. Kibby, Southern Illinois University-Carbondale

Hypothesis/Objective: Brain structure frequently is studied in ADHD, but customarily in comparison to typically functioning individuals. In contrast, the ADHD/developmental dyslexia (DD) comorbidity has rarely been studied using neuroimaging until recently. Based on the neuropsychological literature indicating children with ADHD have executive functioning deficits, children with DD have phonological and orthographic processing deficits, and children with both disorders (ADHD/DD) have both types of deficits1,2,3, we expected the corresponding brain networks to be affected. More specifically, in our initial VBM study4, we hypothesized frontostriatal regions would be smaller in ADHD, temporoparietal and occipitotemporal regions would be smaller in DD, and all of these regions would be smaller in ADHD/DD. Consistent with our neuropsychological research1 and others'5, we found specific frontostriatal regions to be smaller across the three groups, as described below. This led to our subsequent neuroimaging work, also described herein.

Methods: The sample included 106 children, ages 8-12 years: 42 children with ADHD, 17 with DD, 16 with ADHD/DD, and 31 controls. My lab's initial imaging study used the Voxel-Based Morphometry Toolbox (VBM8) to conduct a whole-brain, volumetric analysis. The second study manually traced the frontal gyri via Analyze to determine their volume6. The most recent project performed a whole-brain cortical thickness analysis via the Computational Anatomy Toolbox (CAT12)7.
Results: In our VBM study (Figure 1), we found clusters specific to each group that were consistent with their clinical deficits (e.g., large frontal clusters commensurate with more extensive executive dysfunction in ADHD). Of interest, all three groups had clusters in the right superior frontal gyrus and caudate, part of the frontostriatal circuit. This circuit is implicated in working memory, among other executive functions. Our tracing study found specific frontal gyri were affected per group, with the right inferior frontal gyrus being smaller in ADHD, a gyrus implicated in behavior regulation/inhibition. Children with ADHD/DD had this effect plus a larger left middle frontal gyrus, which was associated with worse endogenous attention. In our cortical thickness project, we found children with ADHD had thinning in frontal, parietal, and temporal regions (Figure 2). The ADHD/DD group had some thinning in these regions, along with areas affected in DD. Moreover, all three groups had thinning in the right superior frontal gyrus, warranting further investigation as a possible contributor to the comorbidity, along with the caudate.
Conclusions: We found the three methods to be complementary: e.g., ADHD was associated with smaller right inferior frontal and bilateral superior frontal volume across the three methods, and each method yielded novel findings as well. Hence, both tracing and computational-based methods (e.g., CAT) should continue to be utilized in future research. No matter the method used, children with ADHD/DD displayed atypical morphology in regions affected by ADHD and DD alone, plus additional regions. Given their location, the neuroanatomical contributors likely affected their executive, linguistic, and reading abilities. Hence, when working with children with ADHD/DD it is important to remind others, such as parents and teachers, that their academic and behavioral problems have neurobiological contributors, as some think their problems are motivational in nature.

5. THE ASSOCIATION BETWEEN ADHD AND GENETICALLY DRIVEN INFLAMMATORY DISORDERS

10:45 A.M. - 12:15 P.M.

Chair: Iris Manor, Geha MHC
Presenters:
Nagahide Takahashi, Department of Child and Adolescent Psychiatry, Nagoya University Graduate School of Medicine
Beth Krone, Icahn School of Medicine at Mount Sinai
Iris Manor, Geha MHC
Moderator: Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University

Overall Abstract: The immune system is intricately involved in the development of the CNS. As such, misfunctions of the immune system are associated with neurodevelopmental (NDD) and psychiatric disorders. The known genetic contributors to ADHD are pleiotropic, and in recent years their essential involvement in immune functioning has become more evident. This symposium discusses associations between several well-defined genetic inflammatory disorders and ADHD as a crucible for understanding the relationship. Two sessions will present joint genetic inflammations common in the Mediterranean, glucose 6-phosphate

dehydrogenase (G6PD) deficiency, and Familial Mediterranean Fever and their association with ADHD. G6PD deficiency is a cellular metabolic disorder associated with anti-oxidants and oxidative stress. Its clinical expression is the inability to metabolize certain medications and foods. FMF is a disorder of the pyrin pathway, which is clinically expressed by repetitive neurological deficits and inflammatory processes, including high fever, arthritis, and building of amyloid plaques. The third presentation will demonstrate the role of the cytokine pathway as a mediator in the association between melatonin-polygenic risk score, an indicator of sleep disorders, and ADHD pathogenesis. This symposium calls for a better understanding of the genetics of the immune system as an essential player in the development of ADHD. In summary, the high heritability of the immune system and, as a result, of immunological dysfunctions provides a yet unstudied route by which the environment influences the final clinical picture of ADHD.

Learning Objective 1: Participants will understand ADHD's overrepresentaiton in genetic disorders with inflammatory presentations.

Learning Objective 2: Participants will understand that immune pathways moderate the association between genetic risk variants and ADHD.

5.1 ADHD AND GENETIC VARIANTS ASSOCIATED WITH MELATONIN SECRETION: THE ROLE OF INFLAMMATORY CYTOKINES AS MEDIATORS

Nagahide Takahashi, Nagoya University Graduate School of Medicine

Hypothesis/Objective: Previously, we have shown using cord blood that elevated inflammatory cytokines (IL-6, TNF-alpha, and MCP-1) are associated with ADHD symptoms in childhood and interact with the genetic risk of ADHD (Polygenic risk score: PRS) (Takahashi et al. 2023. Brain, Behavior, Immunity-Health). On the other hand, inflammatory cytokines have been reported to be continuously elevated in ADHD children, not only during the embryonic period. Furthermore, it has been reported that the IL-6 pathway is involved in melatonin production. Sleep disturbances are frequently observed in ADHD children, especially circadian rhythm disturbances. Therefore, in the present study, we hypothesized that the IL-6 pathway is involved in the pathogenesis of ADHD through the production of melatonin.

Methods: Melatonin-PRS was calculated for participants in the Hamamatsu birth cohort of mothers and children (HBC study) using the discovery cohort of GWAS results involving melatonin production. ADHD-PRS was used to measure ADHD symptoms in 5-6 years old children and the association with melatonin-PRS was examined. We further investigated the involvement of the IL-6 pathway by gene-enrichment analysis.

This study was approved by the Life Sciences and Medical Research Ethics Committee of Hamamatsu University School of Medicine and written informed consent to participate in the study was obtained from all parents and, when possible, oral consent was obtained from their children.

Results: Melatonin-PRS was associated with ADHD-RS score, and gene-enrichment analysis revealed that the IL-6 pathway was associated with melatonin production and ADHD symptoms.

Conclusions: PRS analysis suggested that the IL-6 pathway, an inflammatory cytokine pathway, may be involved in the pathogenesis of ADHD through the production of melatonin.

5.2 THE ASSOCIATION BETWEEN GLUCOSE 6-PHOSPHATE DEHYDROGENASE (G6PD) DEFICIENCY AND ADHD

Beth Krone, Icahn School of Medicine at Mount Sinai

Hypothesis/Objective Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the most common enzymopathy of humans, impacting 4.9% of the population, with higher rates among Mediterranean populations. G6PD deficiency is crucial to several metabolic pathways, each with a possible role in the etiology of ADHD. The objective of this case-controlled population study was to examine the association of G6PD deficiency and ADHD.
Methods The study was a population-based, case-control study, using electronic health records (EHRs) of Leumit Health Services (LHS), a nationwide Health Maintenance Organization (HMO) with N=1,031,354 individuals in Israel. The study group was comprised of individuals with G6PD deficiency (n=7,473) with a strictly matched control group of non-G6PD deficiency subjects who were randomly selected by an algorithm in a 1:4 ratio (N = 29,892) according to age, sex, and Socioeconomic Status (SES). ADHD was diagnosed according to the Israeli Ministry of Health criteria, following international evaluation best practices. The diagnosis was established according to the Diagnostic and Statistical Manual (DSM-4 or 5, depending on the year of the diagnosis) criteria. Clinical descriptors, Fisher's Exact Tests for categorical variables, and Mann-Whitney U tests for continuous variables were computed using R statistical software, version 4.0.4.
Results The mean age of patients and matched controls was 29.2 ± 22.3 years, with exact matching. 68.7% were male. G6PD deficiency conferred a significant 16% greater risk of having a formal diagnosis of adult ADHD (OR =1.16 [95% CI, 1.08-1.25], p less than 0.001). Further, G6PD deficiency was associated with a 30% greater likelihood of follow-up with adult neurologists (OR=1.30 [95% CI, 1.22-1.38], p less than 0.001) and a 12% greater likelihood of follow-up with adult psychiatrists OR=1.12 [95% CI, 1.01-1.24], p=0.048). Use of stimulant medications for ADHD was 17% greater for methylphenidate class drugs (OR=1.17 [95% CI, 1.08 - 1.27] p less than 0.001), and 16% greater for amphetamines (OR= 1.16 [95% CI, 1.03 - 1.37], p=0.047).
Conclusions Adults with G6PD deficiency were significantly more likely to be diagnosed with ADHD. Nearly twice as many patients were seen in neurology clinics as compared to psychiatry clinics. Treatment with stimulants was much more frequent among the G6PD deficiency group. Further research is required to examine the etiological relationships.

5.3 INCREASED RATE OF FAMILIAL MEDITERRANEAN FEVER IN CHILDREN WITH ADHD: A POPULATION-BASED CASE-CONTROL STUDY

Iris Manor, Geha MHC

Hypothesis/Objective: There is growing evidence of involvement of inflammatory mechanisms in attention deficit hyperactivity disorder (ADHD). Previous studies found significantly higher rates of ADHD among children with FMF. The present study examined the rate of exposure to FMF in children with a later (within five years) diagnosis of ADHD compared to non-ADHD children.
Methods: A population-based case-control study of all children (less than 18 years) registered in Leumit Health Services during 01.01.2006-06.30.2021. All cases met ICD-9/10 criteria for ADHD. They were matched by age, sex, and socioeconomic status on a 1:2 rate to randomly selected non-ADHD controls.
Results: Fifty-six (0.30%) children with ADHD (N=18,756) were previously diagnosed with FMF compared to 65 of 37,512 controls (0.17%). A significant, independent association existed between a preceding FMF diagnosis and a later ADHD diagnosis [OR=1.72(95%CI 1.18-2.51); p=0.003]
Conclusions: The mechanisms underlying the association w between FMF and later ADHD diagnosis merit further elucidation.

6. WHAT IS PUBLIC HEALTH DOING TO ADDRESS THE GAPS IN CLINICAL CARE OF ADHD?
10:45 A.M. - 12:15 P.M.

Chair: Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.
Presenters:
Melissa Danielson, Centers for Disease Control and Prevention
Ghasi Phillips-Bell, Nevada Department of Health and Human Services
Joshua Fitzgerald, University of Nevada School of Medicine
Erika Ryst, University of Nevada, Reno

Overall Abstract: Background: The federally funded National Survey for Children's Health (NSCH) collects parent-reported health data annually for children aged 0 to 17 years. Several survey questions address attention-deficit/hyperactivity disorder (ADHD) including whether a child has ever been diagnosed with ADHD, whether they currently have ADHD, and if the child has taken medication and/or received behavioral treatment for ADHD in the past 12 months. NSCH data from 2017-2021 indicate that prevalence estimates of ADHD in youth were lower in Nevada (5.9%) compared to the United States (9.0%).
Objectives: To identify possible explanations for the lower prevalence of ADHD diagnosis and treatment among children and adolescents in Nevada compared to the rest of the United States.

Methods: Parent-reported data from the survey were used to compare 14 demographic, health care access and quality variables with reported current ADHD diagnosis and medication treatment for youth aged 3 to 17 years in Nevada. Nevada Medicaid claims data from January 1, 2019, to June 1, 2023, were also reviewed for youth with an ADHD diagnosis. Finally, a survey was created for primary care providers in Nevada in order to assess their medical knowledge and confidence in diagnosing and treating ADHD.

Results: NSCH data showed that 2.4% of children in Nevada were treated with medication compared to 5.4% of children elsewhere (X2p less than 0.001). This difference was most pronounced for Hispanic children, uninsured children, and children who received healthcare services in places other than a doctor's office. Nevada Medicaid data, like the NSCH data, also indicated lower than expected percentage of youth receiving medication treatment. To understand why ADHD prevalence and treatment are lower in Nevada than elsewhere, data from the state provider survey will be presented.

Conclusion: This presentation will highlight the importance of collaboration between epidemiologists, clinicians, and state health professionals in addressing a public health problem.

Learning Objective 1: Participants will understand how epidemiological data about ADHD are collected for the National Survey for Children's Health
Learning Objective 2: Participants will learn how prevalence data for ADHD differs in Nevada compared to the rest of the United States
Learning Objective 3 Participants will learn how public health data can be used to address gaps in clinical care.

6.1 GEOGRAPHIC VARIATION OF PEDIATRIC ADHD: STATE-LEVEL INSIGHTS FROM NATIONAL SURVEILLANCE DATA
Melissa Danielson, Centers for Disease Control and Prevention

Hypothesis/Objective: National surveys are frequently used to provide population-based estimates of developmental disorder prevalence and treatment. The National Survey of Children's Health (NSCH) is designed to produce national and state-level estimates of various caregiver-reported indicators of children's health, including prevalence of diagnosed ADHD and associated ADHD treatment. CDC has used NSCH data since 2003 to provide state-level estimates of ADHD indicators to inform efforts to address the service needs of children with ADHD at the state level. This presentation will provide a retrospective of examples of how state-level estimates have been used, current state-level estimates of diagnosed ADHD and treatment, and a brief demonstration of a publicly available online query tool using NSCH data that can be used for national and state-level estimates of ADHD and other indicators.
Methods: The NSCH, conducted in 2003–04, 2007–08, 2011–12, and annually since 2016, collects caregiver-reported data on health indicators for children aged 0–17 years with estimates weighted to represent national and state-level populations. The primary indicators for ADHD are whether the child has ever been diagnosed with ADHD, currently has ADHD (asked since 2007), currently takes medication for ADHD, and has received behavioral treatment for ADHD in the past 12 months (asked since 2016). Analyses presented here are restricted to children aged 3–17 years.
Results: State-level estimates of the percentage of children aged 3–17 years ever diagnosed with ADHD in 2020–21 ranged from 5.0% to 17.9%. Seven states had a statistically significant increase in ever or current ADHD prevalence from 2016–19 to 2020–21, while only one state had a statistically significant decrease in current ADHD in that time frame. The percentage of children with current ADHD who received ADHD medication in 2020–21 ranged from 33.2% to 76.3% across states; there was a similar but narrower range across states of 33.0% to 57.7% of children with current ADHD who received behavioral treatment. Seven states had statistically significant decreases in ADHD medication receipt, and three states had statistically significant decreases in behavioral treatment receipt from 2016–19 to 2020–21.
Conclusions: State-level data on ADHD prevalence and associated treatment provide a valuable resource to monitor regional changes over time and inform efforts to ensure that children with ADHD can access care and services allowing them to achieve better outcomes. State-level data can inform expanded investigation into the condition of pediatric ADHD in a given state, such as a case study of ongoing work in Nevada to understand persistently low ADHD prevalence and treatment compared to the rest of the United States.

6.2 DEMOGRAPHIC AND CLINICAL CHARACTERISTICS IN RELATION TO ADHD DIAGNOSIS AND TREATMENT IN CHILDREN, NEVADA VS. THE U.S.

Ghasi Phillips-Bell, Nevada Department of Health and Human Services

Hypothesis/Objective: Prevalence estimates of attention deficit/hyperactivity disorder (ADHD) diagnosis and medication treatment among children are lower in Nevada than the United States (US). However, there are no known reasons for the lower prevalence. Our objective was to identify what demographic and clinical characteristics are associated with ADHD diagnosis and medication treatment in Nevada and the US overall (excluding Nevada; hereinafter, elsewhere). We hypothesized associations with selected clinical characteristics would be stronger in Nevada than elsewhere in the US.
Methods: We used 2017–2021 parent-reported data from the National Survey of Children's Health among children ages 3–17 years in Nevada (n=2,729) and elsewhere in the US (n=149,666). We used chi-square ($\chi 2$) statistics to test for differences in weighted prevalence estimates with two binary (yes/no) outcomes: current ADHD diagnosis and medication treatment between Nevada and elsewhere in the US. We calculated adjusted prevalence ratios (aPR) and 95% confidence intervals, using separate multivariable Poisson regression models

to examine the associations between 14 demographic and clinical characteristics and each outcome stratified by residence (Nevada vs. elsewhere), adjusted for race/ethnicity, sex, and age. To assess differences (Wald-p less than 0.05) between Nevada and elsewhere, we added an interaction term to regression models.

Results: In Nevada, 5.9% of children were diagnosed with ADHD vs. 9.0% elsewhere and 2.4% were treated with ADHD medication vs. 5.4% elsewhere (χ2p less than 0.001). ADHD diagnosis was less likely in Nevada than elsewhere for children with no current insurance vs. current insurance (aPRNevada= 0.16 (0.07–0.40); aPRUSA= 0.66 (0.56–0.78); Wald-p= 0.001) and who received services someplace other than a doctor's office vs. a doctor's office (aPRNevada= 0.40 (0.22–0.73); aPRUSA= 0.81 (0.71–0.93); Wald-p= 0.02). ADHD diagnosis was more likely in Nevada than elsewhere for children who had families with difficulties getting referrals vs. no difficulty (aPRNevada= 3.58 (2.14–6.00); aPRUSA= 1.52 (1.34–1.74); Wald-p= 0.002) or had families usually/always frustrated with getting services vs. not frustrated (aPRNevada= 6.42 (3.96–10.41); aPRUSA= 3.84 (3.42–4.30); Wald-p= 0.03). We observed no differences between Nevada and elsewhere in factors associated with medication treatment.

Conclusions: In Nevada, current ADHD diagnosis was associated with demographic and clinical characteristics, some of which had a stronger association than elsewhere in the US. Understanding the differences in factors associated with ADHD diagnosis between Nevada and elsewhere may identify opportunities to improve access to services.

6.3 USING STATE DATA TO EXAMINE PATTERNS OF ADHD DIAGNOSIS AND TREATMENT IN NEVADA CHILDREN AGES 3-17 YEARS

Joshua Fitzgerald, University of Nevada School of Medicine

Hypothesis/Objective: National Survey for Children's Health (NSCH) data from 2017-2021 indicate that compared to rates in the United States (U.S.) as a whole, youth in Nevada have lower rates of ADHD diagnosis (5.9% vs. 9.0%) and medication treatment (2.4% vs. 5.4%). Nevada is a predominantly rural state with two major urban areas (Las Vegas in the South and Reno/Carson in the North) separated by large swathes of rural and frontier counties. Mental health care access is limited throughout the state and rural counties experience particularly severe mental health workforce shortages. The objectives for this study were to confirm the NSCH low rates using healthcare claims data and to explore possible explanations for these low rates. We hypothesized that: 1) claims-based data would converge with NSCH data, and 2) the low rates might reflect lack of knowledge about evidence-based ADHD diagnosis and treatment among Nevada primary care providers. Further, we surmised that provider knowledge deficits and lack of healthcare access would have more impact on youth from rural areas and underserved ethnic and racial populations, leading to lower rates of ADHD diagnosis and treatment in these groups.

Methods: First, we assessed Nevada Medicaid claims data from January 1, 2019, to June 1, 2022, for youth ADHD diagnosis and medication prescriptions. To examine the impact of social determinants, we assessed rates of diagnosis and medication treatment by age, race/ethnicity demographics, and county size. We subsequently created a survey for primary care physicians, physician assistants, and advanced practice registered nurses across the state of Nevada. This survey will be distributed through state level professional associations. The survey assesses provider demographics, medical knowledge, and confidence in diagnosing and treating ADHD as well as other factors such as beliefs and stigma surrounding ADHD.

Results: Similar to the NSCH data, the state Medicaid data demonstrated a rate of ADHD diagnosis in Nevada of 5.2%, which is again lower than expected compared to the rate of 9.0% found by the NCHS for the total U.S. youth population. Consistent with our hypothesis,

demographic differences emerged, with Hispanic, Non-Hispanic American Indian or Alaskan Native, and Non-Hispanic Pacific Islander or Native Hawaiian groups having lower rates of diagnosis compared to other racial/ethnic groups. The two most populous counties, Clark and Washoe, had lower than expected rates of ADHD with more variability of rates in the rural counties. Lower prescription rates in Nevada mirror the lower prevalence of ADHD. Data from this analysis will be presented in detail, together with the provider survey results.
Conclusions: State-level Medicaid claims data for both diagnosis and prescriptions confirm national data from the NSCH showing lower than expected diagnostic rates of ADHD for Nevada youth. Multiple sources of data, including population-based, healthcare claims data and provider survey data can be used to investigate and understand factors contributing to a state's rates of ADHD diagnosis and treatment.

6.4 USING STATE DATA TO EXAMINE PATTERNS OF ADHD DIAGNOSIS AND TREATMENT IN NEVADA CHILDREN AGES 3-17 YEARS

Erika Ryst, University of Nevada, Reno

Hypothesis/Objective: National Survey for Children's Health (NSCH) data from 2017-2021 indicate that compared to rates in the United States (U.S.) as a whole, youth in Nevada have lower rates of ADHD diagnosis (5.9% vs. 9.0%) and medication treatment (2.4% vs. 5.4%). Nevada is a predominantly rural state with two major urban areas (Las Vegas in the South and Reno/Carson in the North) separated by large swathes of rural and frontier counties. Mental health care access is limited throughout the state and rural counties experience particularly severe mental health workforce shortages. The objectives for this study were to confirm the NSCH low rates using healthcare claims data and to explore possible explanations for these low rates. We hypothesized that: 1) claims-based data would converge with NSCH data, and 2) the low rates might reflect lack of knowledge about evidence-based ADHD diagnosis and treatment among Nevada primary care providers. Further, we surmised that provider knowledge deficits and lack of healthcare access would have more impact on youth from rural areas and underserved ethnic and racial populations, leading to lower rates of ADHD diagnosis and treatment in these groups.
Methods: First, we assessed Nevada Medicaid claims data from January 1, 2019, to June 1, 2022, for youth ADHD diagnosis and medication prescriptions. To examine the impact of social determinants, we assessed rates of diagnosis and medication treatment by age, race/ethnicity demographics, and county size. We subsequently created a survey for primary care physicians, physician assistants, and advanced practice registered nurses across the state of Nevada. This survey will be distributed through state level professional associations. The survey assesses provider demographics, medical knowledge, and confidence in diagnosing and treating ADHD as well as other factors such as beliefs and stigma surrounding ADHD.
Results: Similar to the NSCH data, the state Medicaid data demonstrated a rate of ADHD diagnosis in Nevada of 5.2%, which is again lower than expected compared to the rate of 9.0% found by the NCHS for the total U.S. youth population. Consistent with our hypothesis, demographic differences emerged, with Hispanic, Non-Hispanic American Indian or Alaskan Native, and Non-Hispanic Pacific Islander or Native Hawaiian groups having lower rates of diagnosis compared to other racial/ethnic groups. The two most populous counties, Clark and Washoe, had lower than expected rates of ADHD with more variability of rates in the rural counties. Lower prescription rates in Nevada mirror the lower prevalence of ADHD. Data from this analysis will be presented in detail, together with the provider survey results.
Conclusions: State-level Medicaid claims data for both diagnosis and prescriptions confirm national data from the NSCH showing lower than expected diagnostic rates of ADHD for Nevada youth. Multiple sources of data, including population-based, healthcare claims data

and provider survey data can be used to investigate and understand factors contributing to a state's rates of ADHD diagnosis and treatment.

CME FROM NOVEN - ALL ATTENDEES WELCOME!

1:30 P.M. - 2:15 P.M.

7. ACHIEVING CONTROL IN ADULT ADHD HOW TO GET YOUR PATIENT ON THE RIGHT MEDICATIONS

Chair: David Goodman, Johns Hopkins at Green Spring Station

Presenters:

David Goodman, Johns Hopkins at Green Spring Station

Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

Overall Abstract: Although stimulant medications are the mainstay of treatment for attention-deficit hyperactivity disorder (ADHD), there are no guidelines on treatment for adults with ADHD. In addition, stimulant prescribing patterns and the risk for misuse and diversion of medications are growing concerns. This 30-minute symposium will explore patient-centered considerations, including psychiatric comorbidities and risk factors for misuse and diversion, in treatment selection for adults with ADHD.

Learning Objective 1: Have greater competence related to Tailoring stimulant treatment selection for adult patients with ADHD.

Learning Objective 2: Identifying adult patients with ADHD who may benefit from modification of their stimulant treatment.

Learning Objective 3 Demonstrate greater confidence in their ability to Navigate risks of stimulant drug misuse and diversion in adult patients with ADHD.

7.1 ACHIEVING CONTROL IN ADULT ADHD HOW TO GET YOUR PATIENT ON THE RIGHT MEDICATIONS

David Goodman, Johns Hopkins at Green Spring Station

7.2 ACHIEVING CONTROL IN ADULT ADHD HOW TO GET YOUR PATIENT ON THE RIGHT MEDICATIONS

Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

CONCURRENT SYMPOSIA

2:30 P.M. - 4:00 P.M.

8. UPDATING BEHAVIORAL PARENT TRAINING FOR ADHD: CONTENT, CONTEXT AND CULTURAL ADAPTATIONS

Chair: Gail Tripp, OIST Graduate University

Presenters:

Emi Furukawa, Okinawa Institute of Science and Technology Graduate University

Patricia Bado, D'Or Institute for Research and Education

Shizuka Shimabukuro, Okinawa Institute of Science and Technology Graduate University (OIST)

Overall Abstract: Behavioral Parent Training (BPT) is a recommended form of non-pharmacological treatment for children with mild to moderate ADHD. BPT is effective in improving parenting practices, parent wellbeing, and, to a lesser extent, symptoms of ADHD. Limited symptom change might be explained by altered motivational processing in those with ADHD. Such altered sensitivity to reward and punishment is not typically addressed in the use of BPT programs with ADHD. In addition, while BPT programs developed in Western countries have been adapted for use in different languages and cultures, BPT's availability and evidence for its acceptability and effectiveness in non-English speaking countries is limited. This symposium highlights recent efforts to develop and implement BPT programs for families of children with ADHD in Japan and Brazil. Each of these presentations deals with important content changes, delivery in a given context and efforts to make the programs culturally relevant. In the first presentation Dr. Furukawa describes efforts to modify BPT content to reflect experimental evidence of altered reinforcement sensitivity in those with ADHD. This is carried out in the context of developing an accessible and culturally appropriate BPT program through community-based participatory research in semi-rural Japan. Dr. Bado describes the need for, and development of, HábitE, a new online parenting program in Brazil that embraces available technology to deliver BPT strategies via WhatsApp. The program aims to increase accessibility and encourage parent participation as the agent of change for their children's behavior. In the last presentation, Dr. Shimabukuro describes the development of Well Parent Japan (WPJ), a new hybrid parenting program that addresses the psychological wellbeing of Japanese mothers of children with ADHD before teaching them developmentally sensitive, culturally adapted parenting skills. These experiences are likely relevant for many countries with increasing diversity within.

Learning Objective 1: Participants will understand the efforts made toward, and lessons learned from, developing and implementing behavioral parent training in different countries.

Learning Objective 2: Participants will understand the importance of considering accessibility, acceptability and cultural sensitivity for the content and delivery mode of behavioral interventions.

Learning Objective 3 Participants will understand the value of incorporating community and stakeholder feedback into intervention development and delivery.

Learning Objective 4 Participants will understand the implications of altered reinforcement processing in ADHD for behavioral parent training.

8.1 COMMUNITY-BASED PARTICIPATORY RESEARCH: DEVELOPING ACCESSIBLE RESEARCH-INFORMED BPT IN JAPAN

Emi Furukawa, Okinawa Institute of Science and Technology Graduate University

Hypothesis/Objective: The importance of caregiver support has been increasingly recognized in Japan. However, a lack of trained professionals and stigma surrounding neurodevelopmental/behavioral disorders limit the number of families who seek and receive care. As a result, families of children with elevated ADHD symptoms often struggle privately with everyday challenges. They may also experience difficulties applying commonly advised behavioral modification strategies. These usually teach caregivers to increase the frequency of appropriate behavior and reduce the frequency of unacceptable behavior through manipulating reinforcement contingencies. Empirical evidence, however, indicates unique ways children with ADHD respond to the availability and timing of rewards and punishments (1). Here, we engaged in community-based participatory research (CBPR) to develop a stakeholder-driven parenting program in a semi-rural community in Japan, incorporating basic research findings on reinforcement processing in ADHD (2). Cultural sensitivity, accessibility, and acceptability

were considered, as many behavioral intervention concepts and terms are originally developed in Western countries.
Methods: Community informational sessions were held to engage local stakeholders (parents, teachers and NGO leaders) in the project. A working group of six core members emerged who participated in monthly meetings with two researchers to identify community needs, potential program content, and possible modes of delivery/implementation. The team reviewed existing BPT materials and considered their appropriateness for use in their community. The members sought to understand the role of reinforcement in supporting children's behavior changes and the implications of altered reinforcement processing in ADHD. The working group also met among themselves to define the parameters of the community they wished to reach and generate engagement strategies. The community members participated in the content creation, i.e., the development of the scripts and voicing of animated instructional videos.
Results: The CBPR process was effective in identifying the goals for the envisioned BPT program, which included reducing stigma, reaching hesitant families, and creating peer support environments together with sharing of research-informed behavioral strategies. The CBPR process also influenced the stakeholder attitudes. Initially, they were reluctant to differentiate children according to their behavioral challenges and use reinforcement-based interventions. They also viewed the intervention and research procedures as something professionals and researchers offer, and they receive. Through the discussions and co-production of the program content, they became more accepting of behavioral strategies and eager to partner with the researchers and host the BPT program in their community. They felt that animated instructional content would be appropriate for Japanese caregivers, while being adaptable to other languages given increasing diversity in the country.
Conclusions: Attitudinal changes and increased acceptance of behavioral interventions targeting those with elevated ADHD symptoms were observed among community members participating in the CBPR. They became active partners in creating and delivering BPT, which suggests that peer-led behavioral interventions may be possible and appropriate in Japanese under-resourced communities. The CBPR also generated ideas that researchers did not initially consider, such as using animation, reaching in-person/online hybrid communities, and incorporating experience-based learning opportunities. Plans for co-delivery and -testing of the program are in development.

8.2 MEETING THE BEHAVIORAL SUPPORT NEEDS OF YOUNG UNDERSERVED BRAZILIAN FAMILIES VIA WHATSAPP

Patricia Bado, D'Or Institute for Research and Education

Hypothesis/Objective: Accessible and affordable quality behavioral healthcare for children is very limited in Brazil. Medication is often the only treatment option available and most commonly offered psychosocial intervention is psychoanalysis. Many parents and healthcare professionals are unaware of behavioral parent training (BPT) as a treatment option for ADHD (1). We undertook a qualitative needs assessment to identify barriers to Brazilian families accessing behavioral treatment and the desired intervention content and the preferred mode of delivery (2). The first-hand experiences of the families informed the development of a brief pilot module offering research-informed behavioral strategies and support to parents through short videos and text messages via WhatsApp, a popular messaging app in Brazil. A proof-of-concept study examined the feasibility and acceptability, as well as preliminary effects, of the pilot intervention.
Methods: For the needs assessment, semi-structured telephone interviews were conducted with parents of children with elevated symptoms of ADHD (n = 23), pediatric healthcare professionals (n = 16), and educators (n = 15). Interview responses were coded to generate

narratives regarding families' access to behavioral treatment, parenting difficulties experienced, and strategies used, and what parents desired and needed. For the proof-of-concept study, parents (n = 34) of children meeting the diagnostic criteria of ADHD completed a pilot training module and before and after questionnaires. Short videos teaching antecedent and consequent behavioral techniques were sent to parents every three days, with text messages sent daily. These text messages reinforced the information taught in the videos and offered encouragement to parents. This was done using Wizard-of-Oz methodology, where participants interacted with what they believed to be an autonomous program, which was managed by humans.

Results: The needs assessment confirmed the lack of accessible evidence-based behavioral treatment and delays in accessing care when available. The majority of participating parents had not received any parent training. Parents, educators, and healthcare providers expressed a need for practical tools to manage the behavior of children with ADHD and support for the parents. The results of the proof-of-concept study are promising; caregivers used and liked the program and reported that they gained new knowledge which changed their perceptions and behaviors. Questionnaire data indicated significant reduction in their children's ADHD symptoms and oppositional behaviors, and negative parenting practices.

Conclusions: The gap in existing services for families of children with ADHD was identified in the needs assessment. Direct statements from parents, and those working with families, elucidated the need for practical parenting strategies together with positive reinforcement for parents who are the agent of their children's behavioral change. Our preliminary evaluation results show that instructional content and support provided in the pilot module are appropriate for Brazil's cultural context. Caregivers engaged well with the training videos and text messages, and reported finding the content useful. The social media-based program has the potential to provide low-cost quality caregiver training and support to families struggling to access behavioral services in Brazil. The format and frequent contact are likely reinforcing for the current generation of parents who consume and interact with information daily via messaging applications.

8.3 TEACHING JAPANESE MOTHERS TO CARE FOR THEMSELVES WHILE SUPPORTING THEIR CHILDREN WITH ADHD

Shizuka Shimabukuro, Okinawa Institute of Science and Technology Graduate University (OIST)

Hypothesis/Objective: The stigma that surrounds ADHD in Japan together with Japanese cultural values of sensitivity to interpersonal cues, self-monitoring and harmony increases the vulnerability of Japanese families dealing with ADHD. This is especially true for mothers who continue to carry greater responsibility for parenting and may be judged responsible for their child's behavioral difficulties (1). Although recognizing the value of BPT, Japan lacks empirically supported programs that target the complex needs of families of children with ADHD. To address this gap, we developed Well Parent Japan (WPJ), a hybrid program combining sessions to enhance parents' psychological wellbeing with a culturally adapted version of the New Forest Parenting Program (NFPP) for ADHD. Here we describe the development of WPJ through co-production with parents and therapists (2), the program's unique features, and recent findings from a multi-site RCT.

Methods: Well Parent Japan was developed through pilot and proof-of-concept studies, focus groups and interviews with participating parents and therapists. Obtained feedback guided revisions and extensions to the program. The result is a 13-session group administered program, the first five sessions addressing parent wellbeing (psychoeducation, stress management, problem solving, cognitive restructuring, and communication skills) followed by an 8 session,

culturally adapted, version of NFPP. Well Parent Japan has been evaluated in two RCT trials against waitlist control and treatment as usual (TAU).
Results: Pilot/proof-of-concept study participants approved group delivery, but only for mothers in order to facilitate honest discussion, increased psychoeducation to help reduce self-blame and educate others, a need for additional psychological support (psychoeducation, cognitive restructuring, stress management), and behavioral strategies to address the underlying causes of ADHD. Mothers and therapists identified the need for additional explanation and rehearsal of behavior management practices not common in Japan, in particular using praise to change children's behavior. Therapists also highlighted the importance of addressing mothers' self-doubt over their parenting abilities and the need for enhancing communication skills. In its current form WPJ is superior to TAU in reducing mothers' parenting stress, enhancing their self-esteem and parenting skills and reducing family strain. It also leads to reductions in ADHD symptoms and negative parenting compared with waitlist control.
Conclusions: Well Parent Japan offers the first empirically supported specialist parent training program for ADHD in Japan. It is well received and tolerated by participating mothers and therapists and is associated with lasting benefits to participants wellbeing, parenting skills and family coping. Important lessons learned include the importance of: translating constructs not words; understanding cultural parenting practices; incorporating the voices of parents and therapists; allowing sufficient time to explain, demonstrate, and practice new approaches to parenting; supporting mothers through changing their own and others approaches to parenting; and very significantly understanding that willingness to use praise and reinforcement in managing children's behavior differs across cultures.

9. ADHD IN OLDER ADULTHOOD: STATE OF THE SCIENCE ON COGNITIVE AGING, ADHD-RELATED CONTRIBUTING FACTORS, AND CLINICAL IMPLICATIONS.

2:30 P.M. - 4:00 P.M.

Chair: Brooke Molina, University of Pittsburgh
Presenters:
Brandy Callahan, University of Calgary
Thalida Arpawong, University of Southern California
David Goodman, Johns Hopkins at Green Spring Station

Overall Abstract: Persistence of ADHD into adulthood is a well-established, replicated finding, as is the occurrence of impairments both psychosocial and physical. While persistence of diagnosis into early and middle adulthood is represented in the literature, understanding the diagnosis and treatment of ADHD in older adulthood is especially hindered by a thin evidence base. Practitioners wrestle with the complexities of identifying ADHD for a cohort of individuals whose childhoods pre-dated widespread recognition of the disorder. Moreover, data have recently begun to emerge suggesting potentially accelerated cognitive aging and dementia associated with a history of ADHD. This symposium provides a series of presentations to aide understanding of the latest science regarding cognitive aging amongst individuals with ADHD and current recommended clinical practices for the diagnosis and management of ADHD in the context of these emerging findings from a literature in its infancy. Dr. Brandy Callahan will introduce the available evidence linking ADHD to late-life cognitive outcomes and review the brain health profiles that have been associated with ADHD in adults aged 50+. Dr. EmArpawong will present results from a population-based study of over 2,000 adults that examined genetic vulnerability to ADHD in relation to a blood-based biomarker for

an accelerated aging process. She will also discuss the role of common ADHD-related features (e.g., educational attainment, higher body mass index) and their contribution to accelerated aging. Finally, Dr. David Goodman will discuss common confounds in the diagnostic process of ADHD assessment in older age (e.g., polypharmacy, age-related cognitive changes) and methods by which cognitive deficits may be identified as associated with ADHD versus other conditions and associated treatment implications.
Learning Objective 1: Participants will be able to describe extent of risk for accelerated cognitive decline associated with ADHD.
Learning Objective 2: Participants will be able to describe common features of ADHD that may contribute to cognitive decline and a marker for accelerated biological aging in older age.
Learning Objective 3 Participants will be able to identify brain health profiles associated with ADHD in older adults.
Learning Objective 4 Participants will be able to identify assessment and treatment strategies for diagnosing ADHD amongst older adult patients.

9.1 COGNITION AND DEMENTIA IN OLDER ADULTS WITH ADHD

Brandy Callahan, University of Calgary

Hypothesis/Objective: At least half of childhood cases of ADHD are now known to persist into adulthood and old age, but very little is known about how ADHD evolves into late life. Emerging literature suggests ADHD may have adverse impacts on cognitive aging and potentially increase risk for dementia in older adults. The objective of this presentation is to introduce the available evidence linking ADHD to late-life cognitive outcomes, and review the brain health profiles that have been associated with ADHD in adults aged 50+.
Methods: This presentation constitutes a review of the empirical literature on cognitive and brain health in adults aged 50+ with ADHD, including cohort studies, case series, and case-control studies.
Results: Available studies provide preliminary evidence that ADHD in later life is associated with a cognitive profile emphasizing inefficient frontal-lobe involvement, along with significant within- and between-person cognitive variability across time. Furthermore, neuropathological studies indicate that a given amount of Alzheimer or vascular pathology may be relatively more detrimental to cognitive performance in ADHD than in healthy aging, suggesting increased vulnerability to the impacts of neurodegeneration. Lastly, converging population-based evidence indicates that adults with ADHD are up to six times more likely to develop some type of dementia as they age, relative to their peers without ADHD, with highest risk ratios for vascular dementia. These results are contextualized within the limitations of retrospective study designs and biased sampling methods.
Conclusions: ADHD should be explored further as a risk factor for suboptimal cognitive aging. Prospective longitudinal studies are needed to elucidate its influence on brain health across the lifespan, as well as possible interactions with other health and environmental factors.

9.2 ADHD GENETIC BURDEN ASSOCIATES WITH OLDER EPIGENETIC AGE AND IS MEDIATED BY SOCIODEMOGRAPHIC AND BEHAVIORAL FACTORS

Thalida Arpawong, University of Southern California

Hypothesis/Objective: Truncated lifespans are associated with having ADHD, and is likely mediated by related behavioral and sociodemographic factors that also contribute to accelerated biological aging. Such factors include depressive symptoms, cigarette smoking, higher body mass index, lower educational attainment, lower income in adulthood, and more challenges with cognitive processes. A higher polygenic score for ADHD (ADHD-PGS) is associated with

having more characteristic features of ADHD. In this study, we aimed to evaluate the degree to which: (1) the ADHD-PGS associates with an epigenetic biomarker developed to predict accelerated aging and earlier mortality, (2) such an association would be mediated by behavioral and sociodemographic correlates of ADHD, or (3) such an association would be mediated first by educational attainment, then by behavioral and sociodemographic correlates.
Methods: Data came from the population-based U.S. Health and Retirement Study, invoking a sample of N=2,311 adults age 50 and older, of European-ancestry, with blood based epigenetic and genetic data. The ADHD-PGS was calculated from a previously conducted genomewide meta-analysis. Epigenome-wide DNA methylation levels were used to index biological aging and earlier age of mortality through a blood-based biomarker called GrimAge. Our statistical approach entailed constructing structural equation models to test single and multi-mediation effects from the ADHD-PGS through behavioral and contextual indicators on GrimAge, adjusted for covariates.
Results: The ADHD-PGS was directly and significantly associated with GrimAge, after adjusting for covariates. In single mediation models, the effect of the ADHD-PGS on GrimAge was partially mediated via smoking, depressive symptoms, and education. In multi-mediation models, the effect of the ADHD-PGS on GrimAge was mediated first through education, then smoking, depressive symptoms, BMI, and income.
Conclusions: Findings elucidate lifecourse pathways through which ADHD genetic burden and symptoms can alter risks for accelerated aging and shortened lifespans, when indexed by an epigenetic biomarker. More education appears to play a central role in attenuating negative effects on epigenetic aging from behavioral and sociodemographic risk factors related to ADHD. This has implications for targeting potential behavioral and sociodemographic mediators that may attenuate negative biological system effects.

9.3 CLINICAL IMPLICATIONS OF ADHD IN OLDER ADULTS

David Goodman, Johns Hopkins at Green Spring Station

Hypothesis/Objective: ADHD in older adults has only recently been appreciated as a differential diagnosis in older adults presenting with cognitive complaints. Medical and psychiatric comorbidity accompanied by polypharmacy and age-related/perimenopausal-related cognitive changes confounds the diagnostic process and treatment considerations. This presentation will address the diagnostic complexity and help sort out the assignment of cognitive deficits to perspective disorders. These diagnostic distinctions then lead to an algorithmic approach to treatment options. Identifying target symptoms helps track improvement as treatment options are changed to improve daily function.
Methods: N/A
Results: N/A
Conclusions: ADHD in older adults is an important differential diagnosis for patients presenting with cognitive complaints. Often these older patients were never diagnosed with ADHD because of the lack of recognition of ADHD in the 1950s, 60s, or 70s. While challenging to make this diagnosis in older adults, it is possible with education and awareness. With appropriate treatment, improvement is noticed in cognitive abilities, daily function, and quality of life for the patient and others. The growing body of published literature now supports ADHD in older adults as a valid disorder meriting treatment. Emerging literature has raised ADHD as a risk for neurodegeneration, but research remains in its infancy.

PLENARY SESSION II: ADHD AND WOMEN

4:15 P.M. - 5:15 P.M.

10. ADHD and WOMEN
Chair: Gregory Mattingly, Midwest Research Group
Presenters:
Susan Young, Psychology Services Limited

Overall Abstract: A review of the current understanding of the overall clinical differences and functional impact of ADHD in women.
Learning Objective 1: Clinical presentation of ADHD in women.
Learning Objective 2: Clinical impact of ADHD in women.
Learning Objective 3 Hormonal impact of ADHD in women.

10.1 ADHD & WOMEN
Susan Young, Psychology Services Limited

Abstract There is evidence to suggest that the broad discrepancy in the ratio of males to females with diagnosed ADHD is due to lack of recognition and/or referral bias in females. Studies suggest that females with ADHD present with differences in their profile of symptoms, comorbidity and associated functioning compared with males. The United Kingdom ADHD Partnership hosted a meeting of experts to discuss symptom presentation, triggers for referral, assessment, treatment and multi-agency liaison for females with ADHD across the lifespan. Providing a practical approach based upon expert consensus, the presentation summarizes the outcome of the meeting and inform effective identification, treatment and support of girls and women with ADHD. It is important to move away from the predominant perspective that ADHD is a behavioural disorder characterized by 'boisterous boys'. As children females may present with more subtle and/or internalised problems, but in adolescence and young adulthood they also have difficulty with behavioural and emotional control leading to negative outcomes. It is essential to adopt a lifespan model of care to support the complex transitions experienced by females that occur in parallel to change in clinical presentation and social circumstances.

SATURDAY, JANUARY 20, 2024

INDUSTRY-SPONSORED SYMPOSIUM (SUPERNUS) - ALL ATTENDEES WELCOME!

8:00 A.M. - 9:00 A.M.

11. SUPERNUS SPONSORED SYMPOSIA: MASTERING ADULT ADHD CARE: CASE MANAGEMENT IN THE AGE OF THE STIMULANT CRISIS
Chair: Gregory Mattingly, Midwest Research Group
Presenters:
Gregory Mattingly, Midwest Research Group
Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.
Vladimir Maletic, UofSC School of Medicine
Overall Abstract: Don't miss this opportunity to enhance your knowledge and sharpen your skills in the realm of attention deficit/hyperactivity disorder (ADHD) management. Register now for this informative symposium at APSARD and join an expert discussion on the

complexities of ADHD treatment, including assessing ADHD symptoms with evidence-based strategies, mitigating stimulant misuse in adult patients with ADHD, and tailoring medication selection based on patient-specific factors for adult patients with ADHD in the context of the stimulant shortage.
Learning Objective 1: Have greater competence related to assessing ADHD symptoms with evidence-based strategies.
Learning Objective 2: Have greater competence related to mitigating stimulant misuse in adult patients with ADHD.
Learning Objective 3 Have greater competence related to tailoring medication selection based on patient-specific factors for adult patients with ADHD.

11.1 MASTERING ADULT ADHD CARE: CASE MANAGEMENT IN THE AGE OF THE STIMULANT CRISIS

Gregory Mattingly, Midwest Research Group

11.2 MASTERING ADULT ADHD CARE: CASE MANAGEMENT IN THE AGE OF THE STIMULANT CRISIS

Ann Childress, Center for Psychiatry and Behavioral Medicine, Inc.

11.3 SUPERNUS SPONSORED SYMPOSIA: MASTERING ADULT ADHD CARE: CASE MANAGEMENT IN THE AGE OF THE STIMULANT CRISIS

Vladimir Maletic, UofSC School of Medicine

CONCURRENT SYMPOSIA

9:15 A.M. - 10:45 A.M.

12. THE INTERACTIONS BETWEEN ADHD, COMORBIDITIES, AND DISORDERED SLEEP

Chair: Martin Katzman, START Clinic for Mood and Anxiety Disorders
Presenters:
Tia Sternat, START Clinic for Mood and Anxiety Disorders
Irvin Epstein, START Clinic for Mood and Anxiety
Martin Katzman, START Clinic for Mood and Anxiety Disorders

Overall Abstract: Attention-deficit hyperactivity disorder (ADHD) is a highly comorbid, pervasive neurodevelopmental disorder that impacts approximately 5% of children, adolescents, and adults worldwide and has strong association with a variety of psychiatric comorbidities. Sleep disturbances, including difficulties initiating, maintaining, and achieving adequate restorative sleep, are commonly reported in up to 50% of those suffering with ADHD.1,2
Additionally, ADHD is frequently associated with comorbid psychopathologies, including mood and anxiety disorders, personality disorders, and substance use disorders, which may also be associated with sleep disorders.3 The complex relationship between problems with sleep, ADHD, and comorbid psychiatric disorders is multifaceted and may be indicative of the common neurobiological underpinnings between psychiatric disorders and dysregulated sleep.2 Furthermore, altered circadian rhythms underlying sleep problems has been shown to

increase the risk of suicide in individuals with ADHD.4,5 Therefore, it is important to consider the underlying processes and comorbid psychiatric disorders associated with ADHD and sleep disturbances that may impact prognosis and outcome when managing patients.

As such, the presentation will highlight the functional and neuroanatomical overlap between dysregulated sleep and psychiatric disorders, outlining how sleep interacts in both ADHD-only, as well as comorbid populations, pointing to a higher risk of suicidality and medical complications and perhaps pointing to neurobiological pathways to this complex comorbidity presentation. Furthermore, this presentation will present preliminary data on the implications of sleep medication targeting the orexin system on alleviating insomnia and ADHD symptoms.

Learning Objective 1: Examining the effects of sleep disorders on ADHD severity and comorbidities.
Learning Objective 2: Highlighting the neurobiological mechanisms of sleep disturbances in a psychiatric population.
Learning Objective 3 Understanding the interactions between sleep disturbances, suicidality, and comorbid psychiatric disorders in patients with ADHD.

12.1 SLEEP DISORDERS, SUICIDALITY, ADHD, AND COMORBIDITIES

Tia Sternat, START Clinic for Mood and Anxiety Disorders

Hypothesis/Objective: Individuals with a history of attention deficit hyperactivity disorder (ADHD) are reported to have a significantly higher risk of self-harm behaviors, suicidal ideation, suicide attempts, and developing comorbid psychiatric disorders by early adulthood. Disturbed or disordered sleep is commonly associated with ADHD and has been acknowledged as a biomarker for suicidal ideation and behaviors in individuals with ADHD. Several studies have explored the interaction between sleep disorders and suicidal behaviours; however, the significant impact of disordered sleep on suicidal thoughts and actions in those with ADHD is currently underestimated and critical to consider.
Studies show a sharp increase in suicide risk from 2am to 4am among individuals with comorbid psychiatric disorders that display dysfunctional circadian rhythms and disordered sleep patterns. Circadian rhythms and sleep-wake cycles are found to be altered in ADHD, leading to sleep disturbances, worsening of symptoms, increased risk of suicide, and negative health outcomes. Thus, the interaction between disordered sleep, ADHD, and suicidal behaviour has substantial consequences on short and long-term health outcomes, which may inform diagnosis, management, and treatment of ADHD. This presentation aims to provide a holistic understanding of the interactions between disordered sleep, suicidality within ADHD and comorbid psychiatric populations.

Methods: This symposium will review the present literature encompassing the relationship between disordered sleep and suicidality within ADHD populations and comorbid psychiatric disorders. The worsened prognosis and treatment outcomes of ADHD and comorbidities due to the high risk of suicidality and presence of sleep disorders among individuals with ADHD will be discussed.
Results: Results from case studies and large-scale databases in the literature and real-world examples will be presented.
Conclusions: This symposium will leave the audience with a deeper understanding of interactions between disturbed and altered sleep patterns and ADHD, while highlighting the risk of suicide and negative health outcomes in individuals with ADHD. Additionally, this presentation will highlight the importance of suicidality as a potential marker of undiagnosed

ADHD, along with expanding on pharmacotherapeutic and psychotherapeutic treatment implications.

12.2 DISORDERED SLEEP, ADHD AND COMORBID DISORDERS

Irvin Epstein, START Clinic for Mood and Anxiety

Hypothesis/Objective: Attention-deficit/hyperactivity disorder (ADHD) is a highly prevalent and burdensome neurodevelopmental disorder that affects approximately 5% of the global population.1 Due to the heterogeneous nature of this disorder, it is common for individuals with ADHD to be diagnosed with comorbid mood and anxiety disorders, as well as substance use disorders.2 Previous research has shown that 47.1% of individuals with ADHD suffer from one or more anxiety disorders.3 Additionally, ADHD and depression co-occur in approximately 18.6% to 53.3% of the psychiatric population.3,4 A common underlying symptom among ADHD and these comorbid disorders is sleep disturbances, which includes difficulty falling asleep, waking up in the middle of the night, and early morning wakening.2 The prevalence and severity of disordered sleep is shown to be significantly increased among individuals with ADHD and comorbid psychiatric disorders.5 Furthermore, patients with disordered sleep show higher severity of ADHD symptoms and subsequent comorbidities.6 Thus, it is hypothesized that associations between ADHD and comorbid disorders may be driven by disordered sleep. This symposium aims to examine the crucial role of disordered sleep in the etiology and symptom progression of ADHD and comorbid disorders, while highlighting important theoretical and clinical implications on treatment outcomes. Data in support of the complex interaction between sleep and treatment of ADHD will be discussed.
Methods: This symposium will review the current body of literature regarding the etiology of ADHD and comorbid disorders in relation to disordered sleep, including the presentation of preliminary data regarding the impact of the sleep medication targeting the orexin system on improvements in sleep, reward processing, and ADHD symptoms. This symposium will also examine the relationship between ADHD severity and the development of comorbidities via the aggravation of continuous disordered sleep. Preliminary data will be discussed regarding the use of Lemborexant treatment among those with insomnia and ADHD to assess for symptom severity across both psychiatric disorders. The presentation will then expand on how such understandings can inform more precise pharmacotherapeutic and psychotherapeutic treatments in individuals with ADHD in order to yield optimized treatment outcomes.
Results: Results from case studies, large-scale databases in the literature, and real-world examples will be presented. Additionally, preliminary data analyses will be presented to demonstrate efficacy of pharmacotherapeutic treatment of insomnia on the severity of ADHD symptoms.
Conclusions: The audience will have learned about the impact of disordered sleep on ADHD and comorbid psychological disorders. More specifically, the aggravation of ADHD and comorbidities may be explained through disordered or disturbed sleep. Additionally, future directions for treatments of ADHD and subsequent comorbidities will be discussed, acknowledging the effect of sleep disturbances.

12.3 NEUROBIOLOGY OF ADHD AND SLEEP

Martin Katzman, START Clinic for Mood and Anxiety Disorders

Hypothesis/Objective: Attention-deficit/hyperactivity disorder (ADHD) is a common neuropsychiatric disorder that is highly comorbid with sleep disorders which can induce significant functional and behavioral impairment. Sleep is a complex, behavioral state with profound effects on physical and mental health, psychosocial functioning, and neurocognitive

performance which also impacts ADHD symptom severity.3 The intricate, reciprocal relationship between ADHD and sleep disorders reflects the neurochemical and anatomical similarities underlying these disorders.
The physiological role of the orexin system is to promote arousal and regulate motivation and reward seeking behaviors. Dysregulated orexin signaling has been associated with symptoms of ADHD and sleep disorders. Melatonin is a regulatory hormone involved in sleep and circadian rhythms, with abnormal secretion and regulation reported in patients with ADHD. Individuals with ADHD display higher or delayed melatonin levels compared to healthy controls, leading to delayed and dysregulated sleep. Sleep disorders, such as narcolepsy and insomnia, are hypothesized to promote inattention, poor executive function, and aberrant impulse control through dysregulation of dopamine, noradrenergic, and cholinergic modulation. Overall, an imbalance of excitatory neurotransmitters, including acetylcholine, histamine, dopamine, glutamate, norepinephrine, and serotonin, inhibitory neurotransmitters, such as GABA, as well as changes in melatonin and orexin levels are implicated in sleep disorders and ADHD.

This presentation aims to provide an understanding of the multifaceted relationship and neurobiological interaction between sleep regulation and ADHD. This symposium will explore neurobiological processes associated with ADHD and disorders of sleep, emphasizing the relationship between ADHD and sleep disturbances while informing both pharmacological and non-pharmacological treatment of ADHD.

Methods: This symposium will review the state of the literature regarding the neurobiological mechanisms underlying sleep regulation and how these processes may be altered in ADHD. Sleep disorders have been shown to elevate the risk of negative health outcomes, including diabetes, obesity, high blood pressure, and suicide; therefore, understanding the orexin system, brain processes, and neurotransmitters involved in ADHD and sleep disorders may be critical to consider when managing and treating ADHD.
Results: Results from case studies and large-scale databases in the literature and real-world examples will be presented.
Conclusions: The audience will be given an overview of the neurobiological processes, systems, and neurotransmitters that drive the association between disorders of sleep and ADHD. The presentation will provide a conceptual model that will allow the audience to explore the underlying mechanisms of sleep disorders in ADHD while expanding the current understanding of approaches used for the diagnosis and treatment of individuals with ADHD.
Discussant: Atul Khullar, Northern Alberta Sleep Clinic

13. SCHOOL INTERVENTIONS IN DIGITAL ERA
9:15 A.M. - 10:45 A.M.

Chair: John Mitchell, Duke University Medical Center
Presenters:
Paulo Graziano, Florida International University
Joshua Langberg, Rutgers University
Julie Owens, Ohio University

Overall Abstract: Interventions that target academic functioning for youth with ADHD are crucial given that ADHD is a risk factor for academic underachievement. In the past few years, school interventions have increasingly been created or adapted for digital administration. This symposium will address this important topic with a series of talks that include cutting edge

examples of school interventions in the digital era. Dr. Langberg will present on behavioral therapeutic principles underlying an intervention targeting academic behavior for students with ADHD—Homework, Organization, and Planning Skills (HOPS)—as a case example of how to adapt evidence-based ADHD interventions in the digital era, as well as the use of virtual reality that can help students with ADHD. Dr. Owens will present on trials examining the Daily Report Card Online (DRCO) program, including teacher and student outcomes. Dr. Graziano will present on a treatment that integrates Parent-Child Interaction Therapy (PCIT) with academic school readiness skills administered online for parents of 2- to 6-year-olds called the School Readiness Parent Program. Overall, these presentations will provide the latest empirical evidence of behavioral interventions being administered digitally targeting academic behaviors to guide clinical care for youth with ADHD.

Learning Objective 1: To describe digitized interventions that target academic behavior among youth with ADHD.

Learning Objective 2: To learn about the empirical status of the latest digital interventions targeting academic behavior among youth with ADHD.

13.1 BEHAVIORAL PARENT TRAINING IN THE DIGITAL ERA: EXAMINING THE SCHOOL READINESS PARENTING PROGRAM

Paulo Graziano, Florida International University

Hypothesis/Objective: To gain knowledge related to the feasibility and initial promise of administering a behavioral parent training program via telehealth for parents of preschoolers with disruptive behavior problems.

Methods: Data were collected for 64 children ages 2-6 years (Mage = 4.63, SD = 0.86; 78.1% Hispanic/Latinx) and their families, who received either in-person administration of time-limited Parent-Child Interaction Therapy (PCIT-TL; n=30) or online administration of the School Readiness Parenting Program (SRPP; n=34). SRPP is an adaptation of PCIT which integrates traditional PCIT skills with academic school readiness skills. Originally designed as a group-based adaptation of PCIT, SRPP was validated in a group-based delivery format by Graziano and colleagues (2014). For the purposes of this study, SRPP was delivered in an individual format via a telemedicine platform. Parents attended eight sessions of SRPP, with sessions varying in length from 1.5 to 2 hours. Each session was broken into two components. The first half of each session focused on traditional behavior management strategies (e.g., improving the parent-child relationship, use of reinforcement, time-out). Behavioral management content was based on PCIT with four sessions (one teach and three coach sessions) focused on CDI skills and another four sessions (one teach and three coach sessions) focused on PDI skills. During the second half of each SRPP session, parents participated in discussions on several school readiness topics, including how to appropriately manage behavior problems during homework time and in public settings, how to promote children's social-emotional functioning, how to promote early literacy and math skills, dialogic reading, how to implement a home-school communication plan with teachers (i.e., daily report card), and how to prepare their child for kindergarten.

Clinicians and trained staff administered an assessment protocol that lasted approximately 2 hours and included: (a) a biopsychosocial interview of parents that gathered relevant background information on the child and family, (b) questionnaires on children's externalizing behavior problems and symptomology, (c) questionnaires on parenting stress, and (d) videotaped observations of three 5-minute standard parent-child interaction situations that varied in the degree of parental control expected (child-led play, parent-led play, and clean-up). Families completed a similar post-intervention assessment upon completion of intervention (i.e., 8–10 sessions)

Results: A series of repeated measures ANOVAS were conducted to examine within and between group effects. Results revealed that both SRPP and PCIT-TL significantly reduced inattention (d's = -0.54 to -0.88), aggression (d's = -0.55 to -1.06), and behavioral symptomology (d's = -0.55 to -0.85) and produced significant gains in parental skills (d's = -1.47 to 2.99).
Conclusions: The present study demonstrates the benefits of a telemedicine administration of a time-limited integrative intervention program for not only reducing externalizing behaviors but also teaching parenting strategies. The comparable effects of online SRPP, as compared to a gold-standard in-person administration of PCIT-TL, offer preliminary support for the use of SRPP by practitioners seeing families with behavioral concerns.

13.2 ADAPTING EVIDENCE-BASED ADHD INTERVENTIONS FOR THE DIGITAL AREA

Joshua Langberg, Rutgers University

Hypothesis/Objective: Attendees will learn how a comprehensive understanding of the behavioral therapeutic principles underlying most ADHD interventions can inform digital adaptations and how technology can help families better adhere to behavioral principles.
Methods: A case example will be presented highlighting digital adaptations made to the Homework, Organization, and Planning Skills (HOPS) intervention. In addition, pilot data from a study of 27 college students with ADHD using virtual reality to study and complete work will be presented.
Results: The HOPS intervention was initially developed at a time when few students used computers in schools and most homework and studying was completed using paper and pencil. Specific examples will be provided to show how the HOPS intervention was adapted for a digital world and can be used flexibly by understanding the behavioral principles that underlie the intervention. Pilot data will also be presented showing that virtual reality headsets have significant potential for helping students with ADHD stay focused and motivated when completing schoolwork and completing tests.
Conclusions By understanding the principles of behavior therapy, interventions can be easily adapted for a digital world. The core components of all behavioral interventions are to specifically and clearly define what we want to see, set realistic and achievable goals, create a system of highly consistent and frequent monitoring, and create a system of rewards and consequences tied to goal achievement. These principles can be applied to changing any behavior. However, these principles are difficult to implement, and many families/schools find that it is not feasible to consistently and frequently monitor behavior. Technology can help clinicians support families in more closely adhering to behavioral principles. Understanding behavioral principles also allows clinicians to adapt existing ADHD interventions to better meet the needs of families and youth.

13.3 THE DAILY REPORT CARD ONLINE PROGRAM: EFFECTIVENESS, UTILITY, AND LESSONS LEARNED

Julie Owens, Ohio University

Hypothesis/Objective: The presenter will (a) describe the evolution of and rationale for critical features on the Daily Report Card Online (DRCO) program, (c) share evidence supporting the utility of the DRCO with regard to teacher adoption and implementation and student outcomes, and (d) highlight lessons learned to inform future iterations of similar education technology platforms.

Methods: Data presented will come from multiple published studies of the DRCO (Mixon et al., 2019; Owens et al., 2019; Owens et al., 2021), as well as emerging data from our current trials. Dr. Owens will present data on teacher adoption rates, teacher use of various platform features, implementation data, and student outcomes (changes in target behaviors, changes in teacher-rated behavior problems and academic impairment).
Results: Collectively our first two evaluations (N=33; N=54) revealed that a substantial portion of teachers (ranging from 39% to 52%) could use the DRCO program to adopt and implement a DRC intervention for at least 8 weeks with minimal supports from behavioral consultants and observe changes in teacher-rated student behavior (Cohen's d effect sizes ranged from .22 to .67). We identified characteristics distinguishing short-term (less than 1 month) and long-term (≥1 month) implementers, such as knowledge of behavioral principles and stress (i.e., barriers to implementation), which informed upgrades to DRCO. Website analytics showed that most long-term implementers completed the DRC development process in less than 1 hour and spent 2.46 minutes/day (SD = 2.24) on data entry. Using data from our most recent trial (N=65), Dr. Owens will describe benchmarks for student success and the relationship between teacher implementation and various student outcomes. Platform use metrics will also be used to highlight the evolution of and rationale for critical features on the DRCO.
Conclusions This body of evidence (a) suggests that DRCO helps teachers overcome barriers to using a DRC to produce change in child behavior with minimal support from others, (b) offers benchmarks for student success and teacher implementation for making data-driven decisions in practice settings;(c) highlights critical website features for enhancing teacher adoption and high-quality implementation, and (d) highlights important areas for future research.

14. IMPACT OF CANNABIS ON ADHD AND COMORBID CONDITIONS
9:15 A.M. - 10:45 A.M.

Chair: Frances Levin, Columbia University Irving Medical Center
Presenters:
Ryan Sultan, Columbia University
Mariely Hernandez, Columbia University Irving Medical Center
Gregory Mattingly, Midwest Research Group
Holly Boyle, Brown University Center for Alcohol and Addiction Studies

Overall Abstract: This symposium will present recent research findings and clinical implications for cannabis use in individuals with ADHD and associated comorbidities.
Learning Objective 1: Explore the self-perceived benefit verses actual impact of cannabis use in individuals with ADHD.
Learning Objective 2: Understand recent research findings on the impact of cannabis use and it's impact on ADHD symptoms and the relative risk of developing secondary comorbidities such as depression, bipolar disorder and psychotic disorders.
Learning Objective 3 Explore the impact of cannabis use among 174,797 8th, 10th, and 12th grade students with and without ADHD and cannabis use.

14.1 IMPACT OF CANNABIS ON ADHD AND COMORBID CONDITIONS
Ryan Sultan, Columbia University Department of Psychiatry

Hypothesis/Objective: Adolescence is a critical period for development while the brain is susceptible to exogenous substances. Cannabis use is increasingly viewed by adolescents as not harmful. Effects of cannabis are heightened in adolescents with ADHD due to delayed brain

maturation. Past research has linked cannabis use to adverse biopsychosocial events among adolescents. However, data on dose effects are limited.
Methods: Analysis included 8th, 10th, and 12th grade students (N=174,797) from the 2017-2021 Monitoring The Future (MTF) study. Sociodemographic factors were evaluated. Cannabis use was stratified into 5 distinct groups: Nonuse, Noncurrent, Monthly, Weekly, and Near Daily Use. Odds Ratios (OR) and adjusted Odds Ratios (aOR) were computed using logistic regression with Nonuse as reference. Cohen's d effect sizes were calculated for frequency of cannabis use on adverse biopsychosocial events.
Results: Among adolescents reporting cannabis use frequency, 7438 (4.3%) were Near Daily, 6159 (3.5%) were Weekly, 8407 (4.8%) were Monthly, 22129 (12.7%) were Noncurrent, and 130664 (74.8) were Nonusers. Adjusted odds of no college plans, truancy, low GPA, no extracurricular activities, serious fighting, danger seeking, suicidal, low self-image, and depressive followed an upward stepwise gradient trend. For events of no good friends, prefer risk seeking friends, and anxious, the upward trend was less in comparative magnitude. Finally, lack of social outings followed a downward stepwise gradient trend. Effect sizes for lowered academic performance and greater impulsivity and aggression categories ranged from medium to large (d=0.44 to 1.23; d=0.46 to 0.93, respectively). Effect sizes for worsened mental health ranged from small to medium (d=0.32 to 0.49). Effect sizes for lesser social engagement ranged from none to small for lesser social engagement (d=-0.02 to -0.18).
Conclusions: There is a clear association between frequency of cannabis use and adverse biopsychosocial events across adolescent academics, social, behavioral, and mental health. More longitudinal and mechanistic studies are needed to establish causality and to further explore the biological and social mechanisms underlying these associations. In the context of growing US acceptance of cannabis, clinicians should be vigilant to screen, evaluate, and treat cannabis use in adolescents.

14.2 ATTENTION-DEFICIT HYPERACTIVITY DISORDER AND THERAPEUTIC CANNABIS USE MOTIVESA

Mariely Hernandez, Columbia University Irving Medical Center

Hypothesis/Objective: ADHD is a known risk factor for substance use problems. Widespread decriminalization of cannabis in the United States has led to increased use and lower perceptions of harm, augmenting the risk for cannabis use problems, particularly in populations vulnerable to addictive disorders. Apart from relieving boredom and other hedonic effects of cannabis, studies suggest that individuals with ADHD may be using cannabis therapeutically to improve/accelerate sleep onset and/or treat physical pain. Is there data supporting the use of cannabis for therapeutic use? How should clinicians approach treating patients with ADHD and co-occurring cannabis use?
Methods: Review of relevant literature to summarize therapeutic cannabis use motives in ADHD populations and clinical research findings on the use of cannabis as a treatment of those symptoms.
Results: There is evidence that cannabis use by those with ADHD can be motivated by untreated or inadequately treated symptoms of ADHD, pain, anxiety, and sleep disturbances. The literature does not support long-term use of cannabis to treat these concerns and prolonged cannabis use can actually exacerbate these problems.
Conclusions: Practitioners should inquire about motivations for cannabis use, such as to help with sleep, anxiety, or physical pain. These symptoms may be more effectively treated by pharmacologic or behavioral interventions, which can be part of a treatment plan alongside reducing cannabis use. Psychoeducation is necessary to engage patients in adequately

addressing their symptoms/concerns. Changes in conventional medication regimens may be warranted.

14.3 CANNABIS USE, SELF PERCEPTION AND IMPACT ON COMORBID CONDITIONS

Gregory Mattingly, Midwest Research Group

Hypothesis/Objective: Individuals with cannabis use May self-perceive the impact of their use differently than actual impairment. Recent studies that measure self-perception versus at actual impairment will be reviewed along with the impact of cannabis use on the development of other comorbid mental health conditions.
Methods: Recent reviews and studies regarding these topics will be analyzed.
Results: Results from driving performance, developmental risks of comorbid conditions and concomitant impact on neural development and connectivity will be reviewed.
Conclusions: Individuals with cannabis use significantly under perceive their amount and duration of functional impairment in daily activities including while driving.
Cannabis use disorder is associated with significant increases in mental health conditions including a 2-fold increase in mood disorders and a 4-fold increase in psychotic bipolar episodes.

14.4 ACUTE EFFECTS OF CANNABIS ON COGNITIVE FUNCTIONING

Holly Boyle, Brown University Center for Alcohol and Addiction Studies

Hypothesis/Objective: Cannabis use is associated with impaired inhibitory control, a hallmark feature of attention deficit hyperactivity disorder (ADHD). Cannabis acutely impairs the capacity to inhibit already initiated responses as measured by the Stop Signal task (a behavioral task with a "go" signal to set up a prepotent response tendency and a "stop" signal for participants to withhold their response) across a range of delta-9-tetrahydrocannabinol (i.e., THC; cannabis' main psychoactive constituent) doses (e.g., 2.8% in our prior study, Metrik et al., 2012 to 13% THC in Ramaekers et al., 2009). A strong predictor of inhibitory control is working memory capacity (WMC), which has also been implicated in cannabis-related behaviors. For individuals low in WMC, cannabis may dose-dependently impair inhibition of prepotent response to a greater extent than for individuals with better WMC functioning. Thus, individuals with low WMC may be at greater risk for increased disinhibition following cannabis use.
Methods: New data from 130 non-treatment seeking adults (35% female, 46% ethnic/racial minorities, mean [sd] age = 25.7 [5.2]) who smoked cannabis at least twice weekly (averaging 86% cannabis use days in the past 60) were analyzed. Across three separate days following overnight cannabis abstinence, participants smoked a placebo, 3%, or 7% THC cannabis dose followed by the Stop Signal task administration. Prior to the experimental sessions, individuals were first tested under a baseline/no smoking condition when they completed the Stop Signal task and WMC measures including the Trail Making Test, n-back, and Complex Working Memory Span Tasks.
Results: Relative to placebo, both THC doses significantly increased subjective drug effects and physiological arousal. WMC by drug interaction effects will be tested on the Stop Signal task, with both THC doses expected to reduce the ability to inhibit prepotent response, relative to placebo, to a greater extent among individuals with lower WMC. In the absence of a significant interaction effect, we anticipate a significant main effect of WMC on the Stop Signal task such that lower WMC scores would be associated with greater disinhibition on the Stop

Signal task. In our prior study, THC's acute effect on the Stop Signal task was of small magnitude; therefore, we anticipate a similar effect in the present study.
Conclusions: Findings will determine whether the acute effect of THC on inhibitory control is influenced by individual variability in WMC. Understanding whether individuals with working memory deficits are at increased risk of cognitive impairment from cannabis use may inform targeted prevention and intervention efforts. Furthermore, working memory plays a central role in adaptive decision making, with WMC deficits associated with a range of externalizing psychopathology, including ADHD. The current study may inform future research examining cannabis' effects among those with an ADHD diagnosis.

PLENARY SESSION III: STIMULANT TREATMENT, MISUSE, AND RISK OF OTHER HARMFUL SUBSTANCE USE: LATEST FINDINGS AND CLINICAL IMPLICATIONS

11:00 A.M. - 12:30 P.M.

15. STIMULANT TREATMENT, MISUSE, AND RISK OF OTHER HARMFUL SUBSTANCE USE: LATEST FINDINGS AND CLINICAL IMPLICATIONS

Chair: Brooke Molina, University of Pittsburgh
Presenters:
Brooke Molina, University of Pittsburgh
Timothy Wilens, Massachusetts General Hospital
Discussant: Frances Levin, Columbia University Irving Medical Center
Discussant: Marta Sokolowska, FDA/CDER/Office of the Center Director

Overall Abstract: There is sustained interest among patients, clinicians, and researchers in the extent to which stimulant treatment for ADHD increases risk of later harmful substance use. Studies have accumulated to address this question in recent decades, but variations in study designs and rigor have left gaps in understanding. In this symposium, Drs. Brooke Molina and Sean McCabe will present recently published findings from two complementary studies using novel methods to close these gaps. Discussants Frances Levin, MD, Professor of Psychiatry at Columbia University and an expert in substance use disorder and ADHD treatment, and Marta Sokalowska, PhD, Deputy Center Director for Substance Use and Behavioral Health at the FDA, will provide commentary. Dr. Molina will present recently published findings from the longitudinal follow-up of the children in the Multimodal Treatment Study of Children with ADHD. Followed from a mean age of 8.5, the children from this multisite study, n=579 (and their parents) were repeatedly assessed to a mean age of 25. Over the course of these interviews, children were comprehensively assessed across a wide range of demographic, symptom, and functioning domains including substance use and treatment for ADHD. Two sets of statistical models of associations between stimulant treatment and substance use, through adolescence and into adulthood, were tested. After adjusting for potentially confounding factors not able to be considered in prior research, including adjusting for developmental trends in substance use and age, no associations between stimulant treatment and substance use or substance use disorder were found. Dr. McCabe will present recently published findings based on nationally representative samples of high school students from the Monitoring the Future study. From 10,937 10th and 12th graders who received stimulant therapy for ADHD during their lifetimes, the timing of stimulant treatment initiation was related to illicit substance use in adolescence. Amongst those starting treatment by the age of 9 and experiencing treatment for six or more years, adolescent illicit substance use was not

greater than population controls. However, stimulant treatment initiation after age 9 and for less than one year was associated with cocaine and prescription stimulant misuse. Amongst 12th graders followed to age 24, no associations between prescription stimulant treatment and later cocaine or methamphetamine use were found; in contrast, non-prescribed stimulants (misuse) in adolescence predicted illicit substance use in adulthood. Collectively, these studies provide compelling evidence that prescribed ADHD treatment with stimulants in childhood is not associated with increased risk of harmful substance use later in adolescence or in early adulthood. However, in adolescence, later initiation of treatment and nonprescribed use of stimulants should signal the need for increased attention to risk management regarding the potential for harmful substance use.

Learning Objective 1: Understand the extent to which stimulant treatment for ADHD is associated with risk of later harmful substance use.

Learning Objective 2: Understand the clinical care implications of initiating stimulant treatment at different ages.

15.1 STIMULANT TREATMENT ASSOCIATIONS WITH SUBSTANCE USE THROUGH ADOLESCENCE INTO EARLY ADULTHOOD: PROSPECTIVE LONGITUDINAL FINDINGS FROM THE MTA

Brooke Molina, University of Pittsburgh

Objective: Possible associations between stimulant treatment of attention deficit/hyperactivity disorder (ADHD and risk for subsequent substance use (SU) remain debated and clinically relevant. The prospective, longitudinal assessments into early adulthood of children in the Multimodal Treatment Study of Children with ADHD (MTA) provide a unique opportunity to test this association while considering methodologic complexities (principally, multiple dynamic confounding variables).

Methods: Initiated as a 14-month randomized clinical trial of medication and behavior therapy for ADHD, the MTA transitioned to a longitudinal observational study. Multi-informant assessments included comprehensively assessed demographic, clinical (including SU), and treatment (including stimulant use) variables. This multi-site study with 6 sites in the US and one in Canada included 579 children aged 7-9 (mean=8.5) with rigorously diagnosed DSM-IV combined-type ADHD. Participants were repeatedly assessed to mean age 25. Stimulant treatment of ADHD was measured prospectively from baseline for 16 years (10 assessments) using parent followed by young adult report. Frequency of heavy drinking, marijuana use, daily cigarette smoking, and illicit drug use were confidentially self-reported with a standardized substance use questionnaire.

Results: Generalized multilevel linear models showed no evidence that current and prior stimulant treatment and their interaction were associated with SU after adjusting for developmental trends in SU and age. Marginal structural models adjusting for dynamic confounding by demographic, clinical, and familial factors revealed no evidence that more years of stimulant treatment or continuous, uninterrupted stimulant treatment predicts adulthood SU.

Conclusions: We did not find evidence that stimulant treatment increased or decreased risk for later frequent use of alcohol, marijuana, cigarette smoking, and other drugs in adolescents and young adults with childhood ADHD. These findings do not appear to result from other factors driving treatment decisions over time, and findings held even after considering opposing age-related trends in stimulant treatment and substance use. Support provided by NIDA and NIMH.

15.2 STIMULANT THERAPY FOR ADHD AND ILLICIT STIMULANT USE DURING ADOLESCENCE AND YOUNG ADULTHOOD

Timothy Wilens, Massachusetts General Hospital

Objective: To assess whether age of onset and duration of stimulant therapy for attention-deficit/hyperactivity disorder (ADHD) is associated with cocaine, methamphetamine, and prescription stimulant misuse during adolescence (age 18). To also examine the longitudinal transitions from adolescents' (age 18) prescription stimulant exposure (i.e., stimulant therapy for ADHD and prescription stimulant misuse) to later cocaine and methamphetamine use during young adulthood (ages 19-24).

Method: Nationally representative cross-sectional samples of US 10th and 12th grade students (N=150,395) from the Monitoring the Future study were surveyed via self-administered questionnaires from sixteen annual surveys (baseline cohort years 2005–2020). Next, multiple cohorts of longitudinal panels of US high school 12th grade students were assessed biennially (baseline cohort years 2005–2017) and followed across three waves over a six-year period to age 24 (follow-up years 2011–2021).

Results: An estimated 8.2% of 10th and 12th grade students received stimulant therapy for ADHD during their lifetime (n=10,937). Youth who initiated early stimulant therapy for ADHD (≤9 years old) and for long duration (≥6 years) did not have significantly increased adjusted odds of cocaine or methamphetamine use relative to population controls (i.e., non-ADHD and unmedicated ADHD youth). Youth who initiated late stimulant therapy for ADHD (≥10 years old) and for short duration (less than 1 year) had significantly higher odds of past-year cocaine or prescription stimulant misuse in adolescence than those initiating early stimulant therapy for ADHD and for long duration. Among the longitudinal sample of 12th grade students, 10.2% reported lifetime stimulant therapy for ADHD at age 18. In controlled analyses, there were no statistically significant differences between adolescents who reported stimulant therapy for ADHD at baseline (age 18) compared to those who did not use stimulant therapy for ADHD in the adjusted odds of transitioning to later cocaine or methamphetamine initiation or use during young adulthood (ages 19–24). In contrast, prescription stimulant misuse during adolescence in those not treated with stimulants for ADHD had significantly higher odds of transitioning to later cocaine or methamphetamine initiation and use during young adulthood compared to population controls. About one in three (34%) adolescents who reported prescription stimulant misuse on ten or more times by age 18 later reported cocaine or methamphetamine during young adulthood (ages 19–24).

Conclusions: An inverse relationship was found between years of stimulant therapy and illicit and prescription stimulant misuse. Adolescents with later initiation and/or shorter duration of stimulant treatment for ADHD should be monitored for potential illicit and prescription stimulant misuse. Adolescents' stimulant therapy for ADHD was not associated with increased risk of later cocaine and methamphetamine use during young adulthood. Adolescents' prescription stimulant misuse offered a strong signal for subsequent cocaine or methamphetamine use and warrants monitoring and screening.

ADHD GUIDELINES IN THE U.S. AND ABROAD

2:00 P.M. - 3:00 P.M.

16. ADHD GUIDELINES IN THE U.S. AND ABROAD

Chair: Gregory Mattingly, Midwest Research Group
Presenters:
David Coghill, University of Melbourne
Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University
Luis Rohde, Federal University of Rio Grande do Sul
Moderator: Gregory Mattingly, Midwest Research Group

Overall Abstract: International Guidelines have enabled both policy change and advocacy for individuals with ADHD.
This symposium will draw upon the demonstrated role of international guidelines for creating policy change to enhance the equitable delivery of care for individuals with ADHD. Actionable lessons learned from the Scottish Guidelines, the NICE Guidelines, the Australian Guidelines and others will be discussed. Initiatives by the World Federation, IACAPAP (International Association for Child and Adolescent Psychiatry and Allied Professions), the AADPA (Australian ADHD Professionals Association) and other international ADHD organizations to advocate the WHO and other allied organizations to include ADHD as an essential part of medicine will be reviewed.

The presidents of the of the AADPA, IACAPAP and the World Federation will take part in this meaningful plenary to discuss the role of international guidelines and affiliated ADHD organizations as a template for APSARD to improve clinical care and advocacy within the United States.

Learning Objective 1: The participant will be able to analyze the role of international guidelines in ADHD care.
Learning Objective 2: The participant will develop a greater understanding of ways to utilize guidelines to create policy change in the attempt to enable more equitable care for individuals with ADHD.

16.1 DEVELOPMENT AND IMPLEMENTATION OF EVIDENCE-BASED ADHD GUIDELINES IN THE UK AND AUSTRALIA

David Coghill, University of Melbourne

Hypothesis/Objective: This presentation will chart the development of evidence-based guidelines for ADHD in the UK and Australia and the journey from publication to implementation.
Methods: To review the theoretical underpinning of evidence-based guidelines and the differences between these and consensus driven guidelines. Using the guidelines from Scotland (SIGN: 2001, 2009), England (NICE 2006, 2008, 2018), and Australia (NHMRC 2008, 2022) and associated publications around implementation to explore the process and outcomes around development and implementation.
Results: The Scottish Intercollegiate Guidelines Network (SIGN) were one of the first groups internationally to adopt a formal approach to developing evidence-based guidelines. SIGN Guideline 52, published in 2001, was the first evidence-based guideline for ADHD. It covered assessment and treatment but only in children and young people. A national implementation review was conducted between 2006 and 2008 alongside a 'parents and service users report. The guideline was updated in 2009 and a second national review published in 2012. In England and Wales, the National Institute for Healthcare and Clinical Excellence (NICE) published a Technology Appraisal for ADHD medications in 2006 but did not complete a full clinical guideline until 2008. this comprehensive guideline also covered diagnosis and management but extended across the lifespan including children, young people and adults. This was revised

and updated in 2018. NICE also added in an implementation framework around the guideline recommendations. In Australia the first attempt to develop evidence-based guidelines in 2008 was on one lever a success and introduced an interesting question and answer approach to the process. Unfortunately, these guidelines were never approved by the governing bodies due to issues about conflicts of interest both for the guideline development group and the evidence base from which recommendations were drawn. The second attempt led by AADPA the Australian ADHD Professionals Association, took a much stricter approach to managing conflicts of interest, was endorsed by not only the NHMRC but also all of the medical colleges and professional associations. The challenge in Australia is now going to be to implement the guidelines. There are various research initiatives that will support implementation, but it is also going to require significant external funding which we will hope will come from government and philanthropy. Clearly implementation within a mixed public and private system is a different challenge to that in an almost entirely public system like the UK. Importantly both NICE and AADPA put a strong emphasis not only on an interdisciplinary GDG but also in the involvement of lived experience to the process.

Conclusions: Evidence based guidelines offer a great opportunity for improving outcomes and reducing variation in practice. The development of the guidelines is however only the beginning of the journey with the hard yards coming after publication when the focus switches to implementation.

16.2 PROFESSIONALS ENGAGING WITH A BROADER COMMUNITY: A VIEW FROM THE WORLD FEDERATION OF ADHD

Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University

Hypothesis/Objective: Professional associations have the ability (some would say obligation) to use their expertise to educate patients, advocate for their needs and impact public policy. Over the past decade the World Federation of ADHD (WFADHD) has sought to engage the broader community in several ways.

Methods: This lecture will describe the WFADHD's activities in three areas: 1) leading a group of international experts to create and publish the International Consensus Statement of ADHD; 2) advocating for the addition of methylphenidate to the World Health Organization's List of Essential Medicines for Children; 3) providing education to the public via Ask Me Anything sessions on the Reddit social media platform; and 4) bringing together professional and lay groups with a special interest in ADHD.

Results: The lecture will describe the International Consensus Statement process and main findings. It will explain why our first appeal to the World Health Organization failed and what have done and plan to do in response. I will describe results from the first series of Ask Me Anything session during ADHD Awareness month and explain current efforts to work with affiliated organizations.

Conclusions: Professional associations like APSARD and WFADHD can do much to improve the lives of those living with ADHD beyond what its members do in the clinical care and research arenas. Engaging the broader community concerned with ADHD holds much promise.

16.3 ADHD IN THE INTERNATIONAL ASSOCIATION FOR CHILD AND ADOLESCENT PSYCHIATRY AND ALLIED PROFESSIONS STRATEGIC PLAN

Luis Rohde, Federal University of Rio Grande do Sul

Hypothesis/Objective: The International Association for Child and Adolescent Psychiatry and Allied Professions (IACAPAP) has a strong commitment to advocating for the promotion of

mental health and development of children and adolescents around the world through policy, practice and research. The IACAPAP was created in 1937 and its membership is made up of more than 65 full or affiliate member associations, a huge amount of the worldwide regional or national Child and Adolescent Mental Health Associations. In addition, close to 300 individual members spread around the world, mainly from countries where these national associations do not exist, take part in IACAPAP, making it a body with extensive outreach and huge potential for a global impact.
Methods: This lecture will describe the IACAPAP activities in three areas: 1) helping Child Mind Institute (CMI) to develop the first open access, broad, culturally comprehensive instrument to assess child and adolescent mental health (CAMH) including ADHD, as part of the Stavros Niarchos Foundation CAMH Global Center; 2) working with WHO to guarantee adequate care for people with ADHD; 3) co-leading with CMI the Child and Adolescent Mental Health Clinical Fellowship Program addressed to Low-Middle Income Countries with few or no Child and Adolescent Psychiatrists (CAPs), a training program with a component on ADHD that is also part of the Stavros Niarchos Foundation CAMH Global Center.
Results: The fruitful progress in these three areas will be presented and discussed.
Conclusions: The IACAPAP activities described here reflect its commitment to further promote the mental health and development of children and adolescents globally with a vision of a world where all children grow up healthy, both emotionally and physically, realizing their full potential to contribute to their societies.

CONCURRENT SYMPOSIA

3:15 P.M. - 4:45 P.M.

17. AFTER THE COVID STORM: DARK CLOUDS AND SILVER LININGS FOR PEDIATRIC ADHD CARE

Chair: Courtney Zulauf-McCurdy, University of Washington
Presenters:
Courtney Zulauf-McCurdy, University of Washington
Douglas Russell, University of Washington / Seattle Children's
Erin Schoenfelder Gonzalez, University of Washington School of Medicine
Moderator: Mark Stein, University of Washington

Overall Abstract: Objective: COVID-19 turned service delivery for pediatric ADHD upside down, forcing many to address new challenges and adapt to public health concerns. As we begin to emerge from the pandemic, it is important to examine the impact it had on the provision of care for pediatric ADHD across service settings. This symposium will provide an update on the current state of care and provide recommendations for improving pediatric ADHD care moving forward.
Method: Courtney Zulauf-McCurdy, PhD, will present mixed method findings from an ongoing community-based partnership with preschools focused on increasing parent and teacher engagement in behavioral interventions for ADHD in preschool. Douglas Russell, MD will compare trends in ADHD-related consult requests from pediatric primary care providers to the Seattle Children’s Partnership Access Line preceding and following the public health emergency. Erin Gonzalez, PhD, will report on the successful adaptation of a telehealth stepped care behavioral treatment model for ADHD and disruptive behavior to better meet the needs of youth and their families during and after COVID.

Results: First, results of stakeholder identified barriers to and strategies for increasing parent and teacher engagement in classroom-based behavioral interventions for ADHD in preschool will be discussed. Second, we will invite discussion about how to better support primary care providers treating ADHD in their clinics. Third, we will share the impact of adopting a one-level acuity treatment model for ADHD into a stepped care model designed to tailor care to patient acuity level therefore increasing treatment capacity.

Conclusion: COVID-19 both illuminated cracks in pediatric ADHD care prior to the pandemic while creating new challenges. Together, this symposium starts a discussion around ways to enhance the treatment of pediatric ADHD and related disorders across multiple service settings following the pandemic.

Learning Objective 1: Identify and describe how COVID-19 has impacted parent and teacher engagement in school-based behavioral interventions for ADHD in preschool
Learning Objective 2: Review the impact of COVID-19 on ADHD-related consult requests from pediatric primary care providers to the Seattle Children's Partnership Access Line
Learning Objective 3 Discuss the development and implementation of a fully telehealth stepped care behavioral treatment model for ADHD and disruptive behavior to increase capacity and better serve children and families during and after the pandemic.

17.1 DISCOVERING WAYS TO IMPROVE PARENT-TEACHER ENGAGEMENT IN PRESCHOOL BEHAVIORAL INTERVENTIONS FOLLOWING COVID-19

Courtney Zulauf-McCurdy, University of Washington

Hypothesis/Objective: Symptoms of ADHD emerge as early as preschool and are highly persistent throughout childhood. Behavioral interventions can result in clinically significant improvements in ADHD symptoms when implemented in schools and when they earn the engagement of both parents and teachers. However, parents and teachers experience barriers to implementing behavioral interventions with the recommended frequency and fidelity, with these barriers further exacerbated by the COID-19 pandemic. With an eye towards intervention, this presentation focuses on exploring a malleable determinant impacting the potency and use of behavioral interventions in preschools- parent and teacher engagement.
Methods: This presentation will draw from an ongoing community-driven partnership approach to improve parent and teacher engagement in behavioral interventions for ADHD and related disorders in preschool settings. We have partnered with two early childhood education organizations in the Pacific Northwest that primarily serve low-income families of color. The current presentation will highlight mixed method data to discover a) barriers to parents and teachers engaging in school-based behavioral interventions for ADHD, and b) stakeholder-informed strategies to improve parent and teacher engagement in behavioral interventions for preschool ADHD.
Results: Data consists of interviews, focus groups, and surveys with parents of a young child with behavioral challenges and preschool teachers. Preliminary results suggest that ADHD symptoms and related behaviors have increased since the pandemic. Teachers report that behavioral challenges are a great source of stress especially when they feel like the child's parents won't be much help in supporting behavior change. Further, the pandemic has created new barriers to parent and teacher engagement (e.g., physical distancing; emotional uncertainty) as well as illuminated old ones (e.g., limited communication; conflicting demands). Overall results suggest that parents and teachers are in need of, and want, feasible strategies to improve their joint engagement in school-based behavioral interventions for ADHD symptoms.

Conclusions: Findings will be discussed with an eye towards actionable steps parents, teachers, and schools can take to decrease inequalities in the implementation of behavioral interventions for ADHD in preschool. The research highlighted has clear implications for preventative interventions for ADHD in preschool settings.

17.2 TRENDS IN ADHD-RELATED CONSULT REQUESTS TO THE PARTNERSHIP ACCESS LINE BEFORE, DURING, AND AFTER COVID

Douglas Russell, University of Washington / Seattle Children's

Hypothesis/Objective: The Partnership Access Line (PAL) is an established, well-utilized mental health telephone consultation service for pediatric primary care providers in Washington, Wyoming and Alaska. Questions related to the diagnosis and treatment of ADHD and related disorders comprise a significant portion of these consultations. PAL utilization could be considered one proxy for regional trends in ADHD recognition and care. Extending upon data originally presented at APSARD in 2022, the current presentation compares trends in ADHD-related consultations in the years preceding the COVID-19 pandemic to emerging data during and since the public health emergency.

Methods: We identified consults to PAL which included ADHD, ODD or Specific Learning Disorder (SLD) as current or possible diagnosis, comparing annual rates starting with the program's founding in 2008 and extending through 2023. For the purposes of this presentation, we will highlight the years 2020 through 2023, corresponding to COVID-19 public health emergency.

Results: From 2008 through Summer 2023, the overall annual percentage of consultations to PAL involving ADHD declined from 53.83% to 35.05%; ODD, 15.56% to 6.19%; SLD 3.57% to 1.13%. However, after a relative decline from 2020 to 2021 of 36.53% to 33.35% for ADHD, the rate has slowly increased from 34.47% in 2022, then to 35.05% in 2023. This upward trend in 2022 and 2023 was not reflected in rates of ODD and SLD-related consultation requests. Concerns and clinical examples about changing ADHD management approaches shared by primary care providers will be discussed.

Conclusions: Despite an overall downward trend in ADHD, ODD and SLD-related PAL consultations since 2008, there was a relative increase in ADHD-related consultations from 2021 to 2022, a trend that appears to have continued in 2023. This represents the first time since the program's inception that the relative percentage of ADHD-related consults has increased for two consecutive years, potentially implying increasing community need, increasing recognition, decreasing access to specialized care or a combination thereof.

17.3 TELEGROUPS FOR ALL: EXPANSION OF VIRTUAL STEPPED CARE BEHAVIORAL TREATMENT FOR CHILD ADHD AND DISRUPTIVE BEHAVIOR

Erin Schoenfelder Gonzalez, University of Washington School of Medicine

Hypothesis/Objective: To meet escalating needs during the COVID-19 pandemic for ADHD and disruptive behavior (DB) treatment in youth ages 5-18 and reduce 12-month wait times by adopting a stepped care model of telemedicine treatment to tailor services to patient acuity in an outpatient specialty clinic.

Methods: The Behavior and Attention Management (BAM) Specialty Service in Seattle Children's Hospital Outpatient Psychiatry began rapid expansion of telemedicine during the pandemic to substantially increase service capacity. In Spring 2020, the clinical team redesigned BAM from a program serving one level of behavioral acuity to a stepped care model triaging patients to appropriate care based on acuity. Telemedicine via Zoom "Telegroups" was incorporated to increase implementation capacity.

A measurement-based care (MBC) system tracks changes in ADHD and ODD symptoms (Disruptive Behavior Disorder Rating Scale), and functional impairment (Impairment Rating Scale) to "step" patients up or down in treatment intensity based on treatment response until family goals are met.

Results: Between 2020 and 2023, BAM expanded from 1 treatment acuity level and 3 programs to 5 acuity levels and 19 programs (16 "telegroups") with the following model: Level 1) Psychoeducation classes; Level 2) Standard Care: 9-week behavioral parent training (BPT; "Superparenting") in English or Spanish, 4-week classroom Daily Report Card (DRC) group, or adolescent skills training (Supporting Teen Autonomy Daily; STAND); Level 3) Step Up Care: group parent self-regulation during behavior crises or short-term individualized sessions; Level 4) High Acuity: 12-week group plus individual BMT and rapid-access DB Crisis Consultation (DBCC); Level 5) Intensive Treatment: 6-week individual BPT (3 hours/week) plus 12-week group BPT for aggression (5.5 hrs/week).
60% of new referrals were diverted from lengthy diagnostic evaluations to brief consultation visits (CVs).

In the first 8 months, new patient capacity increased from 6 to 55 CVs per month and wait times reduced to 4 months. Of 267 new families seen in CVs, 23% were referred to Level 1 classes, 66% to Level 2 BMT, 12% to the Level 2 DRC program, and 10% to Level 4 BMT. Patients entered Levels 4 and 5 primarily from the Emergency Department. Initial visit wait times were reduced to 3-5 months and treatment initiation to 2 months.

From 2019 to 2022, the program went from serving 35 families yearly in Level 2 "Superparenting" school-aged program to nearly 300 families yearly. Of caregivers who completed post-Superparenting assessments, 93% observed improved child behavior and 62% needed no additional services. Completers reported significant decreases in oppositional (p less than 0.001), inattentive, ($p = 0.04$) and impulsive ($p = 0.02$) symptoms. 135 families were treated in the first year of Level 4 and 5 programs. Families reported improved ADHD and DB symptoms and increased caregiver confidence and skill use.

Conclusions: Expansion of telegroups using a stepped care model during the pandemic increased families receiving behavioral treatment for ADHD and DB by 500%. Stepped care, which allows healthcare systems to avoid "overtreating" patients and allocate more resources to high-acuity needs, is an excellent fit for ADHD and DB behavioral treatment.

18. BLUEPRINTS IN MOTION: BEHIND THE SCENES IN DIGITAL THERAPEUTICS

3:15 P.M. - 4:45 P.M.

Chair: Gregory Mattingly, Midwest Research Group
Presenters:
Scott Kollins, Akili, Inc.
Michael Kofler, Florida State University
Rich Brancaccio, Revibe Technologies

Overall Abstract: Not long ago, the idea that a videogame could be prescribed to improve symptoms of ADHD would have been science fiction. But today, wearables, videogames, and other digital interventions are being developed that, with the help of AI, are providing personalized care, with demonstrated efficacy and superior safety profiles compared to medication treatment. While considerable progress has been made, the question remains

whether digital therapeutics (DTx) can successfully and sustainably be integrated into healthcare systems and physician workflows.
This nontraditional symposium will provide an opportunity for industry experts to answer questions about the value of digital interventions and discuss the various obstacles, from regulatory hurdles to reimbursement challenges and adoption concerns, that are faced by DTx developers. The first obstacle to be considered is regulatory clearance, including the numerous pathways this can be achieved, as well as study design options for demonstrating efficacy and safety. Next, we'll discuss the current landscape around reimbursement, an obstacle that to date has dominated the conversation around DTx. Finally, adoption, the often overlooked but arguably most critical element that will determine the fate of the field, will be addressed.

As this industry is still in its infancy, and guidelines and regulations are still being developed, this panel discussion will focus on examples from DTx trailblazers to explore the barriers and obstacles from clearance to reimbursement and adoption, sharing lessons learned, and clarifying many misconceptions that may exist. The goal is to provide a forum for education about this exciting new category of medicine through both a set of structured questions and audience participation.

Learning Objective 1: The participant shall be able to differentiate between prescription digital therapeutics vs. digital therapeutics and other terminology associated with the digital intervention space.
Learning Objective 2: The participant shall be able to explain the FDA clearance process and what is required for evidence of safety and efficacy.
Learning Objective 3 The participant shall be able to the role of third-party payors in the value-chain and road to clinician and patient adoption.
Learning Objective 4 The participant shall be able to discuss how this class of products fills important gaps/limitations in treatment.

18.1 PERSPECTIVES FROM A CHIEF MEDICAL OFFICER ON DIGITAL THERAPEUTICS FOR ADHD

Scott Kollins, Akili, Inc.

Hypothesis/Objective: The objectives of this session are to provide education and broaden understanding regarding digital therapeutics (DTx) via a question-and-answer format.
Methods: As a member of the panel, I will bring my experience as a Chief Medical Officer of two digital health companies and the strategic advisor for digital health solutions at the Duke Clinical Research Institute. No specific products will be discussed, nor will the evidence supporting the use of any particular product be shared. However, for the purposes of demonstration and as part of my contributions to the discussion, I will be drawing from my experience at Holmusk and Akili Interactive with respect to the use of real-world evidence to drive therapeutic decisions and the development of a videogame as a cognitive training device. Accordingly, this may necessitate occasional references to a product.
Results: Important topics such as accessibility, personalization, evidence of safety and efficacy, will be discussed making for an engaging conversation. I will bring the unique perspective of having been involved in the development and testing of a pediatric prescription digital therapeutic (PDT) as well as over-the-counter digital intervention for adults. I will be able to comment on all aspects of the generation of evidence that supports safety, efficacy, and quality management (software validation and verification), the steps involved in a DeNovo market authorization with the FDA, and the value of an OTC vs PDT product.

Conclusions: The session will provide a rich and wide-ranging conversation. It will conclude with my closing thoughts on DTx and PDTs and their value.

18.2 PERSPECTIVES FROM AN ACADEMIC RESEARCHER ON DIGITAL THERAPEUTICS FOR ADHD

Michael Kofler, Florida State University

Hypothesis/Objective: The objectives of this session are to provide education and broaden understanding regarding digital therapeutics (DTx) via a question-and-answer format.
Methods: As a member of the panel, I will bring my experience as an academic researcher (Associate Professor) who has leveraged grants from the National Institutes of Health (NIH) to develop and test "gamified" treatments targeting executive deficits for children with ADHD. No specific products will be discussed, nor will the evidence supporting the use of any particular product be shared. However, for the purposes of demonstration and as part of my contributions to the discussion, I will be drawing from my experience working with industry as a potential pathway to disseminating my intervention, and this will necessitate occasional references to the digital therapeutic treatment program itself.
Results: Important topics such as the costs and benefits of partnering with industry to re-develop digital interventions created in an academic setting will be discussed making for an engaging conversation. I will bring the unique perspective of a researcher who has developed and tested novel digital interventions in a traditional academic research setting and has engaged with industry as a potential solution for narrowing the "research to practice gap" and overcoming the challenges that our field faces when it comes to disseminating evidence-based practices.
Conclusions: The session will provide a rich and wide-ranging conversation. It will conclude with my closing thoughts about industry/academic partnerships and their value.

18.3 A FOUNDER'S PERSPECTIVE ON DIGITAL THERAPEUTICS FOR ADHD

Rich Brancaccio, Revibe Technologies

Hypothesis/Objective: The objectives of this session are to provide education and broaden understanding regarding digital therapeutics (DTx) via a question-and-answer format.
Methods: As a member of the panel, I will bring my experience as a Founder of a Digital Health Start-up to the discussion. No specific products will be discussed, nor will the evidence supporting the use of any particular product be shared. However, for the purposes of demonstration and as part of my contributions to the discussion, I will be drawing from my experience developing a wearable digital health intervention and this will necessitate occasional references to the product itself.
Results: Important topics such as accessibility, personalization, evidence of safety and efficacy, will be discussed making for an engaging conversation. I will bring the unique perspective of having started with an over-the-counter wearable device that is in the process of transitioning to a prescription digital therapeutic. I will be able to comment on what it means to develop both hardware and software (as a medical device), the importance of co-designing with the users and stakeholders (including youth with ADHD, their parents, teachers, as well as physicians), and the value of engaging with the FDA throughout the process.
Conclusions: The session will provide a rich and wide-ranging conversation. It will conclude with my closing thoughts on DTx and PDTs and their value.

PLENARY SESSION IV: THE NATURE, DIAGNOSIS AND TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN ADULTHOOD

5:00 P.M. - 6:30 P.M.

19. THE NATURE, DIAGNOSIS AND TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN ADULTHOOD

Chair: Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University
Presenters:
Angelika Claussen, Centers for Disease Control and Prevention
Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University
Melissa Danielson, Centers for Disease Control and Prevention
Discussant: Craig Surman, Massachusetts General Hospital / CHADD

Overall Abstract: This plenary session begins with an overview of the nature, diagnosis and treatment of ADHD in adulthood with an emphasis on diagnostic dilemmas, the relative efficacy of pharmacologic and non-pharmacologic treatments and efforts to define and improve quality care for adults with ADHD. Two presentations from the US Centers for Disease Control and Prevention will present recent nationwide data to address trends in care utilization and medication use by adults with ADHD, along with data describing gaps in ADHD services that the public health community can work to address, through identifying underserved populations, as well as through education and support for people with ADHD, their families, and their healthcare providers
Learning Objective 1: Understand the age dependent prevalence of ADHD and recent trends in the USA.
Learning Objective 2: Understand which treatments show good efficacy and tolerability for adults with ADHD.
Learning Objective 3 Understand trends in health care utilization by adult with ADHD.
Learning Objective 4 Understand gaps in health care services for adults with ADHD and how those might be filled by public health efforts.

19.1 BUILDING CAPACITY FOR PUBLIC HEALTH SURVEILLANCE OF ADHD IN ADULTS

Angelika Claussen, Centers for Disease Control and Prevention

Objective: ADHD is a public health concern. Among children, about 1 in 10 have ever been diagnosed with ADHD, and the majority will continue to experience symptoms into adulthood, with increased risk for poor mental and physical health and lower life expectancy. CDC conducts public health surveillance of ADHD in children and adolescents and is increasing public health capacity for surveillance of adults with ADHD. To capture a full picture of ADHD diagnosis and treatment and to identify gaps in services, CDC uses multiple sources of data on people with ADHD and their healthcare providers, such as surveys and healthcare claims data.
Methods: CDC is applying multiple methods of surveillance of ADHD in adults that have been used for surveillance of ADHD in children. CDC scientists analyzed currently available, deidentified healthcare claims data from the 2021 Merative (TM) MarketScan® Commercial (national convenience sample) and Medicaid Databases (from 7–12 geographically dispersed state Medicaid programs) and examined receipt of ADHD medication (any, stimulant, non-stimulant), type of outpatient provider, and outpatient care for ADHD through telemedicine for

adults ages 18+ compared to children ages 3-17 years. A fall 2023 survey will examine healthcare providers' ADHD services, knowledge, training needs, and experience with and barriers to diagnosis and treatment. We are using panel surveys in fall 2023 to examine adults' experience with ADHD diagnosis and treatment including telehealth. We are also developing items for the National Health Interview Survey, to yield estimates of self-reported ADHD diagnosis and treatment in adults.

Results: The analyses of healthcare claims data showed that for commercial data, 2.4% of enrollees, and for Medicaid data, 2.2% of enrollees were identified as receiving ADHD care; prevalence decreased with age. Compared to adults with commercial insurance, higher percentages of adults with Medicaid received ADHD care by a general medicine or nurse practitioner, and lower percentages received care by a psychiatrist or neurologist. About 1 in 10 young adults (ages 18-24 years) received ADHD care by a pediatrician. For the survey of healthcare providers, we will analyze data available by fall 2023 and present results on ADHD-related services, knowledge, training needs, and barriers by provider type. We will also report on the development of the panel survey of adults with ADHD to capture experiences with diagnosis and treatment including telehealth and potential difficulties with filling stimulant prescriptions. Further, the presentation will describe preliminary information from the item development process for the National Health Interview Survey.

Conclusions: To understand how to protect the mental and physical health of adults with ADHD, CDC is using public health data from multiple data sources, from multiple types of respondents, and using multiple types of methods. Each analysis provides insights into gaps in ADHD services that the public health community can work to address, through identifying underserved populations, as well as through education and support for people with ADHD, their families, and their healthcare providers.

19.2 THE NATURE, DIAGNOSIS AND TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN ADULTHOOD

Stephen Faraone, Norton College of Medicine at SUNY Upstate Medical University

Abstract: This presentation provides an overview of what is known attention deficit hyperactivity disorder (ADHD) in adulthood. After a brief overview of history, epidemiology, etiology and pathophysiology, the focus turns to understanding the clinical features of ADHD in adulthood including both psychiatric and somatic comorbidities, including new data about diabetes and dementia risk. The use of the Adult Self Report Scale for screening ADHD in adults will be discussed as a prelude to the diagnostic process. A discussion of diagnostic issues focusses on differences between diagnostic criteria for children and adults, other clinical features that are typically prominent in adults along with the diagnostic challenges posed by subthreshold ADHD, apparent adult-onset ADHD, and ADHD in high achieving adults. A discussion of treatment describes the efficacy and tolerability of evidence-based psychopharmacologic and non-pharmacologic treatments based on meta-analyses of many studies. Also reviewed are what is what large registry studies have taught us about the adverse effects of medications and their impact on real-world outcomes. The discussion on non-pharmacologic treatment addresses cognitive behavior, meditation-based therapy, Omega-3 fatty acid supplementation and physical exercise. Results from the US Quality Measures Initiative for adult ADHD are also discussed.

19.3 MONITORING TRENDS IN ADHD CARE UTILIZATION AND MEDICATION FILLS IN COMMERCIALLY INSURED CHILDREN & ADULTS, 2016–22

Melissa Danielson, Centers for Disease Control and Prevention

Objective: Analysis of administrative data is one approach to public health surveillance of health care utilization related to ADHD. This presentation includes data from a previously published study using the MerativeTM MarketScan® Commercial Database which described changes in the prevalence of ADHD care utilization and prescription medication fills for stimulants from 2016 to 2021. Results from additional in-progress analyses updating estimates through 2022, describing quarterly changes during 2019-2022, and expanding to include non-stimulant medications will also be presented.

Methods: The MerativeTM MarketScan® Commercial Database is a national convenience sample of deidentified health care claims data from enrollees with employer-sponsored insurance in the United States. The study indicator for receipt of ADHD care in a calendar year was having 2+ outpatient encounters with an ICD-9-CM or ICD-10-CM diagnosis code for ADHD (ICD-9-CM: 314; ICD-10-CM: F90) 7+ days apart, or 1 outpatient encounter with an ADHD diagnosis code and 2+ medication fills for ADHD medication(s) 14+ days apart; encounters/medication fills to meet the case definition could take place in the current or prior year, as long as at least one took place in the current year. We also identified enrollees with 1+ fills for stimulant ADHD medications (amphetamine and mixed amphetamine salts, dexmethylphenidate, dextroamphetamine, lisdexamfetamine, methamphetamine, and methylphenidate) and non-stimulant ADHD medications (atomoxetine and viloxazine). Initial analyses produced annual percentages of enrollees who received ADHD care as well as stimulant and non-stimulant ADHD medication use among all enrollees aged 5–64 years and by sex and age group from 2016 to 2021; additional analyses will extend the presentation of annual percentages through 2022 and examine these indicators on a quarterly basis from 2019 to 2022.

Results: Initial results showed that the percentage of enrollees aged 5¬–64 years receiving ADHD care increased 17% from 3.4% in 2016 to 4.0% in 2021, with a larger increase from 2020 to 2021 (11%) than in prior years (6% cumulative increase from 2016 to 2020). This pattern of increase was particularly notable for adolescent girls and young women (aged 15–24 years) and among all adults aged 25–49 years. Similar patterns of increase were seen for stimulant medication fills overall and by sex and age group during this time period.

Conclusions: Analyses of commercial insurance claims data identified large increases in the receipt of ADHD care and stimulant medications during the COVID-19 pandemic from 2020 to 2021 among several demographic subgroups, providing an example of the utility of administrative data for public health surveillance. These results can provide reference points for further examination of the association between treatment management and regulatory and health care delivery changes during the COVID-19 pandemic, inform current work on the development of clinical practice guidelines for the diagnosis and treatment of ADHD in adults, and provide data to help understand widespread ADHD medication shortages that began in 2022. Administrative data can also help fill current gaps in population-based epidemiology of ADHD in adults and complement future efforts to expand public health surveillance of adult ADHD.

SATURDAY, JANUARY 20, 2024

POSTER SESSION AND LUNCH: SPONSORED BY TRIS PHARMA - ALL ATTENDEES WELCOME!
12:30 P.M. - 2:00 P.M.

*Denotes Presenting Author

S1. PHYSICAL ACTIVITY AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER BEHAVIORS: LOOKING BEYOND THE MEAN

Hannah Scott*[1], Erin K. Shoulberg[1], Connie L. Tompkins[1], Alan L. Smith[2], Betsy Hoza[1]

[1]University of Vermont, [2]Utah State University

Hypothesis/Objective: There is a need to examine the relation between objective measures of physical activity (PA) and attention-deficit/hyperactivity disorder (ADHD) behaviors (e.g., hyperactivity, impulsivity, inattention) in children. Importantly, there are methodological factors to consider when examining these relations. The most widely used objective assessment of children's PA that may relate to ADHD behaviors is mean levels of activity (mean PA), typically measured with accelerometers. Importantly, higher mean PA or overactivity is a central component of hyperactivity. However, other measurements of PA, such as intra-individual variability (PA-var), may better capture other components of ADHD (e.g., impulsivity and inattention). This study examined the unique and interactive effects of mean PA and PA-var on ADHD behaviors.
Methods: One-hundred seventy-six early elementary school students (Mage = 6.83, SD = 0.96, 53% male) participating in a PA intervention study were included. Accelerometry during the intervention period, and post intervention teacher-reported ADHD behaviors were used.
Results: Results demonstrated that mean PA was positively associated and PA-var was negatively associated with teacher reported ADHD behaviors. Additionally, PA-var, but not mean PA, uniquely predicted ADHD behaviors. Specifically, lower levels of PA-var were linked with higher ADHD behaviors. There were no significant interactions between mean PA and PA-var.
Conclusions: When objectively measuring activity, researchers should look beyond mean PA and consider PA-var as an additional tool for understanding activity patterns that may be related to ADHD behaviors. Future research should continue to investigate how PA-var is related to ADHD behaviors across different settings.

S2. THE STRUCTURED CLINICAL INTERVIEW FOR ADHD RESEARCH: AUTOMATION AND VALIDATION

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Hypothesis/Objective: Administering the ADHD module of the Structured Clinical Interview for DSM-5 (SCID) is a time-consuming process for research personnel trying to confirm participants' self-reported ADHD diagnoses for their research studies. Thus, we developed an online, automated version of this assessment for use in research settings to deliver a confirmation of "ADHD" or "Healthy Control". The current study aims to explore the use and

validation of this automated version of the ADHD module of the SCID compared to the standard, interviewer-led SCID with the purpose of creating a more efficient process to confirm self-reported diagnoses of ADHD (or lack thereof) in research settings.
Methods: Two cohorts of participants were recruited (Cohort A: N= 22; Cohort B: N= 40). Cohort A first completed the standard-SCID and then completed the automated survey-SCID. Conversely, Cohort B first completed the survey-SCID and then completed the standard-SCID. We present validity Results: as confusion matrices, along with reliability measured by Cohen's Kappa coefficient. We further assessed performance of the survey-SCID by calculating the sensitivity, specificity, precision, accuracy, and reliability of the survey-SCID as a diagnostic tool.
Results: With the use of multiple cohorts and a counterbalanced survey order, we found that the survey-SCID appears to classify participants nearly identically to the standard-SCID.
Conclusions: These findings have the potential to contribute immensely to research settings, in that the use of an automated, online survey can significantly reduce the amount of time research personnel spend conducting structured clinical interviews to simply confirm ADHD diagnoses (or lack thereof) within their studies.

S3. PSYCHIATRIC AND BEHAVIORAL PREDICTORS OF LATER ADHD SYMPTOMS IN 2-4 YEAR OLDS

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Hypothesis/Objective: ADHD is often not diagnosed until school age, limiting opportunities for preventative intervention. The Research on Heterogeneity in Neurodevelopmental Disorders (RHINO) Study aims to identify early predictors of later ADHD diagnoses in young children. We examine whether parent-reported attention, activity level, and aggression in 2–4-year-olds predict DSM-5 ADHD symptoms 6-12 months later.
Methods: Caregivers of thirty-five 2.5-4-year-old children (Mean age=3.48 years; 28.6% female) completed the BASC-3 Preschool Version (BASC-3; Reynolds and Kamphaus, 2015), a broadband measure of child functioning. At 6- and 12-month follow-up (FU) assessments, parents and teachers completed the ADHD Rating Scale IV Preschool Version (McGoey et al., 2007). Linear regressions were used to estimate which baseline BASC-3 scales (Hyperactivity, Attention Problems, Aggression) best predicted subsequent parent and teacher ADHD symptom ratings.
Results: At baseline, BASC-3 Hyperactivity and Attention Problems scales were significantly correlated with one another (r=0.71, p less than 0.001) but not with the BASC-3 Aggression scale (r=0.20, p=0.26 and r=0.18, p=0.32, respectively). Hyperactivity emerged as a significant predictor of parent-reported DSM-5 ADHD symptoms up to 12 months later (B=0.66, p less than 0.01). In contrast, Attention Problems were significantly associated with teacher-reported ADHD symptoms up to 12 months later (B=0.87, p less than 0.001). Contrary to hypothesis, aggression problems did not predict DSM-5 ADHD outcomes.
Conclusions: Early hyperactive and inattentive symptoms have different predictive validity for ADHD symptoms in home and school settings and may be a valuable tool for identifying young children at risk for ADHD.

S4. ELECTROMYOGRAPHY-BASED DEVICE FOR EVALUATING ATTENTION DEFICITS AND EMOTIONAL DYSREGULATION

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[1]Geha MHC, [2]Mindtension ltd., [3]Haifa University

Hypothesis/Objective: This study presents a novel device (Mindtension1 -MT1) for evaluating inhibition and impulsive dysregulation (emotional impulsivity) measured in children with -Attention-Deficit and Hyperactivity Disorder (ADHD). Each subject in this test is exposed to highly calibrated and diverse auditory stimuli (single or paired) through headphones. The subsequent responses are measured from the orbicularis oculi muscles.
Objectives: Characterizing the responses to paired stimuli as indicators of executive function in children with ADHD and differentiating between ADHD with or without impulsive dysregulation and typically developed (TD) children (i.e., response to a single stimulus).

Methods: The study population included 111 children and adolescents (7-17 years) diagnosed with ADHD and regularly treated with stimulants and 94 age-matched TD controls. A senior psychiatrist filled a Clinical Global Impression – specifically for impulsive regulation – Severity and Improvement (CGI-IR-S, CGI-IR-I) form for each subject. We developed an algorithm using the inhibition and startle parameters and classified the patients based on their physiological data. In comparison with the clinical data.

Results: Children with ADHD demonstrated a significantly reduced startle response and impaired pre-pulse inhibition. Using our algorithm, we were able to classify patients with ADHD compared to controls with Accuracy values of 83%, Precision 84%, Sensitivity 85%, and Specificity 80%.

Conclusions: MT1 provides objective physiologic measures that may contribute to more accurately evaluating the cognitive and emotional control in children with ADHD.

S5. MEASURING ADULT ADHD: PSYCHOMETRIC PROPERTIES OF THE CONNERS ADULT ADHD RATING SCALE 2ND EDITION (CAARS™ 2)

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Hypothesis/Objective: The Conners Adult ADHD Rating Scale 2nd Edition (CAARS™ 2; Conners, Erhardt, and Sparrow, 2023) is a revision of a measure of symptoms, associated features, and functional impairment related to Attention Deficit/Hyperactivity Disorder (ADHD) in adults, aged 18 years and older, providing an update to the well-established CAARS (Conners, Erhardt, and Sparrow, 1999). To guide the appropriate interpretation and use of the CAARS 2, psychometric properties of the new measure were investigated in accordance with the Test Standards (AERA, APA, and NCME, 2014).

Methods: Data were collected from November 2018 to November 2019, and normative samples (N = 1,320 for Self-Report and N = 1,320 for Observer) were selected to match U.S. and Canadian census proportions of gender, racial/ethnic group, geographical region, and education level (EL) within 5 percentage points (Statistics Canada, 2017; United States Census Bureau, 2019), across normative age groups.

Results: Evidence for the reliability of the scores was explored via internal consistency and through a test-retest study. Validity evidence for the CAARS 2 was explored by examining the factor structure of the measure, as well as examining differences in scores between individuals with ADHD and individuals with other clinical diagnoses or no diagnosis. Fairness was

investigated statistically by considering whether scores were biased by group membership by gender, country, education level and race/ethnicity.
Conclusions: Taken together, the reliability, validity, and fairness evidence support the practical and applied use of the CAARS 2.

S6. ADHD TREATMENT RESPONSE FOLLOWING ASSESSMENT-AIDED DIAGNOSIS IN PATIENTS WITH PRIOR HISTORY OF PSYCHIATRIC TREATMENT

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Hypothesis/Objective: We hypothesized that patients reporting a previous history of psychiatric treatment at intake, who then, following a comprehensive psychometric screening-aided diagnosis process, received ADHD treatment, would demonstrate significant improvements in depression and anxiety measurements from their baseline to their most recent visit.
Methods: Deidentified records of 104 patients, with prior reported histories of psychiatric treatment, who had initiated treatment at a center between October 2022 and March 2023, were sampled. These patients had completed an average of 8.07 visits (SD 5.86) over the next 6 to 12 months, had completed comprehensive psychiatric screening, and had received treatment for ADHD following the screening. At each visit they completed a depression scale (PHQ-9) and an anxiety scale (GAD-2). Paired-sample T-Tests were used to determine if they had achieved significant reductions in symptom severity from their baseline measurements to their most recent.
Results: Paired-sample T-Tests demonstrated significant improvements in PHQ-9 scores, t (103) = 8.34, p less than 0.001, mean improvement = 4.59, SD 5.30; as well as significant improvements in GAD-2 scores, t (102) = 8.35, p less than 0.001, mean improvement = 1.41, SD 1.71. The mean initial PHQ-9 measurement was 11.05, SD = 6.14 (moderate depression range), and the mean last PHQ-9 measurement was 6.45, SD = 4.87 (below the mild depression range).
Conclusions: Patients who were non-naïve to psychiatric-treatment-in-general experienced significant reductions of depression and anxiety from treatment based on an ADHD diagnosis identified by comprehensive screening. Experimental research is needed to confirm a cause-effect relationship between data-aided treatment planning and effective treatment.

S7. SENSITIVITY TO COMPREHENSIVE TREATMENT: AN EVALUATION OF IMPROVEMENT IN ADHD SYMPTOM SEVERITY AS AN INDICATOR OF IMPROVEMENT IN DEPRESSIVE AND ANXIOUS SYMPTOM SEVERITY

Joel Young[1], Richard Powell*[1], Anna Powell[1], Lisa Welling[2], Jaime Saal[1], Margot Nash[1]

[1]The Rochester Center for Behavioral Medicine, [2]Oakland University

Hypothesis/Objective: Depressive and anxious symptoms frequently co-occur in adult patients with ADHD. We hypothesized that amongst those being treated for ADHD, measured improvement in ADHD severity would be predictive of improvements in depressive and anxious symptoms as well.
Methods: Deidentified records of 85 adult patients, initiating ADHD treatment between October 2022 and March 2023, were sampled. These patients had completed an average of 8.51

visits, SD 6.26, over the next 6 to 12 months. At each visit, patients completed anxiety, depression and ADHD severity scales (PHQ-9, GAD-2, and ASSET-BS). A two-step cluster analysis and ROC curve analysis were used to test the study hypothesis.
Results: The two-step cluster analysis identified two clusters of patients with good silhouette cohesion and separation. Cluster 1 (N = 23) averaged strong improvement from baseline in depression and anxiety (PHQ-9 Mean Change = 10.83, SD 3.04; GAD-2 Mean Change = 3.00, SD 1.24). Cluster 2 (N = 62) averaged slight improvement (PHQ-9 Mean Change = 2.08, GAD-2 Mean Change = 0.61). The ROC curve analysis found that change in measured ADHD severity was predictive of cluster membership (AUC = .727, 95% CI .603 to .852).
Conclusions: ADHD treatment may carry cross benefits in alleviating co-occurring depressive and anxious symptoms. Improving executive function may counter maladaptive depressive and anxious ways of thinking and behaving by improving patient self-efficacy and self concept. A key limitation is that experimental research is needed to support a cause-effect relationship between response to ADHD treatment and alleviation of depressive and anxious symptoms.

S8. A REAL-TIME COGNITIVE METRIC DERIVED FROM A DIGITAL THERAPEUTIC FOR INATTENTION PREDICTS ADHD-RELATED CLINICAL OUTCOMES: REPLICATION ACROSS THREE INDEPENDENT TRIALS OF AKL-T01

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[1]Akili Interactive Labs

Hypothesis/Objective: AKL-T01 is a digital therapeutic (DTx) that targets attention by generating cognitive processing interference at dynamically updated difficulty levels during a multitasking game (navigating a ship while tapping targets), enhancing frontoparietal network efficiency. Clinical trials of AKL-T01 support its efficacy in attention-deficit/hyperactivity disorder (ADHD), but there is a need to understand how game data can be used to monitor patient changes in attention. We aimed to derive and clinically validate a real-time measure of attention from AKL-T01 patient game data.
Methods: We analyzed data from two 4-week trials of AKL-T01 (pediatric n1=180; M age=9.7; 31% female; adolescent n2=162; M age=14.4; 41% female), and one 6-week trial in adults (n3=221; M age=39.9; 70% female). An attentional metric was derived from targeting response speed, targeting accuracy (d-prime), and navigation skill level. We regressed changes in the Test of Variables of Attention (TOVA)-Attention Comparison Score (ACS) on attentional metric change, controlling for TOVA-ACS baseline, attentional metric baseline, age, and sex. Additional clinical outcomes were explored.
Results: Increases in the attentional metric predicted increases in TOVA-ACS across adult (β=.16, p less than .001), adolescent (β=.09, p=.007), and pediatric (β=.06, p=.014) trials. Attentional metric changes additionally related to quality of life in adults and clinician-rated ADHD symptoms in adolescents.
Conclusions: Findings support the clinical validity of a real-time measure of attention derived from AKL-T01 game data, underscoring the potential for DTx to use patient-device interaction data for in-vivo monitoring of cognitive changes.

S9. SEX DIFFERENCES IN ATTENTION IMPROVEMENTS ACROSS TWO CLINICAL TRIALS OF AKL-T01, A NOVEL DIGITAL THERAPEUTIC FOR INATTENTIVE SYMPTOMS IN CHILDREN AND ADOLESCENTS WITH ADHD

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Hypothesis/Objective: Attention-deficit/hyperactivity disorder (ADHD) remains underdiagnosed and undertreated in girls. One contributor is the predominance of inattentive symptoms, which are less "visible" but drive impairment. AKL-T01 is an FDA-authorized digital therapeutic directly targeting inattention. This analysis sought to examine potential sex differences in AKL-T01 efficacy.
Methods: We conducted secondary data analysis from two 4-week clinical trials of AKL-T01 (n1 = 180 children; 30.6% female, M age = 9.7; n2 = 146 adolescents; 41.1% female, M age = 14.3). Outcomes included the Test of Variables of Attention-Attention Comparison Score (TOVA-ACS) and sub-metrics, and symptoms on clinician-rated ADHD Rating Scale (ADHD-RS). To evaluate sex differences in treatment response, we conducted a series of t-tests of TOVA and ADHD-RS change scores by sex.
Results: Girls using AKL-T01 demonstrated significantly greater improvements in attention on TOVA-ACS (MΔ = 2.44) compared to boys (MΔ = 1.32; t[211.77]) = 2.62, d = .31, p = .009), as well as TOVA reaction time (girls' MΔ = 13.22; boys' MΔ = 3.54; t[229.12] = 3.93, d = .46, p less than .001). We did not observe sex differences in the two other TOVA sub-metrics, nor ADHD-RS (ps greater than .05). Girls had higher compliance, completing more sessions on average (M = 90.22) compared to boys (M = 80.19; t [207.99] = 2.17, d = .26, p = .031).
Conclusions: AKL-T01 may be associated with particular improvements to attentional functioning in girls. That there were no significant sex differences in ADHD symptom change with AKL-T01 underscores the specificity of effects to inattention rather than broad ADHD symptoms.

S10. ESTABLISHING A PROSPECTIVE PRODUCT REGISTRY TO EVALUATE THE REAL-WORLD EFFICACY OF AKL-T01, A DIGITAL THERAPEUTIC FOR TREATING INATTENTION IN ADHD

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Hypothesis/Objective: Registries enhance our understanding of the utility and efficacy of digital therapeutics (DTx) in the real world, beyond the tight controls of a clinical trial. We describe the establishment of a prospective, observational product registry for AKL-T01 (EndeavorRx®), an FDA-authorized DTx with demonstrated efficacy in treating inattention in children with attention-deficit/hyperactivity disorder (ADHD).
Methods: Caregivers of children prescribed EndeavorRx® completed a baseline survey with demographics and ADHD treatment data. In subsequent monthly surveys, caregivers completed the Conners ADHD scale, as well as measures of concurrent treatment and intent to refill EndeavorRx®.
Results: At time of analysis, evaluable data were available for 42 participants, and 36 completed the baseline survey (M age = 9.1 years; 13.9% female). Most children were diagnosed with ADHD-combined type (54.3%) and prescribed EndeavorRx by a pediatrician (30.6%). While 55.6% were taking medication, 22.2% were not receiving treatment beyond EndeavorRx. After three months, 28.6% reported intent to refill; the primary reason for not refilling was "not sure it is working." Average Conners ADHD index T-scores decreased from

88.5 (SD = 4.5, N=33) at baseline to 69.3 (SD = 19.0, N=18) at month 3. Compliance in the first month was 80.3%.
Conclusions: While initial trends in ADHD symptom reductions are favorable, it will be important to formally analyze the real-world impact of EndeavorRx as the registry sample grows. Findings highlight that an important challenge for caregivers is how to know a DTx is working, pointing to the potential utility of in-app progress monitoring.

S11. SINGLE ADHD TARGET SYMPTOM AS A PROXY FOR SYMPTOM DOMAIN IMPROVEMENT IN A MOBILE-HEALTH INTERVENTION

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Hypothesis/Objective: The merits of targeting specific symptoms in ADHD interventions are unclear. The present study aims to determine if the severity of a symptom self-selected as problematic to be worked on in an ADHD symptom-tracking smartphone intervention positively correlate with the severity of other symptoms within the same domain: hyperactive/impulsive or inattentive.
Methods: Seventy-two 18–21-year-old participants (66.7% women, 23.6% men, 9.7% nonbinary/genderfluid/transgender) in the START-Smart study who were not enrolled in high school and had an ADHD diagnosis were included. Participants and collateral reporters assessed ADHD symptoms with clinicians at baseline and follow-up after a smartphone-based intervention which involved daily surveys and feedback on chosen ADHD symptoms over three weeks.
Results: Multiple linear regression tested if changes in target symptom scores predicted average change in other symptom scores within the same domain, adjusting for sex, gender, age, student status, and treatment. Results: of the regression indicated that the model explained 19.73% of the variance in change in symptom domain (R2 = 0.1973, F (8,60) = 1.843, p less than 0.05). There was a marginally significant relation between change in target symptom and change in symptom domain (B = 0.1219; 95% CI [-0.0071, 0.2508], p = 0.06). Student status was a significant predictor such that nonstudents improved in ADHD symptom domain more than those enrolled in college or university.
Conclusions: Though further research should test for correlations between other symptoms and their domains, marginally significant Results: supporting our hypothesis suggest that focusing mobile-health ADHD interventions on self-selected symptoms may help alleviate overall symptom burden.

S12. PILOT EVALUATION OF A FOUR-SESSION CRISIS BEHAVIORAL PARENT TRAINING INTERVENTION FOR HIGH ACUITY DISRUPTIVE BEHAVIORS AND ADHD SYMPTOMS

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Hypothesis/Objective: Severe disruptive behavior (DB) is common in children with ADHD, accounts for approximately half of psychiatric emergency visits in pediatric populations, and is insufficiently addressed with extant evidence-based outpatient interventions. This study evaluates a Disruptive Behavior Crisis Clinic (DBCC) parent training intervention for high-

acuity DBs within a stepped care model, which aims to increase accessibility to evidence-based treatment and divert families from emergency and inpatient care.
Methods: DBCC is a rapid-access, four-week, individually-delivered crisis intervention for caregivers of children ages 5-12 demonstrating high-acuity DB, including physical aggression, property destruction, elopement, and verbal threats toward self/others. DBCC skills target caregiver self-regulation and behavior management. From May 2021 to August 2023, 97 families completed all prescribed sessions. Standardized ratings of parenting behaviors, caregiver strain, program skill use, ADHD and DB symptoms, and functional impairment were collected at baseline and post-treatment.
Results: From pre- to post-treatment, caregivers reported significant decreases in the frequency, intensity, and duration of severe DB episodes and in their use of physical restraint/punishment to manage DB (d=0.42-0.80). Caregivers also reported significant reductions in their use of inconsistent discipline (d=1.99); their overall strain related to parenting (d=1.06); children's oppositional/defiant, inattentive, and hyperactive/impulsive symptoms (d=0.48-0.89); and overall impairment (d=0.92). Caregivers reported using specific skills taught in DBCC during 64-77% of DB episodes on average and indicated moderate to high satisfaction with DBCC.
Conclusions: DBCC is associated with caregiver satisfaction and improvement in several caregiver and child outcomes. A future controlled trial can evaluate program outcomes and service utilization after the program.

S13. SUBSTANCE USE MOTIVES AND PATTERNS IN PEOPLE WITH AND WITHOUT ADHD

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Hypothesis/Objective: Address a key gap in understanding motivations and substance use patterns in individuals with ADHD compared to controls.
Methods: 404 participants aged 18-65 were recruited, with 175 self-reporting ADHD. ADHD and substance use were assessed using ASRS-v1.1 and ASSIST, respectively. Additional scales included GAD-7 and an updated Substance Use Motives Measure (SUMM). Brief questionnaires on usage patterns were also administered. Data were analyzed through correlation and regression models.
Results: Findings confirm that substance use motivations and patterns differ significantly between ADHD and control groups. In the ADHD group, motives were largely linked to coping, social interaction, and performance. Unique patterns included paradoxical reactions, solitary usage, and heightened susceptibility to cues. Gender, age, and anxiety levels were not significant mediators. Treatment presence did not decrease misuse likelihood.
Conclusions: Individuals with ADHD exhibit distinct substance use motivations and patterns, aligning with the self-medication theory. Current treatments were notably ineffective in reducing substance use, especially among those with severe ADHD symptoms. A nuanced understanding of these motivations is critical for developing targeted psychotherapeutic interventions that offer healthier coping strategies for this population.

S14. A PHASE IV, DOSE OPTIMIZED, OPEN LABEL, EVALUATION OF THE EFFECT OF MULTILAYER RELEASE METHYLPHENIDATE (MLR-MPH) ON SLEEP IN CHILDREN AGED 6-12 WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Hypothesis/Objective: Attention Deficit Hyperactivity Disorder (ADHD) is the most common neurobiological condition in childhood. Sleep difficulties have a significant negative impact on the functioning of children and may mimic the symptoms of ADHD. A 2015 meta-analysis (Kindwell et al.) showed that stimulants impair sleep of children. However, some researchers have argued that stimulant medication may improve sleep (Chatoor et al, 1983 and Stein et al. 2012). MLR-MPH is a methylphenidate HCl controlled release stimulant medication indicated in the treatment of ADHD. This study will evaluate the effect of MLR-MPH on sleep, in children aged 6-12 with ADHD.
Methods: This is an 8-week, phase IV, dose optimized, open label, evaluation of the effect of MLR-MPH on sleep in children aged 6-12 with ADHD. Baseline sleep data was collected via actigraph wrist devices and daily sleep diaries, for one week prior to starting MLR-MPH. A 4-week dose optimization titration period was followed by a 2-week maintenance period and a safety follow-up period. Primary and key secondary endpoints included: change in mean sleep latency, change in total sleep time, sleep satisfaction, ADHD-RS and CGI-I/S. Safety and tolerability were also assessed. A total of forty-one participants were enrolled and thirty-four participants completed the study.
Results: The analysis of the data of this trial is ongoing at the time of this abstract submission and Results: will be presented during the conference.
Conclusions: This study will demonstrate the effect of MLR-MPH on sleep in children with ADHD using actigraphy data.

S15. CONSEQUENTIAL TRENDS IN ADHD TREATMENT: FINDINGS FROM AN ADDITUDE SURVEY OF 10K+ CAREGIVERS AND ADULT PATIENTS RE: EXPERIENCES WITH MEDICATION, CBT, SUPPLEMENTS, BRAIN TRAINING, NEW TECHNOLOGIES, MEDITATION, NUTRITION AND EXERCISE

Ann Rodgers*[1], Carole Fleck[2]

[1]WebMD, [2]ADDitude

Hypothesis/Objective: The ADHD treatment landscape is unstable, unnerving, and uncertain for patients exhausted by the months-long Adderall shortage as Vyvanse goes off patent, supply problems persist, and new interventions offer promise. Amid this tumult, ADDitude aimed to learn what symptoms are most impairing, how comorbidities impact treatment, what barriers are impeding healthcare, how caregivers and adults rate the effectiveness of various treatments, where HCPs can make the most significant impact, and why treatment plans fall apart.
Methods: The ADDitude editorial team designed an 85-question survey in Survey Monkey, and invited responses from 978,871 opt-in newsletter subscribers, 10,615 of whom answered the survey in full.
Results: In this research, we learned…58% of parents of newly diagnosed children are not turning to medication as their first-line treatment. Some highly impairing ADHD symptoms are excluded from the DSM. Three-quarters of patients have tried 2+ meds. Each major medication's reported side effects. Which supplemental therapies help the most. How the Adderall shortage continues to upend life. What patients wish they had known all along.
Conclusions: Complex ADHD is the norm, with 92% of adults and 82% of children reporting at least one additional diagnosis. Comorbidities require multimodal treatment, and more than

half of patients are complementing or replacing medication with exercise, supplements, dietary changes, CBT, parent behavior training, and/or another therapy. The most common treatments are not always rated the highest, and the first-line treatment recommended by the APA is only reaching 57% of children, while women still suffer misdiagnosis and ineffective treatment.

S16. A BRAIN-TO-COMPUTER INTERFACE PAIRED WITH A VIDEOGAME TO IMPROVE CORE SYMPTOMS OF ADHD IN CHILDREN: A REAL-WORLD PILOT STUDY

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Hypothesis/Objective: A non-pharmacological intervention using brain-to-computer interface (BCI) technology paired with a cognitive skills training videogame (Skylar's Run) was tested in a small pilot study in a real-world setting. The objective was to determine if the intervention could be successfully administered virtually in the home setting.
Methods: 22 children diagnosed with ADHD were recruited. An EEG headset that measures the child's Attention State Index in real time controls the speed of the game runner. An open label real world proof of concept pilot study was conducted in the home setting. Children who completed the pretest, posttest, and treatment within 4 months (N = 12) were included in analyses. The primary endpoint was the parent reported NICHQ Vanderbilt Assessment Scale. A paired samples t-test was used to compare the means of the pretest and posttest.
Results: Participants exhibited a mean 37.81% reduction on the Vanderbilt from pre to posttest, with 8 participants exhibiting a greater than 25% reduction (MCID). Results: pointed to a significant decrease in core symptoms of ADHD after completing Skylar's Run (M = 23.50, SD = 8.34), vs. baseline (M = 37.50, SD = 6.50), t (11) = 7.58, p less than .0001, Cohen's d = 1.87, 95% CI [0.86, 2.89].
Conclusions: The Results: in this pilot study replicated findings from previous controlled clinical trials. The study Results: highlighted the potential of home-based BCI training to improve the core symptoms of ADHD. This intervention could potentially be used as monotherapy or adjunctive therapy in a comprehensive treatment plan for ADHD in children.

S17. EVALUATING ATTNKARE-T'S EFFICACY AS AN ADHD TREATMENT: A 3T CHILD FMRI STUDY

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Hypothesis/Objective: AttnKare-T, a tablet-based therapy software designed for children with ADHD, facilitates therapeutic effects by utilizing content-based play as a training. We examined the effects of treatment content on attention, working memory, and social skills.
Methods: We conducted an fMRI experiment with 20 children aged 9-10 years, using 3T MRI to scan brain activity during content-based games designed to improve attention, working memory, and social skills, with the goal of identifying activated brain regions and their level of engagement.

Results: The fMRI scans of children engaged in AttnKare-T's content play revealed specific patterns of brain activity. During attention tasks, regions such as the anterior cingulate cortex, medial frontal gyrus and middle frontal gyrus were activated, indicating involvement in attention concentration and response selection. In tasks related to working memory, activation in areas like prefrontal cortex, hippocampus suggested engagement in sustained attention, information storage, and memory retrieval. For social skills tasks, activation in the fusiform gyrus, superior temporal gyrus and inferior parietal lobule indicated involvement in recognizing emotions, interpreting facial expressions, and processing text-based information to understand facial cues.
Conclusions: These findings suggest that the content of AttnKare-T is effective in improving attention, working memory, and social skills, which may have therapeutic benefits for children with ADHD. Future research will examine other AttnKare-T modules to assess their impact on strengthening executive function and alleviating impulsivity.

S18. A PHASE 3, DOSE OPTIMIZED AND RANDOMIZED EFFICACY AND SAFETY LABORATORY CLASSROOM STUDY IN ADULTS WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER (ADHD) USING CTX-1301 (DEXMETHYLPHENIDATE)

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Hypothesis/Objective: To evaluate the safety and efficacy of CTx-1301 (dexmethylphenidate) in adults with ADHD in a laboratory classroom setting.
Methods: This is a single-center, efficacy, and safety laboratory classroom study with CTx-1301 in adults. Safety and efficacy were assessed using the AISRS, PERMP, and CGI scales. The study had a 45-day screening period, 5-week dose-optimization phase and a 7-day double-blind, randomized phase.
Results: Twenty-one subjects completed the study. Eleven subjects received CTx-1301; 10 received placebo. Subjects randomized to their optimized dose of CTx-1301 showed improvements on PERMP scores (effect size 0.88 to 2.6; average of 1.79) compared to subjects on placebo. CTx-1301 subjects demonstrated an effect size of 1.41 at 30 minutes and 0.98 at 16 hours; corresponding to the onset and duration of effect. CGI evaluations demonstrated a statistically significant change in severity of illness for CTx-1301 (-1.1) vs placebo (0.0), (p less than 0.001). The AISRS total scores decreased during the dose optimization phase (baseline mean (32.3) visit 6 mean (15.1)). A statistically significant difference in the CTx-1301 treated subjects (-13.1) versus subjects randomized to placebo on the laboratory classroom day (randomized phase) with a p□0.001. TEAEs during the randomized period were 9% for CTx-1301 subjects and 30% for placebo subjects.
Conclusions: This study 21 patient study demonstrated a lasting PERMP treatment effect size with an average effect size of 1.79 for CTx-1301- starting at 30 minutes and for 16 hours. There was a clinically meaningful improvement in CGI-S; AISRS scores decreased. Subjects on CTx-1301 demonstrated a favorable safety profile compared to placebo.

S19. EFFICACY AND SAFETY OF ONCE-DAILY EXTENDED-RELEASE CENTANAFADINE FOR THE TREATMENT OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN ADOLESCENTS AGED 13-17 YEARS

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Hypothesis/Objective: Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders, characterized by 3 core symptoms of hyperactivity, inattentiveness, and impulsivity. ADHD can persist throughout a patient's lifetime and result in substantial personal and socioeconomic burden. Centanafadine is a noradrenaline, dopamine, serotonin triple reuptake inhibitor currently in development for the treatment of ADHD in adults, children, and adolescents. A trial to determine the efficacy and safety of once-daily extended-release centanafadine for the treatment of ADHD in adolescents was conducted.
Methods: This phase 3, multicenter, randomized, double-blind, placebo-controlled trial (NCT05257265) conducted in the USA and Canada enrolled approximately 450 eligible patients aged 13-17 years with a current diagnosis of ADHD (of any presentation) according to DSM-5 criteria (confirmed by the MINI-KID). Following a 28-day screening period, patients were randomized (1:1:1) to receive high-dose or low-dose centanafadine or placebo daily for 6 weeks. Primary and key secondary efficacy endpoints include change from baseline in ADHD Rating Scale-5 (ADHD-RS-5) symptoms total score and Clinical Global Impression of Severity (CGI-S) for ADHD, respectively, at Week 6, and were analyzed using a mixed-effect model for repeated measures. Safety and tolerability were also assessed.
Results: This trial is ongoing at the time of this abstract (estimated completion October 2023); Results: will be presented during the conference.
Conclusions: This trial is expected to confirm the efficacy and safety of centanafadine in adolescents aged 13-17 years with ADHD.

S20. EFFICACY AND SAFETY OF ONCE-DAILY EXTENDED-RELEASE CENTANAFADINE FOR THE TREATMENT OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN AGED 6-12 YEARS

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[1]Otsuka Pharmaceutical Development and Commercialization Inc., [2]Washington University School of Medicine, St. Louis, [3]Center for Pediatric Excellence, Ottawa, [4]Center for Psychiatry and Behavioral Medicine, Inc., Las Vegas

Hypothesis/Objective: Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders, characterized by 3 core symptoms of hyperactivity, inattentiveness, and impulsivity. Centanafadine is a noradrenaline, dopamine, serotonin triple reuptake inhibitor currently in development for the treatment of ADHD in adults, children, and adolescents. A trial to determine the efficacy and safety of once-daily extended-release centanafadine for ADHD treatment in children is ongoing.
Methods: This is a phase 3, multicenter, randomized, double-blind, placebo-controlled trial (NCT05428033) conducted in the USA and Canada in children aged 4-12 years with a primary diagnosis of ADHD (of any presentation) according to DSM-5 criteria, as confirmed by the MINI-KID. A total of 480 patients enrolled in Cohort 1 (ages 6-12 years). Patients were randomized (1:1:1) to receive a weight-based high-dose or low-dose centanafadine or placebo for 6 weeks. Primary and key secondary efficacy endpoints included the change from baseline

in ADHD Rating Scale-5 (ADHD-RS-5) symptoms total score and Clinical Global Impression of Severity (CGI-S) for ADHD, respectively, at Week 6, and were analyzed using a mixed-effect model for repeated measures. Safety and tolerability were also assessed.
Results: This trial is ongoing at the time of this abstract (estimated completion for Cohort 1 is October 2023); Results: will be presented during the conference.
Conclusions: This study is expected to confirm the efficacy and safety of centanafadine in children aged 6-12 years with ADHD.

S21. IMPACT OF QELBREE® (VILOXAZINE EXTENDED-RELEASE CAPSULES) ON SELF-RATED EXECUTIVE FUNCTION IN A LONG-TERM, PHASE 3, OPEN-LABEL EXTENSION TRIAL OF ADULT ADHD

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Hypothesis/Objective: Assess viloxazine ER effects on self-rated executive function in adults with ADHD during a long-term, open-label extension (OLE) trial.
Methods: Adults completing a double-blind, phase 3 trial were eligible to receive viloxazine ER in the OLE. Temporary closure due to the COVID pandemic resulted in participants being offered delayed enrollment upon trial re-opening. Viloxazine ER was initiated at 200 mg/day, titrated to 400mg, then optimized up to 600 mg/day. Executive function deficits were assessed using the Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A), with assessments at either double-blind (immediate-rollover) or OLE Baseline (delayed-rollover), at Week 4 and every 8 weeks thereafter. The trial was planned for 3 years or until commercial availability.
Results: The OLE enrolled 159 participants (133 immediate-rollover; 26 delayed-rollover), who received viloxazine ER for [mean±SD] 265±254.9 days. At their last on study visit, 35.8% and 49.1% of participants, maintained on viloxazine ER for at least 3 months (dose-optimized), were receiving viloxazine ER doses greater than 200-400 mg/day and greater than 400 mg/day, respectively. All BRIEF-A T-scores, including Global Executive Composite [GEC], Behavioral Regulation Index [BRI], Metacognitive Index [MI] showed continued improvement relative to end of the double-blind period. Respective BRIEF-A T scores for the GEC, BRI, and MI, were 70.4±10.94, 63.0±11.16, and 73.4±11.56 (mildly-significantly elevated from normal range) at Baseline (N=156/157), and 54.7±14.84, 50.7±13.29, and 57.1±15.19 (average) at Week 52 (N=50/51), representing changes of 15.1±13.84, -12.3±12.88, and 15.3±13.58.
Conclusions: Adults with ADHD maintained on viloxazine ER experienced long-term improvement in self-rated executive function measures during open-label treatment.

S22. VILOXAZINE ER (QELBREE®) EFFICACY FOR ADULT ADHD BASED ON PRIOR STIMULANT EXPOSURE

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[1]Midwest Research Group, [2]The Rochester Center for Behavioral Medicine, [3]Supernus Pharmaceuticals, Inc.

Hypothesis/Objective: To evaluate viloxazine ER response based on reported history of stimulant use.
Methods: This was a post-hoc analysis of a viloxazine ER, double-blind, flexible dose (200-600 mg/day) phase 3, registration trial in adults with ADHD. Participants were stratified based on previous use/nonuse of stimulants, as reported in medication histories. Changes in Adult ADHD Investigator Symptom Rating Scale (AISRS) scores (primary trial outcome) were analyzed for prior stimulant users vs. nonusers at Week 6/end-of study (EOS) relative to Baseline, using MMRM.
Results: Prior-stimulant-user and -nonuser groups composed 21% (n=78) and 79% (n=294), respectively, of the total 372 adults treated. Mean baseline AISRS scores, reported as [viloxazine ER; placebo], were generally similar for prior-stimulant-users [38.5 (n=35); 36.4 (n=36)] and -nonusers [38.5 (n=140); 37.9 (n=143)]. Viloxazine ER improved least-squares mean (SE) AISRS scores similarly for prior-stimulant-user and -nonuser groups [-15.8 (2.15) and -15.6 (1.09), respectively], and these changes were statistically significant relative to placebo [9.0 (2.05) and -12.4 (1.04)], but with larger treatment differences for prior-stimulant-users relative to -nonusers [-6.8 (2.92), P=0.02 and -3.2 (1.50), P=0.03], owing to differences in placebo response.
Conclusions: Prior stimulant use did not appear to influence the magnitude of viloxazine ER-associated improvement in ADHD symptoms in this post-hoc analysis of Phase 3 trial data in adults with ADHD.

S23. CENTANAFADINE SUSTAINED RELEASE IS EFFICACIOUS IN PATIENTS WITH ADULT ADHD, REGARDLESS OF THEIR TREATMENT HISTORY

Gregory Mattingly*[1], Andrew J. Cutler[2], Zhen Zhang[3], Caroline Ward[3], Jessica McDonough[3]

[1]Midwest Research Group, [2]SUNY Upstate Medical University, Neuroscience Education Institute, [3]Otsuka Pharmaceutical Development and Commercialization, Inc.

Hypothesis/Objective: To determine the efficacy of centanafadine sustained release (CTN SR) in adults with attention-deficit/hyperactivity disorder (ADHD), stratified by past treatment history.
Methods: Pooled data from 2 double-blind, multicenter, placebo-controlled trials in adults (aged 18-55 years) with DSM-5–defined ADHD were analyzed. Patients were randomized 1:1:1 to twice-daily CTN sustained release (SR) 200 mg or 400 mg total daily dose (TDD) or matching placebo. The primary endpoint was the least squares mean (LSM) change from baseline in Adult ADHD Investigator Symptom Rating Scale (AISRS) score at day 42, based on prior treatment history, analyzed using a mixed model for repeated measures.
Results: In 859 patients analyzed, LSM differences vs placebo were significant at day 42 for CTN SR groups (both, P less than 0.001). In patients with prior stimulant/nonstimulant treatment (n=542), day 42 LSM differences were significant for the CTN SR 200 mg (P=0.02) and 400 mg (P=0.008) TDD groups. In patients who had 2 prior stimulant/nonstimulant treatments (n=47), LSM differences vs placebo was significant for CTN SR 400 mg at day 42 (P=0.03). In patients with no prior stimulant/nonstimulant treatment (n=317), CTN SR 200 mg (P=0.007) and 400 mg (P=0.008) provided significant LSM differences vs placebo at day 42. In those with any past stimulant use, LSM differences vs placebo were significant at day 42 for CTN 200 mg (n=179; P=0.01) and 400 mg (n=166; P=0.006).

Conclusions: In this pooled analysis of 2 phase 3 trials in adult ADHD, CTN SR was efficacious, regardless of prior treatment history.

S24. PATIENT-REPORTED ADULT ADHD SYMPTOM IMPROVEMENTS WITH CENTANAFADINE SUSTAINED RELEASE CORRELATE WITH OBJECTIVE CLINICIAN-BASED EFFICACY MEASURES

Gregory Mattingly*[1], Andrew J. Cutler[2], Zhen Zhang[3], Caroline Ward[3], Jessica McDonough[3]

[1]Midwest Research Group, [2]SUNY Upstate Medical University, Neuroscience Education Institute, [3]Otsuka Pharmaceutical Development and Commercialization, Inc.

Hypothesis/Objective: To evaluate the relationship between the Adult ADHD Investigator Symptom Rating Scale (AISRS), an objective measure of attention-deficit/hyperactivity disorder (ADHD) symptom impact and severity, and the Adult ADHD Self-Report Scale (ASRS), a subjective measure of recent symptom frequency, after 6 weeks of centanafadine sustained release (CTN SR) treatment.
Methods: Data from adults (18-55 years) with DSM-5–defined ADHD enrolled in 2 double-blind, multicenter, placebo-controlled phase 3 trials were pooled. Patients were randomized to twice-daily CTN SR (200 mg or 400 mg total daily dose [TDD]) or placebo. Relationships between clinician-administered AISRS and patient-reported ASRS total scores at baseline and at week 6 of double-blind treatment were compared using linear regression. Outliers were identified using standardized residuals from the model and compared across baseline characteristics.
Results: Of 859 patients, 677 had paired AISRS and ASRS observations at week 6. Baseline AISRS and ASRS total scores were correlated (r=0.68) with a weak model fit (R2=0.49). At week 6, AISRS and ASRS were strongly correlated (r=0.84) with a good model fit (R2=0.71); a bivariate normal distribution described AISRS/ASRS scores at week 6, with a mean (SD) of 40.8 (15.1) for ASRS and 29.0 (12.3) for AISRS. Diagnosis in childhood, combined ADHD subtype, and predominately inattentive subtype ADHD were more common in outliers.
Conclusions: This pooled post hoc analysis of 2 phase 3 adult ADHD trials found a strong correlation between AISRS and ASRS total scores at week 6 in patients taking CTN SR, indicating that clinician-rated improvements correlated with subjective patient experiences.

S25. USING MACHINE LEARNING TO PREDICT LENGTH OF TIME ON FIRST PRESCRIBED MEDICATION IN INDIVIDUALS WITH ADHD

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Hypothesis/Objective: While a large number of studies have examined factors influencing adherence and discontinuation of treatment in children with ADHD, there are limited studies on predictors of time to treatment stabilization. In this study, we applied machine learning Methods: to analyze the length of time on first prescribed medication (and switching to a second medication), in the large, primary care electronic medical record (EMR) database from the University of Toronto Practice Based Research Network (UTOPIAN).
Methods: We identified 14,621 patients in the database that are using ADHD-specific medications, resulting in a prevalence of 3%. Using this de-identified patient dataset, we built a survival model to predict how long a patient is likely to stay on their first medication using the specific ADHD medication, the age/sex of the patient, and the use of non-ADHD

medications. We built the model on 80% of the data and tested its ability to make predictions on the remaining 20%.
Results: Predicting the length of time patients remained on their first prescribed medications using the withheld 20% of data resulted in a mean area under the curve (AUC) of 0.68. We found a non-linear effect of age, sex differences, and interactions with co-prescribed medication (particularly anti-depressants, and asthma medications) aided in making these predictions.
Conclusions: These initial Results: suggest a modest ability to predict time on first medication using individual characteristics of the patient and the type of medication prescribed.

S26. 52-WEEK OPEN-LABEL SAFETY AND TOLERABILITY OF CENTANAFADINE SUSTAINED-RELEASE TABLETS IN ADULTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

Osman Turkoglu*[1], Taisa Skubiak[1], Jessica McDonough[1], Caroline Ward[1]

[1]Otsuka Pharmaceutical Development and Commercialization, Inc.

Hypothesis/Objective: Centanafadine (CTN) is a potential first-in-class norepinephrine, dopamine, and serotonin triple reuptake inhibitor being investigated for attention-deficit/hyperactivity disorder (ADHD). In 2 pivotal phase 3 adult ADHD trials, CTN sustained release (SR) 200 and 400 mg total daily dose (TDD), administered twice daily, significantly reduced Adult ADHD Investigator Symptom Rating Scale (AISRS) total score vs placebo, with favorable safety and tolerability. Long-term effects of CTN SR 400 mg TDD are reported.
Methods: Adults meeting DSM-5 criteria for ADHD who completed a pivotal trial or enrolled de novo were eligible for this 52-week, phase 3, open-label trial (NCT03605849). Patients received twice-daily CTN SR titrated to 400 mg/d by day 8 and fixed thereafter. Long-term safety was assessed by treatment-emergent adverse events (TEAEs), laboratory tests, ECGs, Study Medication Withdrawal Questionnaire (SMWQ), and Columbia-Suicide Severity Rating Scale (C-SSRS). Exploratory efficacy measures included AISRS, Clinical Global Impression-Severity of Illness Scale (CGI-S), and ADHD Impact Module-Adult (AIM -A).
Results: Of 662 patients enrolled, 345 completed the trial, 401 (61.4%) experienced TEAEs, most commonly insomnia (8.0%), nausea (7.7%), and diarrhea and headache (7.0% each). Serious AEs occurred in 12 (1.8%) patients; none were considered CTN-related. SMWQ scores were low throughout the trials. C-SSRS defined suicidal ideation/behavior occurred in 13 (2.0%) patients. Efficacy improved across all exploratory assessments.
Conclusions: CTN SR 400 mg was safe and well tolerated, as evidenced by the low incidence of serious and nonserious TEAEs and low rate of discontinuations because of TEAEs when administered to adults with ADHD for up to 52 weeks.

S27. A THOROUGH QT TRIAL USING C-QTC TO EVALUATE THE EFFECTS OF CENTANAFADINE ON CARDIAC REPOLARIZATION

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Hypothesis/Objective: Centanafadine is a norepinephrine/dopamine/serotonin triple reuptake inhibitor in development for treatment of attention-deficit/hyperactivity disorder (ADHD). The effect of centanafadine on cardiac repolarization from a thorough QT (TQT) trial is reported.

Methods: This double-blind, placebo- and moxifloxacin-controlled, 3-period crossover tria l randomized healthy adults (18-65 years) to dosing sequences including centanafadine (800 mg supratherapeutic dose [400 mg in the morning and 5 hours later]), placebo, and moxifloxacin 400 mg; 72 hours separated each treatment period. Effects on ECG (QT interval using Fridericia correction [QTcF], PR and QRS intervals, and T- and U-wave morphology), and heart rate (HR) were assessed. C-QTc, the relationship between drug concentration and placebo-corrected QTcF change from baseline (ΔΔQTcF), was the primary endpoint.
Results: Of 30 participants enrolled, 56.7% were male; mean (SD) age was 37.6 (14.5) years. The slope (90% CI) of the C-QTc relationship for centanafadine was −0.001 (−0.003, 0.00002) msec/[ng/mL] and was not significant. The significant C-QTc slope (90% CI) for moxifloxacin (0.004 [0.002, 0.006] msec/[ng/mL]) confirmed assay sensitivity. No ΔΔQTcF ≥10 msec was observed for centanafadine at any postdose time point. No centanafadine-treated participants had QTcF increases greater than 30 msec; no relevant PR or QRS interval or HR increases occurred. Four participants had greater than 25% decreases in HR and less than 50 beats per minute. No abnormal U waves were observed; 1 participant had abnormal T-wave morphology. No serious treatment-emergent adverse events or deaths occurred.
Conclusions: In this TQT trial, centanafadine, a norepinephrine/dopamine/serotonin triple reuptake inhibitor in development for ADHD, had no clinically meaningful effect on cardiac repolarization.

S28. REAL-WORLD EFFECTIVENESS OF A WIDELY AVAILABLE DIGITAL HEALTH PROGRAM IN ADULTS WITH ADHD

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[1]Lumos Labs

Hypothesis/Objective: Lumosity is a widely used digital health program employing game-based cognitive training for improving cognition in a general audience. Prior evidence suggests that Lumosity may provide benefits relevant to adults with ADHD. Here we analyzed a large, real-world data set to examine the relationship between real-world Lumosity use and improvements in cognitive performance and subject-reported attention function in adults reporting a lifetime ADHD diagnosis.
Methods: We analyzed historical data from thousands of Lumosity users who reported a lifetime ADHD diagnosis and completed a separate battery of neurocognitive tests (the NeuroCognitive Performance Test, NCPT) and/or a survey of attention and mood in real-world settings (the Brief Attention and Mood Scale, BAMS-7). The NCPT and BAMS-7 were taken online at two timepoints. For analysis, participants were split into two groups according to their extent of Lumosity use between timepoints. Changes in NCPT and BAMS-7 scores were compared for the high-use and low-use groups.
Results: More Lumosity use led to significantly greater improvements on the NCPT composite measure (high- vs. low-use groups: Cohen's d = 0.440) and the Attention subscale of the BAMS-7 (Cohen's d = 0.524). This positive dose-response relationship held for six of eight individual NCPT subtests and three of four BAMS-7 Attention items.
Conclusions: Lumosity use was associated with improved cognitive performance and subject-reported attention function in a large, real-world cohort of adults with ADHD. Subject-reported measures closely mapped to DSM-5 inattentive symptoms of ADHD, suggesting that a digital therapeutic based on Lumosity might be used to treat ADHD symptoms.

S29. DATABASE ANALYSIS FOR THE CONCOMITANT USE OF AN IMMEDIATE-RELEASE STIMULANT WITH AN EXTENDED-RELEASE STIMULANT FOR THE TREATMENT OF ADHD

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[1]Tris Pharma

Hypothesis/Objective: Extended-release stimulants are recommended as a first-line treatment for attention-deficit/hyperactivity disorder (ADHD); however, some patients require a supplemental stimulant for breakthrough symptoms. This analysis aims to estimate concomitant use of immediate-release (IR) stimulants with an extended-release (ER) stimulant medication among various ADHD stimulant products.
Methods: An observational analysis of the IQVIA Formulary Impact Analyzer (FIA) dataset was performed. This database consisted of anonymized patient-level pharmacy claims covering greater than 60% of prescriptions dispensed from retail and specialty pharmacies in the US. To be included in the analysis, patients had to start an ER medication between August 2022 and April 2023 and have ≥1 claim for an IR medication. This analysis focused on the rate of concomitant prescribing of IR and ER medications across all groups.
Results: Approximately 1.9 million patient records met the analysis criteria. The number of patients receiving concomitant therapy with ≥1 IR medication varied by product: Adderall XR (Branded) 19%; Adderall XR (Generic) 21%; Vyvanse 9%; DYANAVEL XR Suspension 4%; DYANAVEL XR Tablet 7%. Patients on DYANAVEL XR were less frequently prescribed a concomitant IR amphetamine product than patients who began therapy with other extended-release amphetamine formulations.
Conclusions: Multiple technologies have been developed for the delivery of ADHD medications leading to the potential variability in medication effects. Because of the LiquiXR technology, DYANAVEL XR offers patients consistency throughout the day and reduced IR supplementation compared to other highly prescribed extended-release amphetamine formulations.

S30. D-AMPHETAMINE TRANSDERMAL SYSTEM (D-ATS) IN TREATMENT OF CHILDREN AND ADOLESCENTS WITH ADHD: SKAMP SCORE ANALYSIS FROM A PIVOTAL TRIAL

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Hypothesis/Objective: This analysis evaluated the efficacy of dextroamphetamine transdermal system (d-ATS) using SKAMP total score by optimized dose, gender, age group, ADHD type, and baseline ADHD severity.
Methods: In this study, patients received d-ATS 5mg/9hr, with weekly evaluation for dose increase. The optimal dose was maintained for the dose-optimization period (DOP) and used during the double-blind treatment period (DBP). Analyses of SKAMP total score by optimized dose, gender, age group, ADHD type, and baseline ADHD severity were conducted. Efficacy was assessed by difference (d-ATS vs placebo) in least-squares (LS) mean SKAMP total score and is reported as LS mean (95% confidence interval [CI]).

Results: The DOP consisted of 110 patients; the DBP, 106 patients. The difference (d-ATS vs placebo) in LS mean SKAMP total score was -5.9 (95% CI: -6.8, -5.0), with differences in attention, deportment, and quality of work sub-scores of -1.4 (95% CI: -1.7, -1.1), -1.9 (95% CI: -2.2, -1.5), and -1.3 (95% CI: -1.5, -1.0), respectively. Patients receiving d-ATS at each optimized dose demonstrated improvements vs placebo in LS mean SKAMP total score. Both male and female patients experienced improvements vs placebo in SKAMP total score. Similarly, improvements vs placebo were seen in patients with combined type ADHD and in those with predominantly inattentive type ADHD. Patients demonstrated improvement during the DBP regardless of baseline ADHD severity.
Conclusions: d-ATS was effective and generally well-tolerated in treating ADHD in children and adolescents regardless of optimized dose, gender, age group, ADHD type, or baseline ADHD severity.

S31. DEVELOPMENT OF AN INTERACTIVE PHARMACOKINETIC DOSE-DEPENDENT DURATION MODEL FOR DELAYED-RELEASE AND EXTENDED-RELEASE METHYLPHENIDATE

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Hypothesis/Objective: Delayed-release and extended-release methylphenidate (DR/ER-MPH, trade name: JORNAY PM®) is an evening-dosed formulation that provides a dose-dependent duration of effect for individuals aged ≥6 years with ADHD. With half of the bioavailable methylphenidate absorbed after peak concentration is reached, increased doses extend duration of effect into the afternoon/evening. This project aimed to develop an interactive pharmacokinetic (PK) model to demonstrate the dose-dependent duration of effect of DR/ER-MPH to healthcare providers (HCPs).
Methods: Using an established population PK model for DR/ER-MPH, a live interactive dashboard was created, in which weight and dose proportionally affect the peak of and area under the PK curve and time of evening administration alters the position of the PK curve along the x-axis. Three literature-based thresholds were applied to estimate duration of effect for those with more, average, and less sensitivity to methylphenidate. A panel of HCPs with experience titrating patients with DR/ER-MPH tested the model for usability and appropriateness of thresholds.
Results: Six HCPs tested the interactive dose-dependent duration model by each retrospectively reviewing the charts of approximately 12 patients who had undergone titration to an optimized dose. The HCPs reported that the three thresholds were appropriate to capture the durations of effect for the majority of patients, and that patients tended to follow along a given threshold as doses were up-titrated.
Conclusions: This interactive model demonstrates face validity in estimating duration of effect in patients with ADHD across ages and highlights the dose-dependent duration of effect of DR/ER-MPH through simulating treatment responses.

S32. POOLED POST HOC ANALYSIS OF PERMANENT PRODUCT MEASURE OF PERFORMANCE (PERMP) SCORES IN CHILDREN WITH ADHD TREATED WITH DR/ER-MPH FROM TWO PHASE 3 STUDIES

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[1]Ironshore Pharmaceuticals, [2]Pediatrix Neurology and Epilepsy of Florida

Hypothesis/Objective: The Permanent Product Measure of Performance (PERMP) is a validated, time-sensitive, skill-adjusted, 10-minute math test that evaluates attention in children with ADHD. Delayed-release and extended-release methylphenidate (DR/ER-MPH, trade name: JORNAY PM®) is an evening-dosed formulation that provides a dose-dependent duration of effect for individuals aged ≥6 years with ADHD. In Study HLD200-106 (NCT02255513) and HLD200-107 (NCT02493777), two Phase 3 trials of children (6–12 years) with ADHD, DR/ER-MPH significantly improved mean PERMP combined scores (PERMP-CS) versus placebo across the classroom day. The aim of this study was to conduct a post hoc pooled analysis of PERMP attempted scores (PERMP-A), PERMP completed scores (PERMP-C), and PERMP-CS at individual timepoints using data from the two trials.
Methods: PERMP was analyzed at 8 AM to 8 PM timepoints during the classroom day in the intention-to-treat populations. The fixed-effects model included PERMP score as the dependent variable; treatment, study center, timepoint, and timepoint-by-treatment interaction were included as main effects. Subjects' intercepts were included as a random effect.
Results: Baseline demographics and clinical characteristics were similar between placebo (n=74) and DR/ER-MPH (n=86) groups. PERMP-A, PERMP-C and PERMP-CS significantly improved at all timepoints analyzed with DR/ER-MPH compared to placebo ($P \leq 0.01$). Significance at the 8 AM timepoint demonstrated that participants in the DR/ER-MPH group were effectively treated prior to the start of the classroom day.
Conclusions: In a pooled post hoc analysis, DR/ER-MPH significantly improved mean PERMP-CS from 8 AM to 8 PM versus placebo, demonstrating consistent improvement in effortful classroom performance from morning until evening.

S33. ADVERSE EVENTS DURING DOSING OF DELAYED-RELEASE/EXTENDED-RELEASE METHYLPHENIDATE – LEARNINGS FROM THE OPEN-LABEL PHASE OF A REGISTRATION TRIAL AND A REAL-WORLD PHARMACOVIGILANCE PROGRAM

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Hypothesis/Objective: DR/ER-MPH (formerly HLD200) is the first FDA-approved evening-dosed delayed-release and extended-release methylphenidate for the treatment of individuals aged ≥6y with ADHD. In phase 3 trials, DR/ER-MPH was well tolerated in children (6–12y) with ADHD, where adverse events (AEs) were collected weekly by general questioning of participants/parents, with sleep-related issues directly queried. Herein, we report post-marketing surveillance data from approximately 74,000 US patients exposed to DR/ER-MPH, where AEs were spontaneously reported.
Methods: AEs reported to Ironshore were categorized according to age, dose, action taken (eg, discontinuation) and seriousness where available.
Results: A total of 395 children, adolescents, and adults (0.5% of 74,000) reported 601 AEs. Five reports were classified as serious, and AEs preceded discontinuation in 172 patients. Many AEs occurred at the lower doses (20 and 40 mg/d; mean: 56.7 mg). The reported AEs were similar in type, but orders of magnitude lower in number, than those reported in the open-label, treatment-optimization phase of a phase 3 trial of DR/ER-MPH (NCT02493777).
Conclusions: Post-marketing pharmacovigilance surveillance of approximately 74,000 patients exposed to DR/ER-MPH revealed a safety profile consistent with observations from a phase 3 trial of DR/ER-MPH. Many AEs were reported early after DR/ER-MPH initiation and

at low doses. Healthcare providers in real-world settings tended to discontinue DR/ER-MPH treatment after AE onset, while clinical trial investigators continued treatment and found that AEs were generally tolerable and transient. ADHD is a chronic condition requiring continuous treatment and healthcare providers may find this information useful in tailoring their treatment plans.

S34. STIMULANT-RELATED IRRITABILITY: PREVALENCE, CONCEPTUALIZATION, AND TREATMENT IN PEDIATRIC ADHD MANAGEMENT

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Hypothesis/Objective: Stimulant medications remain primary treatment for pediatric ADHD. Lack of specialists necessitates facility in stimulant prescribing in primary care. Irritability is a common adverse effect of stimulants frequently causing treatment failure. This study surveyed how often irritability was reported with stimulant treatment and how providers managed its occurrence. We reviewed 200 charts documenting attention concerns in patients under 18, drawn from a health system database. We hypothesized that irritability would be associated with younger age, and that psychiatric specialists would be more likely to consider stimulant withdrawal and utilize short-acting stimulants to treat irritability.
Methods: 200 charts were randomly selected for review. Prescriber type for the first documented stimulant trial, patient demographics, symptom description, and consequent treatment changes were recorded. Cases were excluded if no diagnosis of ADHD or stimulant trial was documented.
Results: 110 charts held sufficient information. Irritability was documented in conjunction with stimulants in 42 (38%) cases, half noting some mood lability preceding the trial. In 20 cases, documentation indicated the prescriber considered when the irritability was seen in the day. In 18 cases (43%) the decision was made to change or stop medication. Mean age of non-irritable patients was 9.6 years and 8.4 for irritable youths ($p=0.08$). Psychiatric providers documented more comorbid diagnoses; however, psychiatric specialists were not more likely to note the timing of symptoms or maintain the stimulant trial. Afternoon short-acting stimulants were tried for irritability in 3 cases.
Conclusions: Irritability occurred commonly in stimulant treatment and frequently led to medication changes or therapy discontinuation.

S35. PRESCRIPTION PATTERN AND THERAPY UTILIZATION AMONG NATIONWIDE SAMPLE OF PRESCHOOLERS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

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Hypothesis/Objective: Clinical practice guidelines recommend psychosocial interventions as the first line of treatment to preschoolers with ADHD followed by methylphenidate. The aim of this study is to identify ADHD treatment patterns in a large nationwide sample of preschool aged youth over the past 6 years including factors that influence selection and sequencing of treatments.

Methods: A retrospective cohort study using TriNetX (approximately 110 million patients from 78 large organizations) was conducted. The study cohort was patients ages 3-6 diagnosed with ADHD between 2017-2023. Odds ratio (OR) and 95% confidence intervals (CIs) were calculated.
Results: Over one-third (37%) preschoolers were prescribed ADHD medications, 13% used multiple medications and 3% antipsychotics. Only one in 10 had 1+ billing codes for psychotherapy services, with most accessing medication (87%) before psychotherapy and almost all (97%) before trying any antipsychotic medication. Treatment Persistence was greatest for CNS stimulants (56-63%), followed by therapy services (50%) and then alpha-2 agonists (34-38%). White families were more likely to access all ADHD treatments (ORs range 1.3-1.8), while Hispanic ethnicity predicted increased utilization of psychotherapy (OR=1.23, 95% CI 1.09, 1.39). Rates of most treatments including polypharmacy and psychotherapy increased with comorbid psychiatric disorders or sleep problems (ORs range 1.4-14).
Conclusions: In contrast with care guidelines, medications are the most common treatment for ADHD in preschoolers with polypharmacy being more common than psychotherapy. Comorbid sleep and psychiatric problems appear to influence utilization of most treatments while demographics impact psychotherapy uptake.

S36. 50-MINUTE DIDACTIC ENHANCES COMFORT WITH EVALUATION AND TREATMENT OF ADHD AMONG PRIMARY CARE RESIDENTS

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Hypothesis/Objective: Many primary care providers may be uncomfortable assessing and treating ADHD. This study analyzes an educational template designed to improve primary care physician comfort level with the assessment and treatment of ADHD.
Methods: Methods PGY-2 and PGY-3 internal medicine residents attended a 50-minute didactic lecture on ADHD assessment and treatment delivered by a faculty psychiatrist. Prior to the didactic, residents completed a five question, Likert scale survey about their personal comfort level assessing and treating ADHD. After the didactic, the residents repeated the same survey. Survey completion was anonymous and optional. The before (pre-didactic) and after (post-didactic) data were unpaired in order to include all collected surveys. Means of the pre-didactic (N=36) and post-didactic (N=41) surveys were compared using unpaired, 1-tail, student t-tests. A 1-tail t-test was chosen based on the hypothesis that there would be an increase in comfort level score following the didactic.
Results: Comfort among all five survey domains showed statistically significant improvement in self-reported comfort level after the didactic: 1) Comfort diagnosing ADHD ($p = 1.81e-10$), 2) Comfort continuing ADHD medication started by a psychiatrist ($p = 1.85e-6$), 3) Comfort starting a new ADHD medication ($p = 4.38e-15$), 4) Comfort assessing for stimulant use disorder ($p = 1.94e-10$), and 5) Comfort treating patients with a stimulant use disorder ($p = 4.77e-7$).
Conclusions: A 50-minute didactic about ADHD assessment and treatment is an effective and efficient tool to improve comfort levels among primary care physicians and should be considered an early step in fostering a culture of collaboration.

S37. PHARMACOGENOMIC ASSOCIATIONS WITH ADVERSE EVENTS IN RESPONSE TO METHYLPHENIDATE TREATMENT FOR ADHD

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Hypothesis/Objective: Methylphenidate (MPH) is a first-line medication for ADHD that is associated with several common and a few rare –but potentially serious side effects that may affect clinical usage. There is a gap in understanding the role of pharmacogenomics biomarkers in predicting MPH response. The goal of this study was to examine candidate gene single nucleotide proteins (SNPs) in relation to adverse effects of MPH treatment.

Methods: N=507 DNA samples isolated from patients from three clinical sites were used in a candidate gene analysis using TaqMan and Pyrosequencing genotyping methods. The association between 20 SNPs and clinical side effects was analyzed using multiple linear regression adjusting for age and baseline values, assuming an additive mode of inheritance. Clinical assessments included child appetite problems, crabbiness, sleep problems, skin picking, being dull/tired, having stomach aches, headaches, being withdrawn, extremely sad, or suicidal measured at baseline and in response to MPH treatment.

Results: Treatment resulted in significant improvements in ADHD symptoms. Treatment also improved dullness/tiredness, crabbiness, extreme sadness, and skin picking. There was no evidence of SNP association with ADHD symptom score. ADRA2A_rs1800544 had significant association with side effects (crabby p=0.0437, sleep problems p=0.0423, dull/tired p=0.0225). DBH_RS2519154 also had significant associations with crabbiness p=.038, while DBH_RS129883 had a significant association with sleep problems p=.039. No SNPs had a significant association with appetite problems, being withdrawn, or extreme sadness.

Conclusions: Genotype dependent improvement in sleep, crabbiness, and dullness/tiredness is a novel finding which speaks to the importance of adrenergic networks in MPH tolerability.

S39. A REVIEW OF THE DELIVERY TECHNOLOGIES USED IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER STIMULANT MEDICATIONS

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Hypothesis/Objective: Multiple pharmaceutical technologies have been developed and applied in the Attention-Deficit/Hyperactivity Disorder (ADHD) treatment space. While the active ingredients are similar, these technologies lead to differences in the medications' properties – including mechanism of release, timing of active drug release, and pharmacokinetic profiles. The technology differences bring up clinical considerations, including delayed- or extended-release properties to achieve once daily dosing.

This review seeks to make side-by-side comparisons of the technical features of the different technologies used in ADHD stimulants, not an efficacy comparison.

Methods: Sources including published literature, filed patents, and prescribing information were reviewed to extract data. Comparison of the technology in ADHD medications included the drug delivery system, mechanism of drug release, and technology components such as use of resins, beads, complexes, coating or layers. Special considerations that come from these properties were elucidated and framed into a broader clinical context.

Results: Although the medications evaluated were all stimulants containing methylphenidate or amphetamine as the active ingredient, they vary in the technology used to deliver medication

to patients. Differences in the technologies provide the platform to meet individual patient needs. This side-by-side comparison, describing the specific features and benefits of each technology, will better inform prescribers.
Conclusions: Clarifying the technologies available among ADHD pharmacotherapies and discussing their implications on patient care may help healthcare professionals better understand the treatment landscape and assist them in clinical decision-making for appropriate ADHD treatment. Knowledge of the mechanism of the technology could improve patients' medication adherence and could benefit clinical programs.

S40. CENTANAFADINE SUSTAINED RELEASE IS EFFICACIOUS IN THE TREATMENT OF ADULT ADHD ACROSS DISEASE SEVERITIES

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Hypothesis/Objective: To assess the efficacy of centanafadine sustained release (CTN SR), a potential first-in-class norepinephrine/dopamine/serotonin triple reuptake inhibitor, in adults with ADHD, stratified by baseline symptom severity.
Methods: Data from 2 double-blind, multicenter, placebo-controlled trials of twice-daily CTN SR (200 or 400 mg total daily dose [TDD]) vs placebo in adults (18–55 years) with DSM-5–defined ADHD were pooled and analyzed by median baseline ADHD Investigator Symptom Rating Scale (AISRS) severity score (less than 38 or ≥38) using a mixed model for repeated measures. Least squares mean (LSM) differences (95% CI) from baseline to day 42 were compared between CTN groups and placebo (2-sided α=0.05).
Results: In 859 randomized patients, significant LSM differences vs placebo at day 42 in AISRS total scores were observed in the overall (200 mg TDD and 400 mg TDD, P less than 0.0001 each), low severity (200 mg TDD [P=0.016]; 400 mg TDD [P=0.019]), and high severity (200 mg TDD [P=0.005]; 400 mg TDD [P=0.003]) groups. Significant LSM differences (P less than 0.01) vs placebo began at day 7 (200 mg TDD) and day 14 (400 mg TDD) in the overall group, remaining significant (P less than 0.001) thereafter. Significant LSM differences vs placebo (P less than 0.05) were observed from day 14 (400 mg TDD) and day 21 (200 mg TDD; low severity group) and from day 7 (200 mg TDD) and day 21 (400 mg TDD; high severity group), and remained significant (P less than 0.05) thereafter.
Conclusions: CTN SR significantly improves symptoms of ADHD in adults, regardless of baseline disease severity, beginning as early as day 7.

S41. VILOXAZINE ER (QELBREE®) ADMINISTERED WITH PSYCHOSTIMULANTS IN CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: RESULTS: OF A PHASE IV SAFETY TRIAL

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Hypothesis/Objective: Evaluate safety and efficacy of viloxazine ER (administered in morning or evening) with psychostimulants in a Phase IV, open-label, trial of pediatric ADHD.

Methods: Participants with inadequate response to psychostimulant therapy (ADHD-RS-5 ≥24 and CGI-S ≥3 during a 4-week screening period) received viloxazine ER flexibly-dosed (per labeling) in the morning (Weeks 1-4) or evening (Weeks 5-8). Safety (primary outcome) and efficacy were evaluated relative to Baseline.
Results: Fifty-six participants (26 children; 30 adolescents) were treated; 85.7% completed. Overall, therapy was well-tolerated, with 1 participant (1.8%) reporting any severe AE (influenza), and 2 participants (3.6%) having AE(s) resulting in discontinuation. The most commonly reported AEs were headache (17.9%), decreased appetite (12.5%), and upper respiratory tract infection (10.7%). Evening dosing appeared well-tolerated with fewer adverse events reported during Weeks 5-8 than Weeks 1-4, potentially attributable to longer treatment duration. Mean ADHD-RS-5 scores at Baseline (n=56), Week 4 (n=54) and Week 8 (n=48) were: 37.2, 24.0, and 19.4, respectively, with corresponding CGI-S scores of 4.4, 3.6, and 3.1, respectively. Improvement at Weeks 4 and 8 was statistically significant vs. Baseline: -13.5 and -18.2 for ADHD-RS-5, and - 0.9 and -1.4 for CGI S [All P less than .0001]. At both Weeks 4 (AM dosing) and 8 (PM dosing), Weekly Parent-Reported Evening and Morning Behavior, Revised (WPREMB-R) ratings showed greater improvement in evening [-4.1; -6.1] versus morning [-1.2; -1.6] behavior.
Conclusions: When administered with stimulant medications, viloxazine ER showed acceptable safety and tolerability, and improved both AM and PM ADHD symptoms, regardless of viloxazine ER administration time.

S42. QELBREE® (VILOXAZINE EXTENDED-RELEASE CAPSULES): FINAL RESULTS: OF THE LONG-TERM, PHASE 3, OPEN-LABEL EXTENSION TRIAL IN ADULTS WITH ADHD

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Hypothesis/Objective: Determine viloxazine ER effects on safety and efficacy in adult ADHD during a long-term, open-label extension (OLE) trial.
Methods: Participants were adults with ADHD who completed a double-blind phase 3 trial. Upon OLE enrollment, viloxazine ER was initiated at 200 mg/day, and optimized to 200-600 mg/day. Adjunctive stimulant use was permitted following Week 12. Enrollment was temporarily closed at the COVID pandemic outset. Participants who re-qualified were allowed delayed entry when enrollment re-opened. Safety and efficacy were assessed relative to DB (or OLE re-entry) Baseline. The trial was planned for 3 years or until commercial availability.
Results: Subjects (N= 159; including 133 immediate and 26 delayed-rollover) received viloxazine ER for 265±254.9 days (mean±SD). Nine subjects used adjunctive stimulant medication. Adverse events included (≥10%) insomnia (13.8%), nausea (13.8%), headache (10.7%), and fatigue (10.1%). Changes in clinical laboratory measures, vital signs, and ECG parameters were consistent with DB and product labeling. ADHD symptom (AISRS), global function (CGI), and quality of life (AAQOL) measures continuously improved relative to Baseline. For participants maintained on viloxazine ER for at least 3 months (dose-optimized) respective [mean±SD] AISRS Total, CGI-S, and AAQOL ratings were 37.6±6.25, 4.6±0.63, and 55.5±14.76 at Baseline, and improved by -20.0±11.63 (n=106), -1.8±1.34 (n=106), and

12.7±17.90 (n=87) at last visit, where 35.8% and 49.1% of these participants were receiving viloxazine ER doses greater than 200-400 mg/day and greater than 400 mg/day, respectively.
Conclusions: Adult participants maintained on long-term, viloxazine ER at optimized doses showed continued improvement in ADHD symptoms, global function, and quality of life measures.

S43. COSTS ASSOCIATED WITH ADVERSE EVENTS DURING TREATMENT EPISODES FOR ADULT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

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Hypothesis/Objective: ADHD medication is frequently associated with adverse events (AEs), but limited real-world data exist regarding their costs from a payer's perspective. Therefore, this study evaluated the healthcare costs associated with common AEs among adult patients treated for ADHD in the US.
Methods: Eligible adults treated for ADHD were identified from a large US claims database (10/1/2015–9/30/2021). A retrospective cohort study design was used to assess incremental healthcare costs per patient per month (PPPM) associated with 10 selected AEs during ADHD treatment by comparing treatment episodes with a given AE to similar treatment episodes without this AE. Entropy balancing was used to create cohorts with similar characteristics. Studied AEs were selected based on their prevalence in clinical trials for common ADHD medications and were identified from ICD-10-CM diagnosis codes recorded in claims.
Results: Among the 461,464 patients included (mean age: 34.2 years; 45.5% male), 49.4% had ≥1 AE during their treatment episode. AE cohort sizes ranged from 823 (dry mouth) to 170,573 (anxiety) individuals. All AEs were associated with statistically significant excess healthcare costs PPPM (erectile dysfunction: $120, fatigue: $248, insomnia: $265, anxiety: $380, diarrhea: $441, dry mouth: $485, nausea: $709, constipation: $802, urinary hesitation: $1,105, feeling jittery: $1,160; all p less than 0.05).
Conclusions: AEs occurring during ADHD treatment episodes are associated with significant healthcare costs, highlighting the potential of treatments with favorable safety profiles to alleviate the burden experienced by patients and the healthcare system.

S44. ADHD-RELATED BEHAVIORS IN TODDLERHOOD PREDICT PEER PROBLEMS AT PRESCHOOL AGE

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Hypothesis/Objective: It is not yet known if early ADHD-related behaviors in toddlerhood predict social functioning at preschool age. This hypothesis was tested leveraging a sample of toddlers at high and low familial risk for ADHD, parents with and without ADHD, and followed longitudinally.

Methods: We followed a sample of 47 toddlers (M=20.3 months) at high (n=22) and low (n=25) familial risk for ADHD to preschool age (M=4.3 years). Parents reported toddler ADHD-related behaviors via the Child Behavioral Checklist (CBCL), preschool ADHD symptoms via the ADHD-Rating Scale IV – Preschool Version (ADHD-RS-P IV), and preschool peer problems via the Strengths and Difficulties Questionnaire (SDQ).
Results: Our primary hypothesis was confirmed: toddler ADHD-related behaviors were significantly correlated with preschool-age peer problems, r=0.38, p less than 0.01. However, familial risk for ADHD (i.e., presence/absence of parental ADHD) was not directly associated with toddler ADHD-related behaviors or preschool-age peer problems. In a linear regression adjusting for familial risk and child sex assigned at birth, toddler ADHD-related behaviors continued to predict more peer problems at preschool age, B=0.39, p less than 0.01. Correlations supported an indirect pathway from familial risk to preschool ADHD hyperactivity-impulsivity symptoms, t=-2.01, p less than 0.05, and from preschool ADHD symptoms to more preschool peer problems, r=0.48, p less than 0.001.
Conclusions: These Results: indicate that ADHD-related behaviors as early as toddlerhood are predictive of later impairment in social functioning and peer relationships. Screening for these early behaviors may be a method for identifying children who would benefit from early intervention to enhance development of social skills before the onset of impairment.

S45. FACTORS IMPACTING PARENTING SELF-EFFICACY AND SATISFACTION IN PARENTS WITH AND WITHOUT ADHD

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Hypothesis/Objective: This study aims to determine if parents with ADHD report lower levels of parental self-efficacy and satisfaction and examine possible predictors of these variables (parental social support, division of labor, and distress).
Methods: Parents completed the Co-parenting Relationship Scale, Parenting Stress Index-Short Form, Social Support Inventory, and Being a Parent questionnaires when their children were toddlers. Parent ADHD status was assessed by a research clinician using the Conner's Adult ADHD Diagnostic Interview for DSM-IV (CAADID). Group comparisons were assessed using t-tests and ANOVA and relation between predictors of parent self-efficacy and parenting satisfaction were examined using linear regressions controlling for family ADHD status, parent age, and parent education.
Results: Parent self-efficacy and satisfaction did not differ with ADHD diagnosis. Across all parents, increased parenting distress predicted decreased efficacy ($t = -4.853$, $p = 0.000$) and decreased satisfaction ($t = -10.919$, $p = 0.000$), and better division of labor predicted increased satisfaction only ($t = 4.261$, $p = 0.000$). Poorer division of labor was reported by partners of parents with ADHD compared to families without ADHD ($t = 3.299$, $p = 0.001$). Less social support was reported by parents with ADHD compared to families without ADHD ($t = 3.166$, $p = 0.002$).
Conclusions: Our hypothesis that parents with ADHD experience less parenting self-efficacy and satisfaction was not supported. Parental ADHD appears to impact the co-parenting relationship such that partners of parents with ADHD report taking on more parenting responsibilities. This may place partners of parents with ADHD at greater risk of poor parenting satisfaction.

S46. THE CAUSAL ROLE OF ADHD ON OTHER EXTERNALIZING BEHAVIOR

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Hypothesis/Objective: ADHD has been a proposed risk factor for the development of externalizing behaviors (i.e., aggression, alcohol use) that could explain the observed covariation among these phenotypes. Previous research has demonstrated genetic overlap between these traits, but has yet to examine whether this overlap may be explained by ADHD representing a common causal feature among other externalizing behaviors. The aim of the present study is to use whole genome Methods: to test causal, directional relations between ADHD, alcohol use, and aggression.
Methods: Two-sample Mendelian Randomization (MR) was conducted to test causal associations between ADHD and the other phenotypes. Summary statistics from several genome-wide association studies (GWAS) were used in these analyses, including GWASs of ADHD diagnosis, drinks per week, aggressive behavior, and alcohol use disorder (AUD) diagnosis. Multiple estimation methods were also employed to account for horizontal pleiotropy (e.g., MR Egger, weighted median, MR PRESSO, MR-MIX).
Results: ADHD demonstrated significant causal relationships with aggression and alcohol consumption across several estimation Methods: (P=7.3e-11 - 0.02 and P=0.001- 0.02, respectively). ADHD also demonstrated a significant relationship with AUD, but only for one method (P=0.007).
Conclusions: Findings suggest that ADHD may be a causal mechanism underlying aggression and alcohol use. However, caution should be used when interpreting the alcohol consumption findings as there was significant heterogeneity in variant effects. An implication from these findings is the suggested potential for early interventions on ADHD reducing risk for later alcohol use and aggressive behavior.

S47. COMPARING PERCEIVED NEED AND USE OF MENTAL HEALTH RESOURCES AMONG ADULTS WITH AND WITHOUT A HISTORY OF ADHD

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Hypothesis/Objective: Individuals with ADHD show high rates of co-occurring mental health problems. Yet, the degree to which adults with ADHD perceive a need for and utilize mental health counseling for co-occurring problems is less well-characterized. A greater understanding of this could inform future efforts to encourage service utilization.
Methods: Participants (N=423; ages 18-30; 57.9% DSM-diagnosed childhood ADHD vs. no-ADHD comparisons) were from the Pittsburgh ADHD Longitudinal Study. Individuals reported their perceived need for counseling for depression/stress, anger-related issues, interpersonal difficulty, and substance use (0=no need between ages 18-30 to 6=definite need between ages 18-30). They also reported utilization of those same resources (0=no utilization between ages 18-30; 1=utilization between ages 18-30). Poisson and logistic regressions tested prediction from childhood ADHD (no/yes) to perceived need and utilization of these resources, respectively, while adjusting for demographic covariates.

Results: Adults with (versus without) childhood ADHD perceived a greater need for anger-related counseling (β=0.55, p less than 0.001), but not for depression/stress (β=0.07, p=0.336), interpersonal (β=-0.06, p=0.545), or substance use (β=0.18, p=0.153) counseling. However, adults with childhood ADHD reported greater utilization of counseling for all types of problems (βs=0.58-3.04, ps=0.047-0.004) except interpersonal counseling (β=-0.06, p=0.877).
Conclusions: Adults with ADHD histories report higher utilization of counseling for a wide array of mental health comorbidities, but not a greater perceived need for counseling for these same problems. This suggests that their treatment utilization may be driven by outside forces (e.g., family members, mandated treatment) and, at times, limited awareness of the severity of their difficulties.

S49. ADHD AND SELF-ESTEEM IN COLLEGE STUDENTS

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Hypothesis/Objective: Many studies found a negative relationship between ADHD and self-esteem. According to Edbom (2009), development of low self-esteem in those with ADHD is related to the functional impairments and symptom severity of the disorder. This study aimed to further explore the links between self-esteem and ADHD. It was believed that students with prior ADHD diagnoses would have lower self-esteem, compared to students who met screening criteria but were never diagnosed with ADHD.
Methods: College students in large metropolitan southeastern universities enrolled in psychology classes (N = 368) took an anonymous online self-report survey battery in exchange for course credit. Included in the battery was a demographic survey (which included questions about prior diagnosis of ADHD), the Adult ADHD Self Report Scale, and the Rosenberg Self-Esteem Questionnaire.
Results: Those with previous diagnoses of ADHD reported lower levels of self-esteem than those who met the screening criteria used in this study but had never been diagnosed.
Conclusions: The Results: suggest that the diagnostic label itself might be contributing to the lower levels of self-esteem, more than the difficulties created by the symptoms. Lower self-esteem in people diagnosed with ADHD could be caused by the fact that they have a higher tendency to receive negative feedback about the abilities they possess when they have been diagnosed with ADHD (Young, et al., 2008) and stigmatization and ostracization while growing up by being labeled weird or different, resulting in feelings of alienation (Singh, et al., 2007).

S50. SOCIAL PROBLEM-SOLVING PERFORMANCE IN CHILDREN WITH ADHD – WHAT MATTERS?

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Hypothesis/Objective: The majority of children with ADHD experience social difficulties. They show deficits in their social information processing, and demonstrate lower levels of social problem-solving skills than typically developing children. This study identifies factors contributing to the social problem-solving abilities of children with ADHD.
Methods: Ninety-eight 6-12-year-old children (67% boys) meeting DSM-5 criteria for ADHD viewed and answered questions about pre-recorded social interactions. Their responses were

grouped into social-problem-solving steps: Encoding, Interpretation, Solution-Generation, Decision-Making. The participants completed neuropsychological assessments measuring their IQ, language skills, theory of mind (ToM), working memory (WM). Their parents reported their children's social skills.

Results: Pearson correlation and hierarchical multiple regression analysis were used. Age correlated with performance on each problem-solving step and was entered first in regression analyses. Estimated IQ correlated with the Interpretation and ADHD-symptom severity with the Encoding. Language skills predicted variance in performance on the Interpretation and Decision-Making above the age and IQ (Interpretation) effects. ToM predicted variance in Solution-Generation, WM in Encoding above the effects of age and symptom severity. Decision-Making skills predicted variance in parent-reported social skills above the symptom severity effects.

Conclusions: The social problem-solving skills of children with ADHD improve with age. Language skills contribute to their ability to understand others' emotions and select best solutions to social conflicts. ToM contributes to children's ability to propose and judge solution appropriateness, their WM skills to their ability to understand social problems. Decision-making abilities contribute to other-observed social skills. These relationships should be considered when assessing and managing social difficulties in children with ADHD.

S52. EXAMINING THE ROLES OF ANXIETY AND WORKING MEMORY ON MATH ACHIEVEMENT IN CHILDREN WITH ADHD

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Hypothesis/Objective: Children with ADHD frequently demonstrate underachievement in math, (Capodieci and Martinussen, 2017), which may be explained by both neurocognitive (e.g., working memory; Friedman et al., 2018;) and socioemotional factors (e.g., anxiety; Justicia-Galiano et al., 2017). Well-established cognitive models posit that anxiety exacerbates working memory difficulties and thus exerts negative downstream effects on task performance (Eysenck et al., 2007), though little is known on how this influences achievement kids with ADHD. As such, the current study aims to examine the roles of trait anxiety and working memory on math achievement in children diagnosed with ADHD.

Methods: The sample comprised 275 children ages 8-13 (106 girls), including 184 children diagnosed with ADHD. Anxiety symptoms were assessed using child self- report from the MASC-2 (March, 2013). Working memory estimates were derived from 3 computerized tasks (Kofler et al.2019). Math skills were assessed using the KTEA-3 (Kaufman and Kaufman, 2014). ADHD, anxiety, and working memory were sequentially modeled as predictors of math achievement in a latent path analysis.

Results: Results: indicate that ADHD predicted large magnitude deficits math (d= -.76; β=-.338; 95% CI excludes 0.0). 100% of ADHD-related underachievement in math was explained by working memory. However, anxiety did not significantly predict math achievement or explain ADHD-related underachievement in math.

Conclusions: Understanding the deficits that contribute to ADHD-related underachievement in math is crucial for informing targeted academic interventions, treatments, and educational planning. Furthermore, examining the relations between internalizing and externalizing pathology may inform targets for transdiagnostic psychological intervention.

S53. INFORMANT DISCREPANCIES IN CO-OCCURRING ANXIETY SYMPTOMS IN KIDS WITH AND WITHOUT ADHD

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Hypothesis/Objective: Anxiety commonly co-occurs with ADHD and may increase these children's risk for academic underachievement (Jarrett and Ollendick, 2008; Vilaplana-Pérez, 2021). Generally, there is low agreement between adult and child ratings of anxiety (Miller et al., 2014). However, to our knowledge this has not been studied in children with ADHD. The current study examines informant discrepancies in ratings of child anxiety in children with and without ADHD, and explores whether these ratings differentially predict academic achievement.

Methods: The sample comprised 275 children ages 8-13 (106 girls). Math and reading achievement was assessed (KTEA-3; Kaufman and Kaufman, 2014). Anxiety symptoms were assessed using parent, teacher (BASC-2/3; Reynolds and Kamphaus, 2004), and child self-report (MASC-2; March, 2013).

Results: ADHD group (n=184): Significant but low agreement between parent and child anxiety (r=.15; p=.047); moderate parent/teacher agreement (r=.36; p less than .001); but no significant relation between teacher and child anxiety ratings (r=.12, p=.10). Only teacher-rated anxiety significantly predicted math achievement, while both child and teacher anxiety ratings predicted reading achievement (all p=.02).

Non-ADHD group (n= 91): Significant but low parent/teacher agreement (r=.28; p=.008); but no significant relations between child and either parent or teacher ratings of child anxiety (both r=.08-.16; p greater than .14). Only parent-reported child anxiety predicted math achievement (p =.003), whereas both parent- and teacher-reports predicted reading achievement (p less than .001; p = 0.003).

Conclusions: Informant discrepancies in child anxiety ratings exist for children with and without ADHD. The extent to which anxiety is associated with academic difficulties varies significantly based on informant for both groups.

S55. DO ADVERSE CHILDHOOD EVENTS MODERATE THE ASSOCIATION BETWEEN ADHD AND SCT IN COLLEGE STUDENTS?

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Hypothesis/Objective: Sluggish cognitive tempo (SCT) and inattentive symptoms of ADHD are strongly associated with each other. The present study aims to better understand these strong associations by investigating adverse childhood experiences (ACEs) as a moderator of this relationship in college students.

Methods: College student participants (n = 4185) were recruited from eight geographically diverse colleges in the United States. Participants completed measures of ACEs, current inattentive symptoms of ADHD and SCT symptoms. Hayes SPSS PROCESS Macro was used to test for moderation.

Results: The overall model was statistically significant, R = .67, F (3, 4181) = 1097.40, p less than .00001. As hypothesized, ADHD inattentive symptoms and SCT symptoms were associated positively with each other, b = .75 (CI = .71 - .78), p less than .00001. ACEs moderated the association between ADHD inattentive symptoms and SCT symptoms, b = -.02,

p = .0006 (CI = -.03 - -.01). Simple slopes analysis indicated that the association between ADHD inattentive symptoms and SCT symptoms was stronger in the context of low ACEs.
Conclusions: ADHD inattentive symptoms and SCT are strongly associated with each other. Notably, the presence of ACEs weakens these associations. This may be related to the increased risk of externalizing symptoms associated with ACEs given SCT symptoms are primarily related to internalizing symptoms. This suggests that clinicians should consider the impact of ACEs during assessment for college students with inattentive symptoms of ADHD. Efforts to further distinguish ADHD inattentive symptoms and SCT should consider the potential impact of ACEs.

S56. SEX DIFFERENCES IN CHRONOTYPE AND ACTIGRAPHY-MEASURED SLEEP TIMING IN ADOLESCENTS WITH AND WITHOUT ADHD

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Hypothesis/Objective: Attention-deficit/hyperactivity disorder (ADHD) is frequently associated with sleep problems, which may stem from an endogenous circadian delay. Females with ADHD are at particularly high-risk of sleep problems; however, whether there are sex differences in circadian functioning in ADHD is unknown. We examined sex differences in two behavioral proxies of circadian delay (chronotype, sleep timing) among adolescents with and without ADHD.
Methods: Sixty-two adolescents aged 13-17 (M=15.27) participated. Thirty-one participants had ADHD (no comorbidities; 39% female), and 31 were healthy controls (HC, 61% female). A diagnostic interview and self-report of chronotype (Morningness Eveningness Scale for Children) were completed. Participants wore an actigraph 24 hours/day for greater than 5 days. Linear regressions covarying for demographics examined main effects of group and sex, and a group by sex interaction effect, on chronotype and actigraph-measured sleep midpoint.
Results: Participants with ADHD had higher eveningness compared to HC (b=.489, t=4.051, p less than .001). There was a sex by group interaction effect on chronotype (b=1.261, t=2.144, p=.036), such that females, but not males, with ADHD reported greater eveningness than HC. There were no main effects of group or sex on sleep midpoint, but there was an interaction effect (b=-1.736, t=-2.451, p=.019), such that females, but not males, with ADHD had later sleep midpoints compared to HC.
Conclusions: There may be a circadian explanation for the sleep complaints observed for females with ADHD, although follow-up studies using biological circadian measures are necessary to confirm. Findings may suggest that females with ADHD may benefit from chronotherapy, including light therapy and/or melatonin.

S57. PERCEPTIONS OF YOUNG ADULT WOMEN WITH ADHD ABOUT THEIR DAILY LIFE FUNCTIONING: A QUALITATIVE ANALYSIS OF THE MULTIMODAL TREATMENT STUDY OF ADHD

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Hypothesis/Objective: Women are often underrepresented in ADHD research. Few studies have examined what it means for women to grow up with ADHD diagnoses using their own explanations and unique perspectives, as opposed to quantitative measures with a pre-determined focus. We adopted a qualitative approach and assessed self-perceptions of life satisfaction, relationships, stress, and ADHD symptoms by young women with ADHD.
Methods: Eighteen women with ADHD (Mage=24) completed semi-structured qualitative interviews. All participants received an ADHD diagnosis at age 7-9 years while participating in the Multimodal Treatment Study of ADHD (MTA) in childhood.
Results: Life satisfaction (e.g., aspirations/confidence about the future) and productivity (e.g., management of daily tasks) varied considerably across individuals. Most participants reported some difficulty with anxiety, depression, or anger, but also experienced positive emotions. Most perceived continued ADHD symptoms (e.g., disorganization, forgetfulness, racing thoughts, distractibility) and impairment, though some questioned the degree to which this was related to ADHD versus their personality. Only half reported strategies for coping with ADHD, such as medication, creating lists, and enforcing structure in their lives.
Conclusions: Most women with a childhood combined-presentation ADHD diagnosis believe that the disorder continues to impact their lives as adults. These complex, contradictory, and nuanced feelings about the diagnosis in adulthood may not be fully captured by quantitative studies alone. Emotional well-being, coping strategies, and social relationships continue to be a challenge for many women with ADHD as they navigate the increased independence required in young adulthood and may be important areas for intervention.

S58. LIGHT REGULARITY ASSOCIATED WITH SLEEP REGULARITY AND TIMING IN ADOLESCENTS WITH AND WITHOUT ADHD

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Hypothesis/Objective: Light exposure may contribute to ADHD pathology through its impact on circadian rhythm regulation. Adolescents with ADHD display irregular/delayed sleep patterns, which may also result from circadian dysfunction. Regularity of light exposure is related to sleep regularity and timing in adolescents generally; however, whether light exposure irregularity contributes to irregular/delayed sleep-in adolescents with ADHD is unknown.
Methods: Forty-six adolescents (54% female, mean age=15.25) completed a diagnostic interview, greater than 5 days/nights of actigraphy, and self-reports of chronotype and daytime sleepiness. Twenty were diagnosed with ADHD; 26 were healthy controls (HC). Linear regressions covarying sex and age examined group differences in the light regularity index (LRI), derived from actigraph-measured light exposure. Partial Pearson correlations examined associations of the LRI with actigraph-measured and self-reported sleep measures in the full sample and the ADHD group specifically.
Results: Adolescents with ADHD displayed lower LRI than HC (β=.31, p=.04). In the full sample, lower LRI correlated with less regular (r=.44) and more delayed (r=-.43) actigraph-measured sleep patterns and greater reported eveningness (r=.32) (p's less than .05); and daytime sleepiness at trend-level (p=.07). In the ADHD group, the LRI was strongly associated with sleep regularity (r=.63) and timing (r=-.50), p's less than .01; associations were non-significant in HC.
Conclusions: Irregular light exposure may contribute to circadian dysfunction (irregular/delayed sleep) in adolescents with ADHD. Regularly-timed light exposure chronotherapy may improve sleep in youth with ADHD. Future studies using biological

measures (e.g., dim-light melatonin onset) may clarify whether links between irregular light exposure and sleep disturbances in ADHD are mediated by disruptive impacts of light on circadian function.

S59. STRESSFUL LIFE EVENTS AND ADHD SYMPTOMS SEVERITY IN YOUNG MEN AND WOMEN

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Hypothesis/Objective: Research has demonstrated a link between trauma and ADHD, but the direction of this association remains unclear, particularly in the high-risk population of young adults with ADHD. We examined whether experiencing more stressful life events (SLEs) was associated with worse subsequent ADHD symptom severity (and vice versa) in young adults with ADHD, and whether these associations were moderated by gender.
Methods: Participants (N=72) in a pilot study were between 18-21 years old. Participants and collateral informants rated the severity of the 18 DSM-5 ADHD symptoms (ADHD Rating Scale). Participants indicated exposure to SLEs on a 25-item Stressful Life Events survey at baseline (lifetime) and 4 weeks later (past month).
Results: The Results: of a series of ordinary least squares regression analyses showed that number of lifetime SLEs was positively associated with baseline ADHD symptom severity for collateral informant report only (adjusting for age, race, gender, medication status, and student status) (B=.246, p less than 0.05) In turn, ADHD collateral informant-report symptom severity was significantly and positively associated with later SLEs (B=.428, p less than .001), such that worse symptom severity at baseline was associated with a greater number of SLEs reported over the subsequent month. Gender did not significantly moderate these associations.
Conclusions: Both trauma history and ongoing stress/trauma exposure may be important considerations in the understanding and treatment of ADHD in young adults, regardless of gender. Future research should examine real-time stress/trauma in ecological momentary assessment (EMA) as it relates to momentary/daily ADHD symptoms to understand how this process unfolds day to day.

S61. NEUROPSYCHOLOGICAL DEFICITS IN ADHD AND TICS DISORDER EXAMINED IN A COMMUNITY SAMPLE

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Hypothesis/Objective: Attention deficit/hyperactivity disorder (ADHD) and tic disorders (TD) often co-occur. About 50% of TD present with comorbid ADHD. It is unclear whether comorbid TD+ADHD has a similar neurocognitive profile as TD or ADHD. Delineating the neurocognitive profiles of TD, ADHD, and TD+ADHD could elucidate whether comorbid ADHD in TD is a true comorbidity or a phenocopy.
Methods: We recruited youth participants (6.0 to 17.9 years of age) from the community. We compared the neurocognitive profile of TD (n=121), ADHD (n=892), TD+ADHD (n=52), and controls (n=16414) using the stop-signal task to measure response inhibition (stop signal reaction time–SSRT), sustained attention (response time variable–RTV), and reaction time (RT). Because of extensive comorbidity, we also conducted a matched pairs analysis by

matching every TD with a non-TD participant while controlling for comorbidity (e.g., TD vs controls, TD+ADHD vs ADHD, etc.).
Results: We find no significant difference in either SSRT, RTV or RT in TD compared to controls. Both ADHD and TD+ADHD had longer SSRT and RTV than controls. There was no difference between ADHD and TD+ADHD. After controlling for ADHD traits, the difference between TD and TD+ADHD was no longer significant. Matched analysis revealed no significant effect of TD on SSRT, RTV or RT.
Conclusions: We conclude that ADHD, but not TD, predicts impairment in response inhibition and sustained attention. TD+ADHD has a similar neurocognitive profile as ADHD, suggesting that the ADHD seen in TD is a true comorbidity.

S62. INHIBITION AFFECTS SPECIFIC COMPONENTS OF WORKING MEMORY PERFORMANCE IN ADHD

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Hypothesis/Objective: Baddeley and Hitch's original working memory (WM) model consisted of three components: the central executive (CE), phonological loop (PL), and visual-spatial sketchpad (VSSP). Research support is plentiful regarding these components in various child populations. In ADHD, inhibition may affect WM performance. However, research is scarce regarding inhibition's relationship to the three components. Therefore, our objective was to determine inhibition's relationship to the components in children with ADHD.
Methods: Participants included 87 children with ADHD (8-12 years, 57% male, 86.6% White) from a pre-existing database attained through a larger study. The BRIEF Parent-Report Inhibition scale measures inhibition problems in daily life. To measure WM, select subtests from the Children's Memory Scale (CMS) were used: Sequences for CE, Numbers Forward for PL, and Picture Locations for VSSP.
Results: Linear regression was used to determine whether the three WM measures were related to (worse) Inhibition. The equation was significant [adj. $R2 = .06$, $F(3, 87) = 2.88$, $p = 0.04$]. Inhibition was related to Sequences performance ($\beta = .26$, $p = .02$). Numbers Forward ($\beta = -.08$, $p = .47$) and Picture Locations ($\beta = .11$, $p = .32$) were not significant.
Conclusions: Having greater inhibition problems was related to better central executive functioning in our sample with ADHD, but short-term memory functioning was not. Clinically, this may suggest that poor inhibition does not contribute to worse WM performance in ADHD; in fact, in some it may be related to better mental manipulation. Given the paucity of research in this area, replication is needed before firm Conclusions: are made.

S63. GENDER DIFFERENCES IN PHYSIOLOGICAL CORRELATES OF AFFECTIVELY DRIVEN DECISION-MAKING BEHAVIOR IN ADULT ADHD

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Hypothesis/Objective: Gender differences in attention-deficit/hyperactivity disorder (ADHD) symptomology are frequently overlooked when studying behavioral abnormalities. However, it is known that women are considerably more affected by deficits in emotional competence. Given that affective functions significantly influence the processing of risky decision-making

and risk-engagement, we hypothesize that gender differences impact risky behavior in ADHD. Consequently, we investigated the interaction of emotionally induced changes in the physiology and behavioral performance.
Methods: Thirty-three healthy controls (n = 14 male; n = 19 female) and twenty-nine patients with ADHD (n = 16 male; n = 13 female) underwent skin conductance response recordings during the performance in a modified version of the Balloon Analogue Risk Task. Additional questionnaires were used to reveal insights in the self-assessment of emotional competence, risk perception and feedback sensitivity. Linear mixed-effects models were used for data analysis.
Results: Women exhibited lower skin conductance responses before decision-making and during feedback display in both groups. However, female patients with ADHD showed a significantly greater risk engagement compared to male patients, which also appeared to influence the correlation of skin conductance and risky decision-making behavior. Comparisons with self-assessment Results: further indicated a reduced behavioral awareness in women with ADHD.
Conclusions: In conclusion, we found an altered interaction between physiology activity and risky behavior in women with ADHD, potentially resulting in reduced sensitivity to their own bodily functions and subsequent disadvantageous decision-making behavior. The current study highlights the need for increased consideration of gender-specific effects on physiological processes and behavior in adult patients with ADHD.

S64. PERSONALIZED VIDEO GAMING THERAPY REDUCES COMORBID DEPRESSIVE SYMPTOMS IN ADULT PATIENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Hypothesis/Objective: ADHD and depression frequently co-occur, with studies reporting prevalence rates of depression in individuals with ADHD ranging from 18 to 53 percent. There is first evidence that personalized video gaming therapy can function as an intervention to improve symptomatology and cognitive functioning in ADHD and depression (Bergmann et al, 2023). The effects of video gaming therapy on ADHD comorbid depressive symptoms are still unknown. Therefore, this study investigates whether video gaming therapy can improve comorbid depressive symptoms more than a standardized cognitive training and treatment as usual (TAU).
Methods: Three groups of (each n=20) ADHD patients similar for age and gender with a comorbid depression received a four-weeks standard computerized (MyBrain), or a 3-dimensional videogame based cognitive training (Nintendo-Switch). A third TAU-group served as control group. Before and after the intervention, changes in depressive symptoms using the Beck´s Depression Inventory (BDI-II) were investigated. A repeated-measures mixed ANOVA was calculated with post hoc paired t-tests.
Results: No significant interaction of time x group was found. Comparisons over the timepoints revealed a significant improvement for the depression scores in the video gaming group only during post-testing.
Conclusions: There is first evidence that personalized video gaming therapy may have a positive impact not only on ADHD symptoms and cognitive functions, but also on comorbid

psychiatric disorders such as depression. Video gaming therapy appears to be more effective compared to a standardized computerized cognitive training. However, further research including larger sample sizes is needed to confirm these findings.

S65. SENSITIVITY TO REWARD AND PUNISHMENT IN YOUTH WITH ADHD: THE IMPACT OF SEX, AGE, AND INTERNALIZING DISORDERS

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Hypothesis/Objective: Youth with ADHD often exhibit high sensitivity to reward (SR) and low sensitivity to punishment (SP) relative to typically developing (TD) youth, and are more likely to experience comorbid internalizing (INT) disorders (i.e., anxiety, depression), associated with higher SP. The current study examines the effects of ADHD, INT comorbidity, sex, and age on SR and SP using multimethod assessment (i.e., questionnaire and task-based).
Methods: Youth ages 8-17 classified as ADHD+INT (n=51, 21 females), ADHD-INT (n=109, 27 females), or TD (n=114, 44 females) completed the Point Scoring Reaction Time Task for children-revised, which measures change in reaction time in response to reward (SR) and punishment (SP) contingencies, and parent and youth questionnaires assessing SR and SP.
Results: Diagnostic groups did not differ in task-based SR or SP. However, parent-report SR was higher in both ADHD groups relative to TD, and SP was higher in ADHD+INT than ADHD-INT, which was higher than TD. Child-report SR did not differ among groups, but SP was higher in ADHD+INT relative to ADHD-INT and TD. Parent- and child-report SR decreased with age, while SP showed no age effects. Task-based SR and SP increased with age, but this varied by diagnosis and sex (e.g., increased SR with age in females with ADHD+INT; increased SP with age except for females with ADHD-INT).
Conclusions: Questionnaire measures suggest atypical behavioral regulation in response to real-world reward and punishment contingencies, whereas task-based measures revealed intact reward salience in ADHD, but different age-related patterns as a function of sex and comorbidity.

S66. SLEEP PROBLEMS IN YOUNG CHILDREN WITH ADHD SYMPTOMS WHOSE CAREGIVERS HAVE ADHD

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Hypothesis/Objective: ADHD symptoms and sleep problems are mutually exacerbating conditions that frequently co-occur in clinical samples (Sciberras, 2023). We hypothesized that medication naive young children with ADHD symptoms would display elevated rates of common sleep problems such as insomnia, inadequate sleep duration, and daytime sleepiness.
Methods: Parents of 205, 3–8-year-old children with elevated symptoms of ADHD (Mean age=5.80 years old; 64.2% boys) participating in an RCT of Parent Stimulant Medication and Parent Training in Multiplex ADHD families. Caregivers completed items from the Children's

Sleep Habits Questionnaire (CSHQ), a validated sleep screening instrument to identify both behaviorally based and medically-based sleep problems in children (Owens et al., 2000).
Results: Children with ADHD symptoms (Mean Vanderbilt score = 38.1) in multiplex families (Mean Caregiver CAARS ADHD score = 68.4) displayed high scores on Sleep Resistance (M=10.26, SD = 3.44), Sleep Onset Delay (M=1.82, SD=0.81), Sleep Duration (Mean=4.37, SD=1.45) and Daytime Sleepiness (Mean=13.07, SD=3.49). 21.9% rarely fall asleep within 20 minutes.
Conclusions: Unmedicated, young children with elevated ADHD symptoms also had elevated sleep problems scores. These elevated sleep scores were similar or higher than rates in other research samples examining pediatric populations diagnosed with primary sleep disorders (Owens et al., 2000). This highlights the need for increased screening and treatment of sleep difficulties in ADHD samples.

S67. UNRAVELING THE MECHANISM OF ACTION OF VILOXAZINE ER IN ADHD

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Hypothesis/Objective: To better understand viloxazine's mechanism of action (MOA) in ADHD, as preclinical studies demonstrate serotonergic (5-HT) effects in addition to its role as a norepinephrine transporter inhibitor.
Methods: To determine pharmacologic effects of viloxazine at plasma concentrations achieved during ADHD treatment, a series of experiments were undertaken, including cell-based binding competition and functional assays, rat microdialysis, transporter occupancy, and monkey PET studies using [11C] CIMBI-36, a 5-HT2A/5-HT2C radioligand.
Results: In cells viloxazine bound the norepinephrine transporter (NET), 5-HT2C, 5-HT2B, and 5-HT7 receptors with Ki's of 0.13, 0.66, 0.84, 1.90 μM, respectively, but not the serotonin transporter (SERT) or 5-HT2A (Ki= 14.4 and 16.3 μM). Viloxazine acted as an inhibitor/antagonist at NET, 5-HT2B, 5-HT7, and an agonist at 5-HT2C. In the rat prefrontal cortex, viloxazine (30 mg/kg) significantly increased norepinephrine (NE), dopamine (DA), and 5-HT; this dose produced unbound plasma concentrations comparable to those in children and adults with ADHD administered effective/approved doses of viloxazine ER. In additional rat experiments, viloxazine (10, 30 mg/kg) occupied 85-95% of NET (EC50=0.19 μM). In monkeys, viloxazine showed dose-dependent reductions in [11C] CIMBI-36 binding in most brain regions, with greatest reductions in 5-HT2C-rich regions (EC50=4.1 μM).
Conclusions: In preclinical studies, viloxazine shows high NET occupancy (greater than 85%), binds to 5-HT receptors, and increases prefrontal cortex NE, DA, and 5-HT levels at clinically relevant plasma concentrations. Combined with published studies implicating a role for serotonergic modulation in mitigating ADHD behaviors, these data suggest the MOA for viloxazine ER in ADHD treatment may be broader than simply NET inhibition.

S68. PRESSING ISSUES: CORTICAL SENSITIVITY TO PREPOTENT RESPONSE INHIBITION DIFFERS AMONG CHILDREN WITH ELEVATED HYPERACTIVITY/IMPULSIVITY

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Hypothesis/Objective: Children with ADHD commonly perform poorly on laboratory measures of prepotent response inhibition. Prepotency level can be manipulated by varying the number of response trials preceding an inhibition trial. Additionally, children with ADHD show atypical cortical activation during inhibitory trials, as measured with event related potentials (ERPs). However, the effect of prepotency level on ERPs in children with and without ADHD has not been tested.
Methods: Thirty-five 7-11-year-old children with confirmed ADHD and 14 typically developing children completed a GoNoGo ERP task. Mean amplitude of a late P3 ERP component was extracted from the parietal scalp at 375-500 ms, for correct NoGo trials. Level of prepotency was quantified as the number of preceding "Go" trials.
Results: Greater severity of DSM-5 inattention and hyperactive/impulsive symptoms were associated with enhanced late P3 amplitude, indicating greater cortical activation during successful inhibition. The association between late P3 amplitude and hyperactivity/impulsivity was moderated by the level of prepotency. Specifically, enhanced late P3 amplitude was found during all inhibition trials for children with elevated hyperactive/impulsive symptoms, but only during trials with high prepotency among children with low hyperactive/impulsive symptoms. There was no interaction between prepotent response and inattention symptoms on late P3 amplitude.
Conclusions: Children with high hyperactivity/impulsivity require greater cortical activation to successfully inhibit responses even at low levels of prepotency, while children with low symptoms only exhibit increased cortical response with high levels of prepotency. The frequency and sequence of NoGo trials should be considered when designing and analyzing inhibition-based ERP tasks.

S69. THE INTERPLAY OF HYPERTENSION, MEDICATION AND SYMPTOM SEVERITY IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

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Hypothesis/Objective: Methylphenidate (MPH) is the most commonly prescribed medication for ADHD. While it improves the main symptoms of ADHD, it can be associated with adverse events such as elevated blood pressure (BP). However, limited research has directly explored the interplay of ADHD symptom severity on blood pressure regardless of medication status. In this study, we investigated the within-subject modulation of BP based on ADHD symptom severity in two groups according to follow-up MPH status: (1) on MPH, (2) off MPH. We expect that BP will be modulated with treatment, pharmacological or otherwise.
Methods: We reviewed patient medical records from Children's Specialized Hospital, NJ (2011-2021). We extracted data for 23 on and 20 off MPH, 6-12 years old (70% males). Data included cardiac measures (pulse rate, systolic, and diastolic BP), medication history, and Vanderbilt scores to assess symptom severity for the initial and follow-up visits.
Results: At baseline, 35 patients had normal BP, and 8 had elevated BP. During the follow-up visit, only 2 patients from the on-MPH group had elevated BP. All children with ADHD showed improved symptoms during the follow-up visit. Mixed-model ANOVA showed a significant interaction of visit (initial vs. follow-up), group (on vs. off MPH) and cardiac measures; all of which were significantly lower during the follow-up visit for both groups.

Conclusions: Our findings suggest that cardiac measures improve with ADHD treatment, pharmacological or otherwise. This study could provide a way of understanding pediatric hypertension and its role in ADHD pathology.

S70. GIVE ME SOMETHING TO BITE ON: A CASE REPORT OF COMPULSIVE BITING AND CHEWING WITH MIXED AMPHETAMINE SALTS

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Hypothesis/Objective: Stimulants are considered to be the first line pharmacological treatment for attention deficit hyperactivity disorder (ADHD). We present a unique case of a patient who developed a chewing compulsion when taking mixed amphetamine salts (MAS).
Methods: A 32 y/o female with a past medical history of gastroesophageal reflux disease, gastroparesis, and migraines was seen for initial psychiatric assessment due to concerns for irritability. She was diagnosed with PTSD, generalized anxiety disorder, ADHD, inattentive type and unspecified bipolar disorder (BD). Lamotrigine was started and titrated to 25 mg bid with improved mood stability. MAS IR was started at 2.5 and titrated to 5 mg daily for ADHD. She then experienced an uncontrollable urge to chew, finding relief when chewing on a child's teething necklace which provided satisfaction and a reduction in anxiety. She denied jaw tightness or teeth grinding in the day or at night. The dose of MAS IR was reduced to 2.5 mg daily with improvement in symptoms and a few months later increased again to 5 mg daily which she was then able to tolerate.
Results: Stereotyped biting behaviors have been observed in rats with use of amphetamines and the onset of compulsive behavior has emerged in children with use of dextroamphetamine, however, this is the first known case of compulsive chewing or biting movements reported in humans with MAS.
Conclusions: This case highlights the need to assess patients for adverse events like compulsive biting and chewing movements or other oral facial stereotypies after commencement of stimulants including MAS.

S71. IMPACT OF PANDEMIC ON TREATMENT UTILIZATION OF PRESCHOOLERS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

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Hypothesis/Objective: A little is known about the impact of the coronavirus pandemic on psychotropic medication use in preschoolers with ADHD. The aim of this study is to identify if treatment utilization patterns were altered during the COVID-19 pandemic in a large nationwide sample of preschool aged youth over the past 6 years.
Methods: A retrospective cohort study using TriNetX was conducted by creating three temporal subgroups: pre-pandemic (Jan 2017 – Feb 2020), pandemic (March 2020 – July 2021, acute phase corresponding school/daycare closings, and remote learning), and post-pandemic (August 2021 – August 2023). The study cohort was defined as patients ages 3-6 diagnosed with ADHD. Odds ratio (OR) and 95% confidence intervals (CIs) were calculated.

Results: All medication classes (CNS stimulants, non-stimulants, antidepressants, polypharmacy, ORs 1.92 to 7.43) and therapy services (OR=2.61, 95% CI 1.84, 3.71) were more frequently utilized during post-pandemic times than during pre-pandemic. ADHD medications (ORs 1.97 to 2.30) and therapy services (OR= 1.80 95% CI 1.24, 2.62) were also more utilized during pandemic versus pre-pandemic periods. The highest odd ratio was for CNS stimulants (OR=7.43, 95% CI 5.46,10.11) during the post-pandemic period.
Conclusions: Rates of most treatments including psychotherapy increased over the course of the coronavirus pandemic. The pandemic-inspired healthcare policy may have led to increased utilization of a wide range of behavioral health services for children. Given the appreciable challenges connecting families with therapy services for their children, extension of these access-improving policies should be considered regardless of the status of the pandemic.

S72. UNDERSTANDING WEB-BASED INFORMATION NEEDS IN ADULTS WITH ADHD AND PARENTS OF CHILDREN WITH ADHD

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Hypothesis/Objective: To determine the information needs and knowledge of ADHD in adults with ADHD and parents of children with ADHD.
Methods: Two independent studies were conducted. In the first study, parents of children with ADHD and adults with ADHD were recruited via email using a list of existing local networks of ADHD parents, advocates, educators, and primary care providers. In the second study with national representation of, individuals seeking ADHD information were surveyed via Amazon Mechanical Turk (MTurk, www.mturk.com). The analyzed data includes 40 adults with ADHD and 50 parents/guardians of children with ADHD in the local group, and 602 adults with ADHD and 510 parents/guardians of children with ADHD in the MTurk group.
Results: The MTurk participants expended more time researching health or medical topics. In both groups, the most common misinformation regarding ADHD was the identification of evidence-based medications. However, many MTurk participants accurately recognized incorrect evidence-based medication information. In contrast, more participants in the local group correctly identified accurate information about evidence-based behavioral treatments for adults with ADHD, Complementary and Alternative Treatments, core symptoms of ADHD, and the diagnostic process. Both groups shared concern about the accuracy of online information related to ADHD and reported experiencing frustration during their internet searches associated with ADHD.
Conclusions: These findings illustrate a concern for the accuracy of the ADHD information available on the internet and frustration. Research that aims to develop and test more effective Methods: to deliver accurate, accessible information related to ADHD is also in progress.

S73. PCP NON-ADHERENCE TO LIKELY ADHD GUIDELINE ELEMENTS PREDICTS EDUCATIONAL NEEDS

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Hypothesis/Objective: A PCP's documented evaluation of a patient suffering from a problem of inattention prior to referral of that patient for further evaluation varies widely. We

hypothesize that the current behavior of PCPs can predict training needed to meet coming performance guidelines.
Methods: 104 adults from family- and internal- medicine clinicians in Rochester MN, were referred to a pilot project for further evaluation and management of possible ADHD over 10 months beginning October 2022. Evaluations prior to referral were reviewed to see whether they included a screening tool, collateral informants, mood or substance use assessment, childhood and current impairments quantified or expressed in narrative, a medical evaluation undertaken, and sleep or eating disorders screened.
Results: PCPs documented an ASRS in 31% of referrals. 76% were screened for mood disorders, and other medical problems possibly causing a problem of inattention sought in 59%. In 49% were current and in 41% childhood impairments were mentioned in narrative; in 15% collateral information was included. Substance use was assessed in 21%, and troubled sleep considered as a cause or consequence of impairment in 12%. Eating disorders were found in 13% but not screened for in any. There were referrals to the pilot in which no PCP assessment was undertaken.
Conclusions: PCPs referring adults to an ADHD pilot program unevenly used and interpreted the ASRS, inconsistently described patient impairments in adulthood or childhood and didn't always speak to substance use. Screening for common comorbidities (eating and sleep disorders) and use of collateral informants were areas of consistent underperformance.

S74. HEALTH RISK BEHAVIORS AMONG YOUTH WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) AND OTHER MENTAL DISORDERS: FINDINGS FROM THE 2015-2017 COMMUNITY-BASED PROJECT TO LEARN ABOUT YOUTH-MENTAL HEALTH (PLAY-MH)

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Hypothesis/Objective: To describe associations between health risk behaviors and ADHD among a community-based sample of students by mental disorder diagnosis criteria, ADHD medication use, and ADHD symptom count.
Methods: Utilizing a two-stage data collection design, teachers within a South Carolina school district screened students at high or low risk for a mental disorder in Stage 1 (n=6,937). A stratified sample of high and low risk 4th-12th graders were selected for Stage 2 (n=380); parents completed the Diagnostic Interview Schedule for Children Version IV and a mental health diagnosis and treatment questionnaire, and students completed the Youth Risk Behavior Survey. Students were categorized as: ADHD, other mental disorders, and no disorder. ADHD medication status and ADHD symptom count were also examined. Weighted prevalence estimates and unadjusted prevalence ratios (PR) with 95% confidence intervals (CI) compared health risk behaviors by diagnosis types, ADHD medication use, and ADHD symptom count.
Results: Students with ADHD experienced more unintentional injuries, screen-time, and violence than those with no disorder (p less than 0.05). Larger percentages of students with medicated ADHD exhibited 2+ hours of screen-time (PR=1.89, CI: 1.25-2.86), weekly soda consumption (PR=1.25, CI: 1.06-1.49), and missing daily fruit/vegetable servings (PR=1.11, CI: 1.01-1.23), and lower prevalence of breakfast skipping (PR=0.43, CI: 0.24-0.79), compared to those without ADHD. Higher ADHD symptom counts were also associated with elevated

screen-time, ADHD medication misuse, physical fights, and weapon possession (p less than 0.05).

Conclusions: A comprehensive approach to addressing health risk behaviors, such as targeted prevention and intervention strategies, may benefit youth with ADHD, regardless of treatment status.

S75. MENSTRUAL CYLE PHASE AND HORMONE EFFECTS ON EMOTIONAL EATING AND EATING BEHAVIORS IN FEMALES WITH ADHD

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Hypothesis/Objective: Women with ADHD are at increased risk of disordered eating and emotional eating (EE). Previous research has shown that cyclical fluctuations in ovarian hormones can predict changes in ADHD symptoms as well as eating behaviors, particularly EE, but so far, no studies have examined the role of ovarian hormones and cycle phase on eating behaviors and EE in females with ADHD, the goal of the current investigation.

Methods: 78 young women (ages 21-25 years) with regular menstrual cycles, overrecruited for ADHD, provided daily ratings of emotional eating, eating behaviors and ADHD symptoms and saliva samples assayed for levels of E2 and P4 for up to two menstrual cycles.

Results: Phase analyses indicated that increased appetite and food cravings were higher during the early luteal phase than the mid-follicular phase ($\beta = -0.231$, $p = 0.024$; $\beta = -0.268$, $p = 0.007$ respectively). Additionally, the desire to eat when there was nothing to do was related to lower E2 and higher P4, while the desire to eat when irritated and the desire to eat when depressed were related to both higher E2 and P4 ($\beta = -0.112$, $p = 0.015$; $\beta = 0.0006$, $p = 0.027$; $\beta = 0.0007$, $p = 0.021$; $\beta = 0.001$, $p = 0.001$, respectively).

Conclusions: Eating behaviors and certain EE items appear to be influenced by cycle phase and ovarian hormones in our sample of women with ADHD. Study findings may inform the design of personalized interventions targeted to cycle phase for eating behaviors in individuals with ADHD.

S76. THE ASSOCIATION BETWEEN SLEEP DURATION AND INATTENTION IN ADOLESCENTS WITH ADHD

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Hypothesis/Objective: Attention-deficit/hyperactivity disorder (ADHD) is highly prevalent (5.6% worldwide). Sleep disturbances are common in ADHD and are believed to influence key symptoms like inattention and hyperactivity-impulsivity. Thus, we investigated the relationship between sleep adequacy and symptoms (inattention and hyperactivity-impulsivity) in adolescents with and without ADHD.

We hypothesized that lower inattention and hyperactivity-impulsivity scores would be associated with higher probability of adequate sleep.

Methods: Participants were 69 ADHD and 64 typically developing (TD) adolescents (12–17-year-olds) from the Mapping Impulsivity's Neurodevelopmental Trajectory (MINT) study. The ADHD group was primarily diagnosed with ADHD Combined Presentation. Sleep duration was assessed with the self-report Youth Risk Behavior Survey. Adequate sleep was defined using age-wise sleep recommendations. Inattention and hyperactivity-impulsivity scores were

taken from the Conners' Parent Rating Scale. Binary logistic regression models controlling for age and sex were conducted using SAS.

Results: Lower inattention scores (p=0.01), but not hyperactivity-impulsivity, were significantly associated with higher likelihood of adequate sleep in the ADHD group only. There were no age or sex differences in adequate sleep between ADHD and TD groups.

Conclusions: These findings highlight the complex relationship between sleep and ADHD symptoms. Future analyses will explore whether inattention drives inadequate sleep or poor sleep contributes to ADHD ratings resulting in a diagnosis of ADHD. Because these participants were overwhelmingly diagnosed with ADHD, Combined Presentation, and thus had symptoms of hyperactivity/impulsivity in addition to inattention, it suggests other factors beyond poor sleep can lead to diagnosis. These findings may inform lifestyle recommendations for ADHD adolescents.

S77. LATENT STRUCTURE OF ADHD SUBTYPES BASED ON SYMPTOMS OF DEPRESSION AND ANXIETY

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Hypothesis/Objective: The differential diagnosis process in identifying ADHD is critical because of the prevalence of comorbidities and the number of overlapping symptoms, especially in adulthood (Pehlivanidis, 2020, Gnanavel, Sharma, Kaushal, and Hussain 2019). To better understand what types of depression and anxiety symptoms are more or less intrinsic to specific subtypes of ADHD, factor mixture modeling was used to identify the latent structure of ADHD symptoms, with subgroups examined for differences in potential symptoms of anxiety and depression.

Methods: The Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003 dataset was used, with a focus on the variables for assessing ADHD, general anxiety disorder, and major depressive disorder. The sample size was 19,826. Mplus 8.0 was used to run all models and the best fitting model was assessed for common trends in symptoms.

Results: Results indicate that there are several groupings of depression and anxiety symptoms that are more related to ADHD subtypes, such as loss of interest being more intrinsic to inattentive ADHD. Certain types of symptoms were also identified as being more likely of a different condition, such as cardiovascular related anxiety symptoms.

Conclusions: Factor mixture modeling can be used to identify symptoms more commonly present in a comorbid or alternative diagnosis, aiding in the diagnostic process of ADHD. The specific symptom groupings identified in the models can also be utilized in specialized treatment plans.

S78. REVISITING THE ROLE OF SEROTONIN IN ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Hypothesis/Objective: Viloxazine ER, while classified as a norepinephrine (NE) reuptake inhibitor, has unique serotonergic modulating properties at clinically relevant doses for ADHD treatment. The role of possible serotonergic mechanisms in ADHD was therefore evaluated.
Methods: A comprehensive literature review was conducted to evaluate the potential involvement of serotonin (5-HT) in the behavioral manifestations of and treatment of ADHD. We specifically evaluated the behavioral consequences of 5-HT depletion in the brain, the impact of standard ADHD treatments on the serotonergic system, and interactions between the serotonergic and catecholaminergic systems in promoting ADHD behavioral phenotypes and treatment efficacy.
Results: Across species, 5-HT deficiency is linked with impulsivity and emotional dysregulation. Preclinical studies demonstrate that 5-HT modulates behavioral responses to standard ADHD treatments, which may result from serotonergic interactions with the catecholaminergic systems. In addition, preclinical and clinical data suggest that targeting specific 5-HT receptor subtypes (e.g., 5-HT2C, 5-HT7) may benefit some individuals with prominent features (i.e., impulsivity, emotional dysregulation) or psychiatric comorbidities (i.e., depression).
Conclusions: The convergence of data across species highlights the potential utility of preclinical models to advance our knowledge of the role of 5-HT in regulating catecholaminergic neurotransmission, which may have implications for understanding the etiology of ADHD and its treatment.

S79. "GENDER-EQUITABLE" CAN BE A DIAGNOSTIC VALIDATOR FOR ADHD

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Hypothesis/Objective: Older conceptualizations of diagnostic validity elaborate validity as an exclusively scientific concept. However, scholars have recently argued that the choice of validators for a specific diagnostic construct is largely driven by what we want the diagnosis to do, by what we value in diagnosis. Currently, health equity is highly valued in medicine. We hypothesize that the concept of "gender-equitable" could be employed as a validator of the Attention-Deficit / Hyperactivity Disorder (ADHD) diagnostic construct to advance health equity.
Methods: We conducted a selective review of literature on the philosophy of psychiatry, gendered ADHD presentations, and feminist critiques of nosology.
Results: The concept of gender-equitable can be used as a diagnostic validator when defined as the extent to which: 1) a diagnostic construct produces similar benefits and harms in females and males. A potentially falsifiable assumption—that ADHD is similarly prevalent and burdensome among both sex/genders—grounds this definition and functions as a corrective to the historically male-focused ADHD research program; or 2) a diagnostic construct performs similarly regarding other validators in females and males. For example, were it demonstrated that the current ADHD construct selectively misses the diagnosis of ADHD in girls who would respond similarly to stimulant treatment as would boys, then the current ADHD construct would be less valid. Objections to these definitions include their problematic, explicitly binary sex/gender distinction.
Conclusions: The concept "gender-equitable" can be applied to the ADHD diagnostic construct as a validator. Its application has the potential to advance health equity.

S38. TREATING EXECUTIVE FUNCTIONS IN YOUTH WITH ADHD: A REVIEW OF INTERVENTIONS

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Hypothesis/Objective: EF deficits are common in youth with ADHD. EF deficits pose functional impairments; however, the extent of interventions addressing EF in youth with ADHD remains unclear. To this end, we conducted a literature review on interventions for EF in youth with ADHD.
Methods: We conducted a review of the literature using PRISMA guidelines. Electronic searches for published literature were conducted across six databases and registers. Included in this review were randomized controlled trials treating EF in youth (less than 26 years) with ADHD. Stimulant-only pharmacotherapy was not included.
Results: Our search identified 135 studies (N= 11,315 subjects). We identified six major intervention categories: nonstimulant pharmacological (N=21), neurological (neurofeedback, others, N=28), psychological (N=30), digital (N=34), physiological/exercise (N=16), and combination (N=4). Most studies employed only neuropsychological testing (N=78) relative to only clinical scales (N=30), while the 27 remaining studies used both; and most studies were short term. The bulk of the evidence supported pharmacology as most effective for EF in youth with ADHD, closely followed by psychological and digital interventions. Physiological interventions largely changed EF but relied largely on test-based EF measures and neurological interventions had mixed results. Combination interventions were generally positive but lacked replication.
Conclusions: There exists a breadth of treatments for EF in youth with ADHD. Pharmacological, psychotherapeutic, and digital interventions had the most favorable, replicable outcomes. However, a lack of standardization limited comparison amongst treatments. More data on the persistence of the interventions' effects over time are necessary.

S48. UNMASKING THE IMPACT OF PARENT AND COPARENT ADHD ON POSTPARTUM MENTAL HEALTH

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Hypothesis/Objective: This study tests the hypothesis that parent (including coparent) ADHD symptoms are associated with postpartum mental health.
Methods: 218 parents (109 mother-father pairs), half with parental ADHD, were enrolled 6-10 months postpartum. Parents completed the Patient Health Questionnaire (depression symptoms), Generalized Anxiety Disorder Screener, Maternal Social Support Index, Parenting Stress Index, and Barkley Adult ADHD Rating Scale (self and partner symptoms). Semi-structured interviews (SCID-5) documented prior history of mood disorders.
Results: Parents in ADHD (47%, n=51) and control pairs did not differ in age, marital status, education, income, or prior mood disorders. Odds of moderate-to-severe postpartum depression or anxiety symptoms were four times higher for parents in ADHD pairs (OR=4.27, 4.74; 95% CI [1.18-2.08], [1.87-12.01]).

Across the sample, using linear regressions, self-reported (β=0.18, 0.15) and coparent ADHD symptoms (β=0.11, 0.11), parenting stress (β=0.12, 0.09), and prior mood disorders (β=2.18, 2.76) were associated with both depression (R^2=0.31) and anxiety (R^2=0.29) symptoms (p less than 0.05).

For mothers, self- and coparent ADHD symptoms (β=0.11, 0.10), parenting stress (β=0.22), and prior mood disorders (β=2.46) were associated with depression symptoms (R^2=0.38), but only coparent ADHD (β=0.10) and prior mood disorders (β=3.45) were associated with anxiety symptoms (R^2=0.31) (p less than 0.05). Among fathers, only self-reported ADHD (β=0.25, 0.24) was associated with either depression (R^2= 0.29) or anxiety (R^2=0.30) symptoms (p less than 0.05).

Conclusions: Postpartum mental health was poorer among new parents when parental ADHD was present. Treating ADHD in new parents may reduce depression and anxiety for those showing ADHD symptoms and their coparents, supporting the mental wellbeing of the whole family.

S51. EXAMINING THE ASSOCIATION OF NEIGHBORHOOD CONDITIONS ON ADHD SYMPTOMS IN AUTISTIC YOUTH USING THE CHILD OPPORTUNITY INDEX 2.0

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Hypothesis/Objective: The quality of neighborhood conditions experienced during childhood has a significant effect on outcomes later in life. In the present study, we examined whether neighborhood conditions at birth are associated with ADHD symptoms in middle childhood/late adolescence in youth with autism (ASD), developmental delay (DD), and in those that are typically developing (TD).

Methods: Data were collected from CHARGE (Childhood Autism Risks from Genetics and the Environment), which assessed children ages 2-5 years and later in the ReCHARGE Study at ages 8-20 years. We assessed the association of neighborhood conditions, as measured by the Child Opportunity Index 2.0 (COI), on ADHD symptoms, as measured by the Aberrant Behavior Checklist, using regression analyses.

Results: Participants (401 males; 123 females) included 246 in the ASD group, 85 in the DD group, and 193 in the TD group. Regression analyses revealed a significant interaction between diagnostic status and COI, such that the lower the COI, the greater ADHD symptoms exhibited by the ASD group relative to TD and DD groups, even after controlling for demographics and family SES. Secondary analyses revealed those with High and Low COI scores had similar levels of ADHD symptoms during early childhood, but by middle childhood/late adolescence, those with low COI scores had significantly higher ADHD symptoms.

Conclusions: The quality of neighborhood conditions during early childhood predict ADHD symptoms in later development, with a stronger relationship in autistic individuals. These findings have important clinical implications and highlight the need for increased and improved resources in poorer neighborhoods to reduce existing disparities.

S54. INCREASED GENETIC RISK FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER POTENTIATES COGNITIVE IMPAIRMENT, TAU PATHOLOGY, AND BRAIN HYPOMETABOLISM IN ALZHEIMER'S DISEASE

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Hypothesis/Objective: Emerging evidence suggests that ADHD is associated with an increased risk for mild cognitive decline (MCI) and dementia due to Alzheimer's disease (AD). However, the impact of ADHD on cognitive function and AD biomarkers in patients with MCI and dementia is not well understood. In this study, we tested the hypothesis that genetic susceptibility to ADHD is associated with worse cognitive function and elevated markers of AD pathology in individuals with cognitive impairment.
Methods: We computed weighted ADHD polygenic risk scores (ADHD-PRS) in 939 cognitively impaired participants (675 MCI and 264 AD; mean age 73.5 years) with genomic information and clinical assessments. A subset underwent CSF analysis for amyloid-β and phosphorylated tau, as well as fluorodeoxyglucose positron emission tomography ([18F] FDG-PET). Regression models were used to assess the association between ADHD-PRS and cognition and AD biomarkers.
Results: Elevated ADHD-PRS was independently associated with worse executive function in both MCI and AD, alongside higher levels of CSF tau pathology in AD. Moreover, an increased genetic risk for ADHD was associated with hypometabolism across widespread cortical and subcortical regions among AD participants, predominantly in frontal and parietal cortices. Mediation analyses revealed that hypometabolism in the parietal cortex mediated the effects of ADHD-PRS on executive function in AD.
Conclusions: ADHD appears to be associated with a more advanced disease presentation in individuals with AD, characterized by impaired executive function, elevated tau pathology, and hypometabolism in frontal and parietal cortices. These findings may indicate the need for a more tailored assessment of cognitive decline and dementia in ADHD.

S60. HYPERACTIVE AND INATTENTIVE SYMPTOMS AS DISTINCT AND COMPLIMENTARY PREDICTORS OF CORTICAL MORPHOLOGY IN ADHD

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Hypothesis/Objective: The purpose of this study was to determine whether hyperactive/impulsive and inattentive symptoms would predict distinct or overlapping cortical morphometry in children across various surface-based morphometry techniques. While previous studies have shown decreases in global gray matter and gyrification using comparative analyses (Ambrosino et al., 2017), it has not been studied whether different dimensions of ADHD would predict unique morphological signatures across multiple surface measurements, including cortical thickness, cortical complexity, gyrification, Toro's gyrification index, and sulcal depth.
Methods: Participants included 73 children, (50.9% boys, 86.8% White; 42 with ADHD, 31 Controls), ages 8-12 years, who participated in a larger study. These children received a T1-weighted MRI scan as part of the study. Parent-reported BASC-2 Attention Problems and Hyperactivity scales were used as predictors in separate analyses where age and sex were controlled.
Results: Although both series of analyses were not significant for predicting cortical thickness as expected, they were significant for the other surface measurements (TFCE, p less than .01). Summary Results: in CAT12 showed overlap in multiple cortical measurements, although

many were subthreshold, perhaps due to shared contributors. Overall, inattention was associated with more temporal and parietal cortical regions that met the significance threshold and hyperactivity/impulsivity with more frontal regions.
Conclusions: This study helps shed further light on the relationship between cortical structure in children with ADHD and clinical symptomology. Additionally, it highlights the complexities of cortical morphology across different measurement techniques using the same sample and the need for further research on the replicability of such findings.