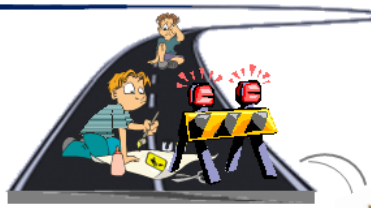
NEWSLETTER



INDICE:

ISTITUTO DI RICERCHE FARMACOLOGICHE MARIO NEGRI · IRCCS

BIBLIOGRAFIA ADHD LUGLIO 2022

Acta Neuropsychol. 2022;20:187-94.

IS ADHD UNDER-DIAGNOSED IN BOSNIA AND HERZEGOVINA? COMPARISON OF CLINICALLY CONFIRMED CASES VS PARENT-REPORTED OF ADHD.

Dizdarevic A, Mujezinovic A, Memisevic H.

Background: Attention Deficit Hyperactivity Disorder (ADHD) is a frequent neurodeve-lopmental disorder characterized by hyperactivity, inattention, and impul-sivity. The issue of whether ADHD is a socially constructed disorder has received much attention. The goal of the present study was to examine the clinical prevalence of ADHD in Bosnia and Herzegovina (BIH). An ad-ditional goal was to investigate the prevalence of school-aged children who fulfill the criteria for the condition but do not have a clinical diagnosis. For the first research goal, the sample consisted of five University Clinical Centers in BIH that provided data on the prevalence. For the second goal, the sample consisted of 1935 parents of children aged 6 to 15 years. Material/

Methods: Parents of 1935 school-aged children from the Federation BIH completed the questionnaire regarding ADHD symptoms. Children ranged in age from 6 to 15 years. The mean age of children was 10.2 years (SD-2.1 years). There were 1061 girls and 874 boys in the sample. Five hospitals in the Federation BIH (4 University Clinical Centers and 1 Cantonal Hos-pital) were sent a questionnaire to provide us with information on how many school-aged children were diagnosed with ADHD and their basic demographic data. In addition, the Clinical Centers were asked to provide information on what treatment they provide to children with ADHD.

Results: The results of this study indicated that clinical diagnosis of ADHD is infrequent. The number of clinically confirmed cases of ADHD in the Federation BIH was 138 or less than 0.001%. On the other hand, ac-cording to survey data, there is a prevalence rate of ADHD indicated like that observed in western countries. According to the parents reports, there were 97 children or 5% who fulfilled the criteria for ADHD diagnosis. In relation to gender distribution of ADHD, there were more boys (88 boys) than girls (50 girls) with a clinically confirmed diagnosis of ADHD and boys were 1.76 times more likely to have a ADHD diagnosis than were girls. On the other hand there were more girls than boys who had ADHD according to parents reports, but this difference, according to the Chi square test, was not statistically significant (X2 = 0.14; p =,70).

Conclusions: The results of this study have clearly shown that ADHD is underdiag-nozed in Bosnia and Herzegovina. There is a huge discrepancy between the clinically diagnosed children and the parent-reported symptoms of ADHD. Given the burden that ADHD has on children and their families it should be of the utmost importance to provide timely diagnosis and proper treatment. One way to improve the current situ-ation is through a better cooperation between school staff (psycholo-gists, teachers), parents, and medical professionals

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Per la ricerca degli articoli pubblicati nella letteratura scientifica nel mese in esame sono state consultate le banche dati Medline, Embase, PsycINFO e PsycArticle utilizzando le seguenti parole chiave (o i loro sinonimi): 'Attention deficit disorder', 'Attention deficit hyperactivity disorder', 'Infant', 'Child', 'Adolescent', 'Human'. Sono qui riportate le referenze considerate rilevanti e pertinenti.

Acta Psychiatr Scand. 2022.

CHILDHOOD SYMPTOMS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND BORDERLINE PERSONALITY DISORDER.

Tiger A, Ohlis A, Bjureberg J, et al.

Objective: Childhood attention-deficit /hyperactivity disorder (ADHD) is known to be associated with adult Borderline Personality Disorder (BPD). We investigated if any of the subdimensions of childhood ADHD, that is, impulsivity, inattention, or hyperactivity was more prominent in this association.

Methods: In a nation-wide cohort (N= 13,330), we utilized parent reported symptoms of childhood ADHD and clinically ascertained adult BPD diagnoses. The summed total scores of ADHD symptoms and its three subdimensions were used and standardized for effect size comparison. Associations were analyzed using Cox regression with sex and birth-year adjustments. Secondary outcomes were BPD-associated traits (i.e., self-harm and substance use) analyzed using logistic- and linear regression respectively.

Results: ADHD symptom severity was positively associated with BPD with a hazard ratio (HR) of 1.47 (95% confidence interval [CI]: 1.22-1.79) per standard deviation increase in total ADHD symptoms. Impulsivity was the most prominent subdimension with the only statistically significant association when analyzed in a model mutually adjusted for all ADHD subdimensions–HR for inattention: 1.15 (95% CI: 0.85ΓÇô1.55), hyperactivity: 0.94 (95% CI: 0.69-1.26), impulsivity: 1.46 (95% CI: 1.12-1.91). In secondary analyses, weak positive associations were seen between total ADHD symptom score and self-harm and substance use. In analyses by subdimensions of ADHD, associations were weak and most prominent for inattention in the model with self-harm.

Conclusion: Childhood ADHD symptoms were associated with subsequent development of BPD diagnosis and appeared to be driven primarily by impulsivity. Our findings are important for understanding the association between childhood symptoms of ADHD and subsequent BPD

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Alcohol Clin Exp Res. 2022;46:268A-9A.

PROBLEMATIC ALCOGOL USE IN ADULTHOOD AS A FUNCTION OF ADHD IN CHILDHOOD, PARENTAL KNOELWDGE IN ADOLESCENCE, AND IMPARIRMENT IN YOUNG ADULTHOOD.

Walther CAP, Wang FL, Kennedy TM, et al.

Children with ADHD are at increased risk for problems with alcohol use in adulthood (Lee et al., 2011). Research examining this risk in adolescence and young adulthood has described mediational pathways through ADHD symptom persistence, delinquency, and social and academic impairment (Molina et al., 2012; 2014), with stronger associations among adolescents with low parental knowledge about their day-to-day behavior. Whether these processes extend into adulthood is unknown. This study tested whether young adult functioning (ADHD symptom persistence, delinquency, social impairment, and educational attainment) continued to mediate ADHD-related risk for problematic alcohol use at age 30 and whether parental knowledge in adolescence exerted lasting effects by moderating these associations in adulthood. Participants from the Pittsburgh ADHD Longitudinal Study (N = 255, 57% = childhood ADHD; 82% = white; 92% = male) were interviewed during adolescence, at age 25 (or 27/29 for ADHD symptom persistence), and at age 30. Participant/parent-reported delinquency, parent-reported social impairment, participant/parent-reported ADHD symptom persistence, and participant-reported highest level of education at age 25 were tested as mediators in the relation between childhood ADHD and participant-reported frequency of past-year heavy drinking (average of binge drinking/drunkenness) and alcohol problems at age 30. Adolescent perception of parental knowledge was tested as a moderator of the mediated pathways (adjusting for gender, race, parent psychopathology, and childhood socioeconomic advantage). For the heavy drinking and alcohol problems models, childhood ADHD was associated with higher young adult social impairment (+¦ = .41, p <.001), lower young adult educational attainment (+¦ = -.47, p <.001), and higher adult ADHD symptom persistence (+¦ = .41, p <.001). Childhood ADHD was associated with lower age 30 heavy drinking (+¦ = -.19, p <.05), but none of the mediation pathways for heavy drinking were significant. An effect of childhood ADHD on more age 30 alcohol problems was mediated by lower young adult educational attainment (+¦ = -.43, p <.05). More parental knowledge during adolescence was associated with higher young adult education (+¦ = .23, p <.05) but did not moderate any of the associations. Coupled with our earlier report of mediation by adolescent GPA, these findings support strengthening academic performance for

individuals with ADHD as they navigate adolescence and early adulthood. Interventions, such as tutoring and organizational support to improve secondary school academic performance, may reduce alcohol problem risk

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Am J Med Genet Part B Neuropsychiatr Genet. 2021;186:412-22.

SEX DIFFERENCES IN ANXIETY AND DEPRESSION IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: INVESTIGATING GENETIC LIABILITY AND COMORBIDITY.

Martin J, Shameem Agha S, Eyre O, et al.

It is unknown why attention deficit hyperactivity disorder (ADHD) is more common in males, whereas anxiety and depression show a female population excess. We tested the hypothesis that anxiety and depression risk alleles manifest as ADHD in males. We also tested whether anxiety and depression in children with ADHD show a different etiology to typical anxiety and depression and whether this differs by sex. The primary clinical ADHD sample consisted of 885 (14% female) children. Psychiatric symptoms were assessed using standardized interviews. Polygenic risk scores (PRS) were derived using large genetic studies. Replication samples included independent clinical ADHD samples (N = 3,794; 25.7% female) and broadly defined population ADHD samples (N = 995; 33.4% female). We did not identify sex differences in anxiety or depression PRS in children with ADHD. In the primary sample, anxiety PRS were associated with social and generalized anxiety in males, with evidence of a sex-by-PRS interaction for social anxiety. These results did not replicate in the broadly defined ADHD sample. Depression PRS were not associated with comorbid depression symptoms. The results suggest that anxiety and depression genetic risks are not more likely to lead to ADHD in males. Also, the evidence for shared etiology between anxiety symptoms in those with ADHD and typical anxiety was weak and needs replication

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ANAE Approche Neuropsychol Apprentiss Enfant. 2021;33:310-18.

A COGNITIVE-FUNCTIONAL (COG-FUN) INTERVENTION MODEL IN OCCUPATIONAL THERAPY FOR CHILDREN WITH ATTENTION DEFICIT DISORDER WITH OR WITHOUT HYPERACTIVITY (ADHD).

Dantin P, Mallet C, Morel AL, et al.

ADHD impacts a person's occupations throughout their life. It affects children's self-care, leisure activities and education. The Cog-Fun approach is an intervention model for Occupational Therapists working with people with Attention deficit hyperactivity disorder (ADHD). A randomized controlled study carried out, in 2014, showed that Cog-Fun had a significant effect on participation and the executive functions for children with ADHD. This approach provides French Occupational Therapists with an innovative intervention model focused on occupational performance for this population

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Appl Psychophysiol Biofeedback. 2022 Sep;47:145-81.

RESULTS OF NEUROFEEDBACK IN TREATMENT OF CHILDREN WITH ADHD: A SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS.

Moreno-Garcia I, Cano-Crespo A, Rivera F.

Attention-deficit/hyperactivity disorder (ADHD) is one of the most prevalent disorders in children and adolescents. Neurofeedback, a nonpharmaceutical treatment, has shown promising results. To review the evidence of efficacy of neurofeedback as a treatment for children and adolescents with ADHD. A systematic review of the specific scientific studies published in 1995-2021, identifying and analyzing randomized controlled trials (RCT). A total of 1636 articles were identified and 165 met inclusion criteria, of which 67 were RCTs. Neurofeedback training was associated with significant long-term reduction in symptoms of ADHD. Though limitations exist regarding conclusions about the specific effects of neurofeedback, the review documents improvements in school, social, and family environments

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Appl Psychophysiol Biofeedback. 2022 Sep;47:223-29.

ALPHA/THETA RATIO NEUROFEEDBACK TRAINING FOR ATTENTION ENHANCEMENT IN NORMAL DEVELOPING CHILDREN: A BRIEF REPORT.

Nan W, Wan M, Jiang Y, et al.

Attention plays an important role in children's development and learning, and neurofeedback training (NFT) has been proposed as a promising method to improve attention, mainly in population with attention problems such as attention deficit hyperactivity disorder. However, whether this approach has a positive effect on attention in normal developing children has been rarely investigated. This pilot study conducted ten sessions of alpha/theta ratio (ATR) NFT on eight primary students in school environment, with two to three sessions per week. The results showed inter-individual difference in NFT learning efficacy that was assessed by the slope of ATR over training sessions. In addition, the attention performance was significantly improved after NFT. Importantly, the improvement of attention performance was positively correlated with the NFT learning efficacy. It thus highlighted the need for optimizing ATR NFT protocol for the benefits on attention at the individual level. Future work can employ a double-blind placebo-controlled design with larger sample size to validate the benefits of ATR NFT for attention in normal developing children

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Arch Gynecol Obstet. 2022 Jul;306:29-35.

IMPACT OF FETAL PRESENTATION ON NEURODEVELOPMENTAL OUTCOME IN A TRIAL OF PRETERM VAGINAL DELIVERY: A NATIONWIDE, POPULATION-BASED RECORD LINKAGE STUDY.

Toijonen A, Heinonen S, Gissler M, et al.

PURPOSE: To assess the risk of adverse neurodevelopmental outcomes at the age of four after an attempted vaginal delivery according to the fetal presentation in birth.

METHODS: This retrospective record linkage study evaluated the risks of cerebral palsy, epilepsy, intellectual disability, autism spectrum disorder, attention-deficit/hyperactivity disorder, and speech, visual, and auditory disabilities among preterm children born after an attempted vaginal breech delivery. The control group comprised children born in a cephalic presentation at the same gestational age. This study included 23 803 singleton deliveries at gestational weeks 24+0-36+6 between 2004 and 2014.

RESULTS: From 1629 women that underwent a trial of vaginal breech delivery, 1122 (66.3%) were converted to emergency cesarean sections. At extremely preterm and very preterm gestations (weeks 24+0-31+6), no association between a trial of vaginal breech delivery and neurodevelopmental delay occurred. At gestational weeks 32+0-36+6, the risks of visual disability (aOR 1.67, CI 1.07-2.60) and autism spectrum disorders (aOR 2.28, CI 1.14-4.56) were increased after an attempted vaginal breech delivery as compared to vaginal cephalic delivery.

CONCLUSION: A trial of vaginal breech delivery at extremely preterm and very preterm gestations appears not to increase the risk of adverse neurodevelopmental outcomes at the age of four. In moderate to late preterm births, a trial of vaginal breech delivery was associated with an increased risk of visual impairment and autism spectrum disorders compared to children born in cephalic presentation. A trial of vaginal preterm breech delivery requires distinctive consideration and careful patient selection

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Assessment. 2022 Sep;29:1134-43.

EVALUATING THE FACTOR STRUCTURE AND CRITERION VALIDITY OF THE CANADIAN LITTLE DCDQ: ASSOCIATIONS BETWEEN MOTOR COMPETENCE, EXECUTIVE FUNCTIONS, EARLY NUMERACY SKILLS, AND ADHD IN EARLY CHILDHOOD.

Hudson KN, Willoughby MT.

The Canadian Little Developmental Coordination Disorder Questionnaire (Little DCDQ-CA) is a parent-report screening instrument that identifies 3- to 4-year-old children who may be at risk for Developmental Coordination Disorder (DCD). We tested the factor structure and criterion validity of the Little DCDQ-CA in a sample of preschool-aged children in the United States (N = 233). Factor analysis indicated that the DCDQ-CA was best represented by one factor. Using cutoff scores that were proposed by the developer, 45% of

the sample was identified as at-risk for DCD. Although a much larger percentage of children was identified as at-risk than would be expected based on the prevalence of formal DCD diagnoses in the population, the Little DCDQ-CA demonstrated good criterion validity. Specifically, compared with their peers, children who exceeded the at-risk criterion demonstrated worse motor competence, executive functioning skills, and early numeracy skills and were rated as having greater ADHD behaviors by their teachers, all consistent with expectations for children who are at risk for DCD. Results are discussed as they relate to future use of the Little DCDQ-CA

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Aust New Zealand J Psychiatry. 2022;56:134-35.

RISK AND PROTECTIVE FACTORS ASSOCIATED WITH MENTAL HEALTH DIFFICULTIES FOR CHILDREN WITH ADHD OVER THE COVID-19 PANDEMIC: A LONGITUDINAL STUDY.

Sciberras E, Stokes MA, Middeldorp C, et al.

Background: A growing number of studies have reported both positive and negative outcomes associated with COVID-19 in children with attention-deficit/hyperactivity disorder (ADHD) and their families. However, very few longitudinal studies have examined outcomes over multiple time points over the pandemic.

Objectives: To examine COVID-19-related mental health (MH) impacts for children with ADHD and their families over a 12-month period over the pandemic.

Methods: The parents of 213 Australian children (5-17 years) with ADHD were recruited in May 2020 when COVID-19 restrictions were in place. Parents completed surveys at repeated time points assessing MH (CoRonavIruS Health Impact Survey [CRISIS] - mood states subscale) and predictors. Latent profile analyses were used to examine the patterns of MH difficulties over the pandemic using the first four waves of data collected from May to August 2020, and the fifth wave of data collected in May-July 2021. Numerous baseline predictors of MH patterns were examined.

Findings: Using the first four waves of data, three groups were identified comprising: (1) children with unchanging (36%), (2) increasing resolved (30%) and (3) increasing persistent (34%) MH difficulties. The most robust predictor of increasing persistent MH difficulties was stress related to COVID-19 (e.g. stress associated with restrictions related to COVID-19). Analyses are being updated to include our fifth wave of data collection (May-July 2021) (70% retention rate).

Conclusion: A subgroup of children with ADHD appears to be struggling with MH, which is related to the stress associated with COVID-19 restrictions

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Aust New Zealand J Psychiatry. 2022;56:100-01.

ATTENTION-DEFICIT HYPERACTIVITY DISORDER (ADHD) AND YOUBG PEOPLE IN NSW CUSTODY.

Le J, Kasinathan J.

Background: Attention-deficit hyperactivity disorder (ADHD) is a disorder characterised by inattention, hyperactivity and impulsiveness, which can negatively impact learning and development and have lifelong implications. ADHD is more prevalent in marginalised groups, including young offenders. International and Australian evidence has more recently increased understanding about the variety of mental health problems that affect young offenders, including ADHD. Objectives: Exploration of ADHD in young offenders cannot be divorced from an increasing understanding that young offenders have high rates of mental illness generally, with a high level of comorbidity. This paper explores a preliminary examination of ADHD and psychiatric disorder comorbidity as elucidated by the Young People in Custody Health Survey (YPiCHS) conducted in NSW in 2015.

Methods: Data were drawn from the 2015 YPiCHS which surveyed 227 young people in NSW Juvenile Detention Centres in 2015. Of 192 youth who participated in the mental health screening, 21% met criteria for ADHD with higher prevalence (27%) in females reported. Participants were grouped into ADHD and non-ADHD based on whether or not they met the criteria for ADHD at the time of assessment and compared on study outcomes.

Findings: Relevant and salient findings will be presented.

Conclusion: Improving our understanding of ADHD youth and comorbid psychiatric disorders in detention may be helpful in informing prevention, intervention, policy and practice

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Autism. 2022.

CLINICIAN FACTORS RELATED TO THE DELIVERY OF PSYCHOTHERAPY FOR AUTISTIC YOUTH AND YOUTH WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Roudbarani F, Tablon Modica P, Maddox BB, et al.

Autistic children and adolescents are more likely than non-autistic youth to experience mental health problems, such as anxiety or depression, but less likely to receive psychotherapy to address these concerns. Recent research indicates that clinician factors, such as knowledge, attitudes, confidence and beliefs, can impact their decisions to provide care, though this work has primarily focused on adults or within the context of one kind of treatment (cognitive behaviour therapy). The current study examined psychological predictors (e.g. attitudes and confidence) of cliniciansΓÇÖ intention to deliver psychotherapy to autistic youth and those with attention-deficit hyperactivity disorder. Participants included 611 clinicians across publicly funded agencies in Ontario, Canada. Multiple mediation analyses revealed that clinician knowledge on mental health-related topics (e.g. core symptoms, developing treatment plans and identifying progress towards treatment goals) was associated with intention to treat autistic clients or clients with attention-deficit hyperactivity disorder, and normative pressures and attitudes partially mediated this association. Clinicians felt less likely to treat autistic clients than clients with attention-deficit hyperactivity disorder, partly because of differences in attitudes, normative pressures and knowledge. This research suggests that targeted training around autism and mental health care may be a useful initiative for agency staff. Lay abstract: Autistic children and youth often experience mental health problems, such as anxiety, depression and behavioural challenges. Although there are therapy programmes that have been found helpful in reducing these issues, such as cognitive behaviour therapy, autistic children often struggle to receive adequate mental health care. CliniciansΓÇÖ knowledge, attitudes, confidence and beliefs about treating mental health problems in autistic people may be related to their choices in providing psychotherapy. Across Ontario, Canada, 611 mental health clinicians, working in publicly funded agencies, completed an online survey about their experiences and opinions on delivering therapy for autistic clients compared to those with attention-deficit hyperactivity disorder. Clinician knowledge was associated with their intention to treat autistic clients or clients with attention-deficit hyperactivity disorder, partly because of their attitudes and the social pressures or values they felt. Clinicians reported feeling less intent on providing therapy to autistic youth compared to youth with attention-deficit hyperactivity disorder because of differences in their attitudes, social pressures and knowledge. This research can inform the training and educational initiatives for mental health practitioners

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Basic and Clinical Pharmacology and Toxicology. 2022;130:43.

INFLUENCE OF AGE ON NOCEBO RESPONSE IN CHILDREN AND ADOLESCENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: A META-REGRESSION ANALYSIS OF 63 STUDIES.

Barcheni M, Albaladejo MF, Saco DR, et al.

Objective: Our study aims to determine the relationship between nocebo response and age in children and adolescents with attention deficit hyperactivity disorder (ADHD).

Material and/or methods: We performed a systematic review with meta-analysis of randomized controlled trials (RCTs) investigating the efficacy of pharmacological interventions for ADHD. Data were retrieved from the Minerva database-« (www.minervadatabase.org), a comprehensive database of ADHD RCTs. Nocebo response was defined as the proportion of patients receiving placebo that experienced Adverse Events (AEs). The relationship between patient age and nocebo response was first studied by means of univariate and multivariate meta-regression. In the multivariate model, we included as moderators those covariates found to be related with nocebo response in other studies, namely: Age, type of drug (stimulant vs. non-stimulant), treatment length, psychotherapy, method for collecting AEs and publication date.

Results: Sixty-three RCTs were included, with 4.229 patients receiving placebo. Most (72.2%) patients were male, had an average age of 10.1 years and a mean baseline ADHD severity of 71.2. The mean treatment duration was 7.5 weeks, the probability of receiving placebo was 37.2%, and the mean number of study centres was 23.6. The pooled nocebo response was 51.9% (95%CI from 47.6% to 56.2%, I2 = 85.2%.) Age was associated with nocebo response (coefficient = 0.17 [SE = 0.04], p value < 0.0001, R2 = 0.14). This relationship did not change significantly after adjusting for the effect of potential confounders.
Conclusions: Nocebo response in ADHD RCT was notable. After adjusting for potential confounders, we found that nocebo response increases with age in children and adolescents with ADHD. Age explains 14% of betweenstudy nocebo response variability. These findings must be interpreted with caution as we analysed aggregated data, which are prone to ecological bias. Studies analysing individual patient data are required to confirm our results

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Basic and Clinical Pharmacology and Toxicology. 2022;130:41.

COMPARISON OF THE TREATMENT RECOMMENDATIONS FORMULATED BY APPRAISE-RS/ TDAPP, A PROTOTYPE OF AUTOMATED, PERSONALIZED, PARTICIPATORY RECOMMENDER SYSTEM, AND CLINICAL PRACTICE GUIDELINES IN A SAMPLE OF SIMULATED ATTENTION DEFICIT HYPERACTIVITY DISORDER PATIENTS.

Cervello XC, Platonenkova EB, Casanovas +, et al.

Objective: To determine the degree of disagreement between treatment recommendations formulated by APPRAISE-RS/TDApp, a prototype of automated, personalized, participatory recommender system, and recent clinical practice guidelines (CPG) in patients with attention deficit hyperactivity disorder (ADHD).
Material and/or methods: We have recently designed APPRAISE-RS; a recommender system development methodology that adapts the GRADE heuristic to formulate automated, up-to-date, participatory and personalized therapeutic recommendations. We have initially applied APPRAISE-RS to ADHD (APPRAISE-RS/ TDApp). APPRAISE-RS/TDApp was tested on 28 simulated ADHD patients, 20 of which were children or adolescents and 8 were adults, 15 had a severe ADHD, 18 had a comorbid disorder and 6 were receiving concomitant medications. The treatment recommendations formulated for these patients by four recent CPGs (USA, Canada, United Kingdom and Spain) were extracted. We determined the degree of disagreement between APPRASE-RS/TDApp and CPGs' recommendations by computing the pharmacological distance (minimum and maximum 0.0 and 3.0 respectively) using the NbN2R ontology that was then applied to draw hierarchical clustering dendrograms.
Results: The mean number recommendations per patient was 2.0 with APPRAISE-RS/TDApp and 7.6 with CPGs. The most frequently recommended drug by APPRAISE-RS/TDApp and CPGs was high doses of methylphenidate (53.6% and 77.4%, respectively). APPRAISE-RS/TDApp recommended not to use pharmacological treatment in 19.7% patients while no CPG made such recommendation. Dendrograms showed that CPGs clustered on one side and APPRAISE-RS/TDApp on the other one.
Conclusions: APPRAISE-RS/TDApp provides treatment recommendations that are different from CPGs' and thus might be a tool for assisting medical decision making

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Behav Ther. 2022.

WHEN ADOLESCENTS EXPERIENCE CO-OCCURRING SOCIAL ANXIETY AND ADHD SYMPTOMS: LINKS WITH SOCIAL SKILLS WHEN INTERACTING WITH UNFAMILIAR PEER CONFEDERATES.

Greenberg A, De Los Reyes A.

Adolescents with elevated social anxiety commonly experience peer-related impairments ΓÇô particularly with same-age, unfamiliar peers ΓÇô stemming from their avoidant behaviors. Yet, peer-related impairments are not unique to social anxiety. For example, adolescents who experience social anxiety may also experience symptoms of attention deficit/hyperactivity disorder (ADHD), which also increase risk for peer-related impairments. Relative to social anxiety, peer-related impairments linked to ADHD symptoms more likely stem from hyperactivity (i.e., approach behaviors). These distinct pathways point to adolescents with elevated social anxiety and ADHD symptoms (i.e., social anxiety + ADHD) experiencing particularly high

peer-related impairments, which commonly manifest as behavioral displays of low social skills when interacting with unfamiliar peers. We tested this notion in a mixed-clinical/community sample of 134 14- to 15-year-old adolescents and their parents. Adolescents participated in a series of social interaction tasks designed to simulate how adolescents interact with same-age, unfamiliar peers. Trained observers independently rated adolescents on observed social skills within these interactions. Both parents and adolescents completed parallel surveys of social anxiety and ADHD symptoms, which we used to identify social anxiety + ADHD adolescents as well as other combinations of social anxiety and ADHD symptoms (i.e., neither, elevated on one but not the other). Adolescents with social anxiety + ADHD displayed significantly lower social skills, relative to all other groups. Among adolescents, social anxiety + ADHD may have a compounding effect on social skills. As such, therapists working with social anxiety + ADHD adolescents should probe for peer-related impairments and factors implicated in the development and maintenance of these impairments

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Behav Interv. 2022 Jul;37:777-90.

USING AN INTERVENTION PACKAGE WITH PERCENTILE SCHEDULES TO INCREASE ON-TASK BEHAVIOR.

Kwak D, Najdowski AC, Danielyan S.

Improving on-task behavior can allow individuals to access more learning opportunities and is especially relevant for individuals with developmental disabilities. The current study examined the efficacy of an intervention package that used percentile schedule of reinforcement, feedback, and application of lower limits to changes in criteria to increase on-task behaviors in children with developmental disabilities. Using a nonconcurrent multiple baseline across participants design, data revealed a functional relationship between the implementation of the intervention and an increase in the percentage of intervals that participants were on task. Overall, the participants' on-task behavior improved from a mean of 32% during baseline to 68% during intervention, with a proportionate percentage change of 118%. Although there is no widely accepted method for shaping, using percentile schedules as part of an intervention package appears to be a promising way to shape behavior. (PsycInfo Database Record (c) 2022 APA, all rights reserved)

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BMC Women's Health. 2022;22.

SELF-EXPERIENCED SEXUAL AND REPRODUCTIVE HEALTH IN YOUNG WOMEN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER A QUALITATIVE INTERVIEW STUDY.

Wallin K, Wallin Lundell I, Hanberger L, et al.

Background: Sexual risk behaviors and struggles in romantic relationships result in higher risk of unplanned pregnancy, sexually transmitted diseases, sexual victimization and lower satisfaction in relationships for young women with Attention Deficit Hyperactivity Disorder (ADHD). There is a need to better understand sexual behaviors and the consequences of relational difficulties to help health professionals promote sexual and reproductive health. To deepen knowledge in this area, this study aimed to identify and describe self-experienced sexual and reproductive health in young women with ADHD.

Methods: A qualitative design was used. Data was collected with individual and focus group interviews with 15 young women, aged 15ΓÇô29, with an ADHD diagnosis, and analyzed with thematic analysis.

Results: Data analysis identified the themes Acceptance of being different and Feeling sexually secure. The women reveal feelings of being different from others without ADHD as they break norms of sexual behavior, struggle with romantic relationships, and have difficulties concentrating during sex. There is a need to be understood and accepted, to not feel judged, and to manage romantic relationships. Self-knowledge helps them to recognize needs for support and to develop strategies that can improve sexual satisfaction. Feeling sexually secure illustrates the women’s need to feel comfortable with their own sexuality and in control in the sexual situation. Low self-esteem and a negative self-image, described as a consequence of living with ADHD, can compromise communication in sexual situations and increase fear of being rejected. Further, misjudging sexual partners and situations can contribute to sexual victimization.

Conclusions: This study provides knowledge of how ADHD affects emotions and sexual behaviors in young women. The results highlight the need for understanding and acceptance by peers and partners. It accentuates the value of involving the partner in counselling and the importance of self-knowledge. Feeling insecure in sexual relationships further implies the importance of early diagnosis to prevent secondary outcomes of ADHD, and the need for sexual victimization screening in professional settings

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Brain Imaging Behav. 2022.

CENTRALITY AND INTERHEMISPHERIC COORDINATION ARE RELATED TO DIFFERENT CLINICAL/BEHAVIORAL FACTORS IN ATTENTION DEFICIT/HYPERACTIVITY DISORDER: A RESTING-STATE FMRI STUDY.

Tarchi L, Damiani S, Fantoni T, et al.

Eigenvector-Centrality (EC) has shown promising results in the field of Psychiatry, with early results also pertaining to ADHD. Parallel efforts have focused on the description of aberrant interhemispheric coordination in ADHD, as measured by Voxel-Mirrored-Homotopic-Connectivity (VMHC), with early evidence of altered Resting-State fMRI. A sample was collected from the ADHD200-NYU initiative: 86 neurotypicals and 89 participants with ADHD between 7 and 18 years old were included after quality control for motion. After preprocessing, voxel-wise EC and VMHC values between diagnostic groups were compared, and network-level values from 15 functional networks extracted. Age, ADHD severity (Connor's Parent Rating-Scale), IQ (Wechsler-Abbreviated-Scale), and right-hand dominance were correlated with EC/VMHC values in the whole sample and within groups, both at the voxel-wise and network-level. Motion was controlled by censoring time-points with Framewise-Displacement > 0.5 mm, as well as controlling for group differences in mean Framewise-Displacement values. EC was significantly higher in ADHD compared to neurotypicals in the left inferior Frontal lobe, Lingual gyri, Peri-Calcarine cortex, superior and middle Occipital lobes, right inferior Occipital lobe, right middle Temporal gyrus, Fusiform gyri, bilateral Cuneus, right Precuneus, and Cerebellum (FDR-corrected-p = 0.05). No differences were observed between groups in voxel-wise VMHC. EC was positively correlated with ADHD severity scores at the network level (at p-value < 0.01, Inattentive: Cerebellum rho = 0.273; Hyper/Impulsive: High-Visual Network rho = 0.242, Cerebellum rho = 0.273; Global Index Severity: High-Visual Network rho = 0.241, Cerebellum rho = 0.293). No differences were observed between groups for motion (p = 0.443). While EC was more related to ADHD psychopathology, VMHC was consistently and negatively correlated with age across all networks

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Brain Sciences. 2022;12.

SEX DIFFERENCES IN SUBSTANCE USE, PREVALENCE, PHARMACOLOGICAL THERAPY, AND MENTAL HEALTH IN ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD).

Castellano-Garcia F, Benito A, Jovani A, et al.

Sex differences are poorly studied within the field of mental health, even though there is evidence of disparities (with respect to brain anatomy, activation patterns, and neurochemistry, etc.) that can significantly influence the etiology and course of mental disorders. The objective of this work was to review sex differences in adolescents (aged 13ΓÇô18 years) diagnosed with ADHD (according to the DSM-IV, DSM-IV-TR and DSM-5 criteria) in terms of substance use disorder (SUD), prevalence, pharmacological therapy and mental health. We searched three academic databases (PubMed, Web of Science, and Scopus) and performed a narrative review of a total of 21 articles. The main conclusions of this research were (1) girls with ADHD are more at risk of substance use than boys, although there was no consensus on the prevalence of dual disorders; (2) girls are less frequently treated because of underdiagnosis and because they are more often inattentive and thereby show less disruptive behavior; (3) together with increased impairment in cognitive and executive functioning in girls, the aforementioned could be related to greater substance use and poorer functioning, especially in terms of more self-injurious behavior; and (4) early diagnosis and treatment of ADHD, especially in adolescent girls, is essential to prevent early substance use, the development of SUD, and suicidal behavior

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Brain Sciences. 2022;12.

ATTENTION DEFICIT HYPERACTIVITY DISORDER ASSESSMENT BASED ON PATIENT BEHAVIOR EXHIBITED IN A CAR VIDEO GAME: A PILOT STUDY.

Sujar A, Bayona S, Delgado-G+¦mez D, et al.

Symptoms of Attention Deficit Hyperactivity Disorder (ADHD) include excessive activity, difficulty sustaining attention, and inability to act in a reflective manner. Early diagnosis and treatment of ADHD is key but may be influenced by the observation and communication skills of caregivers, and the experience of the medical professional. Attempts to obtain additional measures to support the medical diagnosis, such as reaction time when performing a task, can be found in the literature. We propose an information recording system that allows to study in detail the behavior shown by children already diagnosed with ADHD during a car driving video game. We continuously record the participantsΓÇÖ activity throughout the task and calculate the error committed. Studying the trajectory graphs, some children showed uniform patterns, others lost attention from one point onwards, and others alternated attention/inattention intervals. Results show a dependence between the age of the children and their performance. Moreover, by analyzing the positions by age over time using clustering, we show that it is possible to classify children according to their performance. Future studies will examine whether this detailed information about each childΓÇÖs performance pattern can be used to fine-tune treatment

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Child Abuse Negl. 2022 Sep;131:105765.

LIFETIME PSYCHIATRIC DIAGNOSES AMONG ADOLESCENTS WITH SEVERE CONDUCT PROBLEMS - A REGISTER-BASED FOLLOW-UP STUDY.

Manninen M, Koivukangas J, Holm M, et al.

Background: Both delinquency and out-of-home care (OOHC) are associated with a wide spectrum of psychiatric disorders. Reform schools (RS) are Finnish OOHC institutions for adolescents with severe conduct problems.

Objective: We investigated the prevalence of psychiatric diagnoses among individuals with a history of RS placement.

Participants and setting: The data consisted of individuals placed in a RS on the last day of the years 1991, 1996, 2001, 2006 or 2011 (N = 1074) and a matched comparison group (N = 5313).

Methods: Information on lifetime psychiatric diagnoses, grouped into eight categories, was collected from the nationwide health care registry. The follow-up time ranged from 17 to 44 years.

Results: Among RS population, 59.5 % had some psychiatric diagnosis, which was 12-fold compared to general population peers (hazard ratio HR = 12.4). The most prevalent categories were Conduct disorders and/or ADHD (30.7 %, HR = 41.5), Substance use disorders (29.3 %, HR = 16.8,), Other childhood disorders (8.6 %, HR = 11.9) and Personality disorders (10.9 %, HR = 11.6) followed by Mental retardation (6.4 %, HR = 8.4), Schizophrenia spectrum disorders (9.7 %, HR = 7.9), Affective disorders (17.9 %, HR = 7.3), and Disorders of psychological development (6.1 %, HR = 4.4). All differences were statistically significant ($p < .001$).

Conclusions: RS background associates with an excess of psychiatric disorders, which adds to the burden of other known risk factors for adult age well-being. Effective screening and intervention for psychiatric problems should be available both during the RS placement and after-care

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Child Adolesc Psychiatry Ment Health. 2022;16.

THE POTENTIAL SHARED BRAIN FUNCTIONAL ALTERATIONS BETWEEN ADULTS WITH ADHD AND CHILDREN WITH ADHD CO-OCCURRED WITH DISRUPTIVE BEHAVIORS.

Liu N, Jia G, Li H, et al.

Background: Attention-deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder. Many previous studies have shown that the comorbid status of disruptive behaviour disorders (DBD) was a predictor for ADHD persistence into adulthood. However, the brain mechanisms underlying such a

relationship remain unclear. Thus, we aim to investigate whether the brain functional alteration in adults with ADHD could also be detected in children with ADHD co-occurring with disruptive behaviours from both quantitative and categorical dimensions.
Methods: A total of 172 children with ADHD (cADHD), 98 adults with ADHD (aADHD), 77 healthy control children (cHC) and 40 healthy control adults (aHC) were recruited. The whole-brain spontaneous fluctuations in brain activity of each participant were recorded using functional near-infrared spectroscopy (fNIRS), and the functional connectivities (FCs) were calculated. We first compared the FC differences between aADHD and aHC. Then, for the regions with significantly abnormal FCs in aADHD, we further compared these features between cADHD and cHC. In addition, the correlation between these FCs and the conduct disorder (CD)/oppositional defiant disorder (ODD) symptoms were analysed in cADHD. Moreover, to render the results readily interpretable, we compared the FC differences among ADHDCDΓêÆ, subthreshold ADHDCD+ and cHC groups, and among ADHDODDΓêÆ, ADHDODD+ and cHC groups. Finally, we repeated the above analysis after controlling for other comorbidities and core symptoms to diminish the potential confounding effects.
Results: We found that compared with aHC, aADHD showed significantly increased FCs in the VN, DMN, SMN, and DAN. The aforementioned abnormal FCs were also detected in cADHD, however, in an opposite orientation. Notably, these abnormal FCs were positively correlated with CD symptoms. Finally, the subthreshold ADHDCD+ group even exhibited a tendency of adult-like increased FCs compared with the cHC. The results held after controlling for other comorbidities and core symptoms.
Conclusion: This study provides functional neuroimaging evidence that CD might be a risk factor for ADHD persistence into adulthood. Our work highlights the importance of differentiating ADHDCD+ from ADHD and inspiring further understanding of brain development in ADHD

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Child Neuropsychol. 2022.

TURKISH ADAPTATION AND VALIDATION OF THE SHORT-UPPS-P IN ADOLESCENTS AND EXAMINATION OF DIFFERENT FACETS OF IMPULSIVITY IN ADOLESCENTS WITH ADHD.

Eray A, Sigirli D, Yavuz BE, et al.

The short form of the Impulsive Behavior scale (S-UPPS-P) is a widely used scale to measure multiple impulsive personality traits; although it has been translated into many languages, no Turkish translation has been studied to date. Our study had two aims. First, we tested the validity and reliability of the Turkish version of the S-UPPS-P for adolescents. Second, we examined impulsive trait characteristics exhibited by adolescents with ADHD, compared to a community sample. We evaluated the psychometric properties of the Turkish S-UPPS-P scale in 384 adolescents aged 11ΓÇô18 and tested correlations with ADHD symptoms by assessing 41 adolescents diagnosed with ADHD. Our results showed that with a few slight modifications the Turkish translation of the S-UPPS-P scale can validly assess impulsive trait characteristics for Turkish adolescents. The subscales of lack of premeditation, positive urgency, and negative urgency efficiently distinguished between adolescents with ADHD and control subjects. This is the first scale to evaluate the multidimensional nature of impulsivity in Turkish adolescents. This scale is capable of screening various facets of impulsivity in typically developing adolescents as well as those with ADHD, enabling us to enhance our understanding of possible risks for comorbid diseases in the latter group

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Child Neuropsychol. 2022.

THE ASSOCIATION BETWEEN DIETARY ACID LOAD AND RISK OF ATTENTION-DEFICIT HYPERACTIVITY DISORDER: A CASE-CONTROL STUDY.

Ghasemi F, Abbasi K, Ghiasvand R, et al.

Although previous studies have suggested that dietary acid load may be associated with mental health, the relationship between food-induced acid production and odds of attention-deficit hyperactivity disorder remains (ADHD) unclear. The aim of the present study was to evaluate the relationship between dietary renal acid load and odds of ADHD among children. A case-control study was designed to assess the data of 500

children aged 4 to 12 years (200 children with diagnosed ADHD and 300 control group). Patients were clinically diagnosed according to the Diagnostic and Statistical Manual-5th Edition criteria. Subjects in the control group did not have any history of chronic diseases and they were screened for the absence of ADHD. Dietary intake was assessed by a semi-quantitative food frequency questionnaire. The odds of incident ADHD for each unit increase of potential acid load (PRAL) in the raw model showed ~9.8% (OR = 1.098, 95% CI: 1.072, 1.125, p <.001) higher odds of ADHD. In model 1, where age, gender, Body mass index (BMI), and socio-economic status were adjusted, the odds of ADHD was ~10.7% (OR = 1.107, 95% CI: 1.076, 1.140, p <.001). Also, in model 2 (model 1 in addition to energy) the odds was ~10.8% (OR = 1.108, 95% CI: 1.065, 1.152, p <.001). Findings of the present study suggest a possible relationship between oxidative stresses and odds of development of ADHD. Furthermore, the size of the odds ratio is small. It appears that dietary considerations are warranted in order to ameliorate the impact and/or incidence of ADHD

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Child Psychiatry Hum Dev. 2022 Aug;53:635-53.

ADULT-ONSET ADHD: A CRITICAL ANALYSIS AND ALTERNATIVE EXPLANATIONS .

Taylor LE, Kaplan-Kahn EA, Lighthall RA, et al.

Attention deficit/hyperactivity disorder (ADHD) is characterized as a neurodevelopmental disorder. However, data from several recent studies suggest that there may be adults who meet current criteria for ADHD, yet did not experience symptoms until adulthood (i.e., "adult-onset ADHD"). This systematic review evaluated and synthesized the empirical evidence on adult-onset ADHD to answer the question: Is the extant literature strong enough to evaluate adult-onset ADHD? Nine studies met strict inclusion/exclusion criteria. Results suggest that the methodologies of the extant studies were not strong enough to evaluate adult-onset ADHD. Insufficient methodologies provide presently unclear information about the nature of late-onset symptoms. These symptoms seem to exist but their source could be (1) adult-emergent symptoms that were previously surpassed due to lower environmental demands/supportive facilitators, (2) mimics that were not properly assessed, or (3) childhood-onset symptoms that were not detected earlier due to failure to come to clinical attention. Future directions, clinical recommendations, and limitations of the literature and the current review are discussed

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Child Psychiatry Hum Dev. 2022 Aug;53:725-36.

INDICATORS OF SUICIDAL OUTCOMES AMONG 6- TO 12-YEAR-OLD TREATMENT SEEKING YOUTH.

Doyle RL, Fite PJ.

Suicide among elementary school-age youth is vastly understudied despite being a major health concern. This study utilized mediation and moderation models to elucidate the nature of risk factors for suicide by examining the effect emotion dysregulation (of anger, sadness, and worry) has on the relation between ADHD symptoms (hyperactivity/impulsivity and inattention) and suicidal outcomes (suicidal behavior and risk for suicide) in children ages 6 to 12. When accounting for sex, age, depressive symptoms, and emotion dysregulation, hyperactivity/impulsivity was positively associated with suicidal behavior; however, inattention was negatively associated with suicidal behavior. After accounting for the variance associated with sex, age, and depressive symptoms, two interaction effects were evident. At low levels of sadness and worry dysregulation, hyperactivity was positively associated with suicide risk. However, at high levels of sadness and worry dysregulation, hyperactivity was not related to suicide risk. Findings support moderation over mediation

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Child Psychiatry Hum Dev. 2022 Aug;53:786-96.

EFFECTS OF COMORBID DEVELOPMENTAL COORDINATION DISORDER AND SYMPTOMS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER ON PHYSICAL ACTIVITY IN CHILDREN AGED 4-5 YEARS.

James ME, King-Dowling S, Graham JD, et al.

Developmental coordination disorder (DCD) is often comorbid with attention-deficit/hyperactivity disorder (ADHD). While children with DCD engage in less moderate-to-vigorous physical activity (MVPA) compared to typically developing (TD) children, research pertaining to how ADHD affects this relationship is limited. We investigated the effect of ADHD on MVPA among children at risk for DCD (DCDr). 507 children aged 4-5Â years (DCDr=233, TD=274) participated. Motor skills were assessed using the Movement Assessment Battery for Children-2nd edition (DCDr 16th percentile), ADHD symptoms were assessed using the Child Behaviour Checklist, and Actigraph accelerometers measured MVPA over seven days. DCD did not negatively affect MVPA, however, after adjusting for ADHD symptoms, the effect of DCD became significant and was driven by symptoms of inattention. Symptoms of ADHD may be suppressing the negative effects of DCD on MVPA, highlighting the importance of assessing and controlling for ADHD symptoms in this population

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Clin Neuropharmacol. 2022 Jul;45:105-06.

PROBABLE METHYLPHENIDATE-RELATED REVERSIBLE "VISUAL SNOW" IN A CHILD WITH ADHD.

Naguy A, Naguy C, Singh A.

OBJECTIVES: Visual snow syndrome is relatively a recently recognized neurological entity presenting primarily with positive visual disturbance. Etiology is largely speculative.

METHODS: Authors report here on a child case of ADHD that developed a probable visual snow syndrome related to methylphenidate.

RESULTS AND CONCLUSIONS: Although remaining rare, prescribers ought to be cognizant of such unusual methylphenidate-related perceptual alterations

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Clin Neurophysiol. 2022 Aug;140:145-58.

ATTENTION DEFICIT AND HYPERACTIVITY DISORDER DISRUPTS SELECTIVE MECHANISMS OF ACTION.

Coubard OA.

OBJECTIVE: People with attention deficit and hyperactivity disorder (ADHD) present attentional and emotional deficits and show paradoxical qualities such as hyperfocus. Previous studies have reported errors, slowness, and reaction time (RT) variability using eye movements. This study aimed to explore the underlying mechanisms of ADHD further.

METHODS: Thirty French children and teenagers, 15 with ADHD and 15 neurotypical (NT), underwent a saccadic eye movement task. We conducted conventional analysis (movement duration, precision, velocity, RT) and Bayesian analysis.

RESULTS: Saccade duration and velocity failed to differentiate the two groups, whereas amplitude was higher in ADHD than in NT participants. Saccade RT and variability were higher in ADHD than in NT participants. In the Bayesian analysis, ADHD altered the main distribution of saccades and of early saccades but did not influence the express saccade triggering.

CONCLUSIONS: ADHD disrupts two mechanisms of action: it reduces the gain of the decision signal, thus explaining slowness and variability; it quickens the decision process of early responses at the origin of short-latency but controlled movements. SIGNIFICANCE: These premises and their interconnections explain previous observations and support the striatal-frontal wiring of ADHD, thus explaining ADHD complexity in its negative and positive manifestations

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Clin Case Stud. 2022 Jun;21:235-48.

EVALUATION OF AN INDIVIDUALIZED LEVELS SYSTEM TO INCREASE CONSUMPTION FOR AN ADOLESCENT WITH FOOD REFUSAL.

Ripple HE, Smith HM, Whipple H, et al.

A levels system is an intervention that uses a combination of behavioral principles, such as differential reinforcement and response cost, in order to increase appropriate behaviors and simultaneously decrease problem behaviors. Within a levels system, an individual must meet a pre-determined behavioral criterion in order to gain access to various levels of reinforcement. For example, engaging in higher rates of inappropriate behavior will result in access to highly preferred items or activities, while higher rates of inappropriate behavior will access to lesser preferred activities. Although levels systems have been applied in group settings, as well as in the individual treatment of severe problem behavior, their use has not been explored in the treatment of food refusal. The current study implemented a levels system to target increasing the variety and volume of food consumed by a 12-year-old female diagnosed with fetal alcohol spectrum disorder (FASD) effects, mild intellectual disability, and attention-deficit/hyperactivity disorder (ADHD). At the end of her admission, the participant had increased her variety consumed at an age-appropriate volume significantly, as well as the volume of food consumed

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Clin Pediatr. 2022.

PEDIATRIC SCHOOL OUTREACH: CLINICAL NEEDS OF AN URBAN STUDENT POPULATION.

Ng PML, Cohen-Silver J, Yang H, et al.

Pediatric School Outreach (PSO) is a school-based health center (SBHC) in an urban elementary school in Toronto, Canada. PSO focuses on developmental, behavioral, mental health, and educational concerns. A retrospective chart review aimed to characterize demographics, diagnoses, and referrals of patients attending PSO. Of 137 children, ages 2 to 15 years, 73.7% were male; 58.1% had a household annual income of <$30 000 CAD. Possible or confirmed diagnoses included attention deficit hyperactivity disorder (48.5%), learning disability (35.6%), anxiety (22.0%), autism spectrum disorder (16.7%), oppositional defiant disorder (14.4%), and expressive language delay (11.4%). Involvement of community mental health and other agencies was advised in 37.9% of cases. Psychoeducational testing was recommended for 25.0% of patients. Results suggest the need for timely developmental testing, particularly for autism spectrum disorder, and accessible learning disability diagnostic support. There is potential for expansion of interprofessional care at PSO, including psychology, psychiatry, social work, and behavior therapy

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Clin Pediatr. 2022.

TREATING ADHD AND COMORBID ANXIETY IN CHILDREN: A GUIDE FOR CLINICAL PRACTICE.

Leon-Barriera R, Ortegon RS, Chaplin MM, et al.

Attention-deficit hyperactivity disorder (ADHD) is frequently comorbid with anxiety disorders with rates as high as 25% to 50% in children and adolescents. Despite various treatment options for ADHD symptoms, limited research addresses treatment in the context of comorbidity. This article seeks to provide a review of the evidence regarding treatment of this comorbid population. Distinct emotional, cognitive, and behavioral symptoms have been observed in this population, suggesting a need for tailored treatment. Despite common concerns about anxiety exacerbation, stimulant medications demonstrate good tolerability and good response in addressing symptoms. Atomoxetine has also demonstrated some benefit and good tolerability for treating this comorbid population. Selective serotonin reuptake inhibitors can be used as adjunctive treatment for anxiety but require careful monitoring of side effects. Cognitive behavioral therapy (CBT) is an important treatment to improve anxiety symptoms in the absence of significant ADHD symptoms. Psychosocial interventions are also essential to improve outcomes

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Clin Psychopharmacol Neurosci. 2022;20:350-63.

ALTERED ARGININE/NITRIC OXIDE PATHWAY IN CHILDREN DIAGNOSED ATTENTION DEFICIT HYPERACTIVITY DISORDER, AND THE EFFECT OF 10 WEEKS METHYLPHENIDATE TREATMENT.

Doneray E, Yazici KU, Yazici IP, et al .

Objective: In this study, we investigated the levels of arginine, nitric oxide (NO), asymmetric dimethylarginine (ADMA), and adrenomedullin that are presumed to play a role in attention deficit hyperactivity disorder (ADHD) etiology, and to compare the findings with healthy controls.

Methods: Thirty ADHD patients and thirty healthy control subjects aged 6-12 years were included in the study. Sociodemographic data form, Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version; Conners Parent/Teacher Rating Scale-Revised: Long Form; Children's Depression Inventory; and The State-Trait Anxiety Inventory for Children were applied to all cases. All participants included in the study were evaluated in terms of their serum arginine, NO, ADMA, and adrenomedullin levels. Subsequently, methylphenidate treatment was started in ADHD patients and blood parameters were tested again in the tenth week of treatment.

Results: At the start of the study, arginine and ADMA levels were significantly higher and NO and adrenomedullin levels were significantly lower in the ADHD group compared to the control group. Post-treatment arginine and ADMA levels were found to be significantly lower than in the pre-treatment period. There were no significant differences in NO and adrenomedullin levels before and after treatment. There was no correlation between scale scores and blood parameters.

Conclusion: These variations in the blood parameters of the ADHD group seem to be worth further investigation. Studies to be conducted with larger sample groups after longer-term treatment may provide new information about the alterations in neurobiological processes related to ADHD etiology and treatment

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Clin Psychopharmacol Neurosci. 2022;20:259-70.

EFFECTS OF METHYLPHENIDATE ON SOMATIC SYMPTOMS AND BRAIN FUNCTIONAL CONNECTIVITY IN ADOLESCENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: A PILOT STUDY.

Kim SM, Min KJ, Han DH.

Objective: This study aimed to evaluate whether somatic symptoms in adolescents with attention deficit hyperactivity disorder (ADHD) are associated with a dissociative pattern of functional connectivity (FC) within the default mode network (DMN) and whether methylphenidate administration can improve clinical and somatic symptoms. We also evaluated whether the improvement of somatic symptoms is associated with increased FC within the DMN in response to methylphenidate treatment.

Methods: Fifteen male adolescents with somatic symptoms of ADHD and 15 male adolescents with ADHD without somatic symptoms were included. At baseline and after 6 months of methylphenidate treatment, all adolescents were asked to complete questionnaires for the Korean version of the DupaulΓÇÖs ADHD rating scale, the symptom checklist-90revised-somatization subscales, the Beck Depression Inventory, and the Beck Anxiety Inventory. Additionally, a resting-state functional magnetic resonance imaging scan was conducted.

Results: Methylphenidate treatment improved clinical and somatic symptoms in adolescents with ADHD. In addition, it increased brain FC within the DMN from the posterior cingulate cortex (posterior DMN) to the middle prefrontal cortex (anterior DMN). The improvement of somatic symptoms was associated with FC within the DMN from the posteri- or cingulate cortex to the middle prefrontal cortex in ADHD adolescents with somatic symptoms.

Conclusion: Methylphenidate increased brain FC between the anterior and posterior DMN. The improvement of somatic symptoms in adolescents with ADHD was associated with FC within the DMN. The DMN in adolescents with ADHD seems to be associated with the severity of the clinical and somatic symptoms of ADHD

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Clin Psychopharmacol Neurosci. 2022;20:320-29.

ASSOCIATION BETWEEN ATTENTION DEFICIT HYPERACTIVITY DISORDER MEDICATION AND DEPRESSION: A 10-YEAR FOLLOW-UP SELF-CONTROLLED CASE STUDY.

Oh Y, Joung YS, Kim J.

Objective: There is clinical concern that the stimulant methylphenidate (MPH) might increase the risk of depression, particularly in children. This study aimed to investigate the association between MPH use and the risk of depression.

Methods: A population-based electronic medical records database was used. We obtained claims data for prescription of ADHD medication, diagnosis of depression, and prescription of antidepressant medication between January 2007 and December 2016 for 43,259 individuals aged 6 to 19 who were diagnosed with ADHD between July 1, 2007 and December 31, 2007. The final analysis was based on 2,330 eligible participants. A self-controlled case series design was used to identify risk factors for major depressive disorder (MDD).

Results: An elevated MDD risk was found during the 90 days before MPH exposure, with an incidence rate ratio (IRR) of 12.12 (95% confidence interval [95% CI]: 10.06-14.61, p 0.0001). During methylphenidate treatment, the IRR was 18.06 with a 95% CI of 16.67 to 19.56 (p 0.0001), but it returned to baseline levels after day 31 of MPH treatment discontinuation. The IRR for patients aged 6 to 9 years was 13.11 (95% CI: 9.58-17.95) during the 90 days before MPH exposure, and 17.7 (95% CI: 15.6 20.08) during MPH treatment, but returned to baseline levels after discontinuation of MPH treatment.

Conclusion: We confirmed the temporal relationship between depression and methylphenidate use in young people with ADHD. Though the absolute risk is low, the risk of depression should be carefully considered, particularly in the period directly following the start of methylphenidate treatment

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Clinical Schizophrenia and Related Psychoses. 2022;16.

ATYPICAL FUNCTIONAL CONNECTIVITY OF LIMBIC NETWORK IN ATTENTION DEFICIT/HYPERACTIVITY DISORDER.

Nyatega CO, Qiang L, Jajere MA, et al.

Objective: Previous neuroimaging works have been used to research abnormal functional connectivity in patients with Attention Deficit/Hyperactivity Disorder (ADHD). Although most of these studies relied on static functional connectivity, we instead attempt to explore dynamic functional connectivity changes associated with the limbic network connectivity in ADHD.

Methods: We applied sliding window approach to the resting-state functional magnetic resonance imaging data of 25 children with ADHD and 23 Typically-Developing Controls (TD) to generate temporal correlations maps, then we evaluated the average and variability of the limbic structures to the whole brain network functional connectivity in each window.

Results: In ADHD compared to TD during eight minutes and twenty two seconds of scanning time, dynamic resting-state analyses revealed increased average of limbic network connectivity in three different seconds of the seventh minute (i.e fourth, sixth and eighth) and increased variability within all temporal windows in the fifth minute 22 seconds to 32 seconds and between fifth minute 38th second to sixth minute 14th second. ADHD group also reported stronger correlation ($r=0.62$, $p<0.001$) between in-scanner head motion and ages compared to the TD group ($r=-0.1$, $p<0.001$). Moreover, static functional connectivity (long-range) did not reveal significant differences between the groups.

Conclusion: Our findings suggest that dynamic functional connectivity analyses might be crucial in characterizing abnormal patterns in ADHD and that the exploitation of these dynamics in further investigations may serve as potential indicators of ADHD

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CMAJ Canadian Medical Association Journal. 2012;184:755-62.

INFLUENCE OF RELATIVE AGE ON DIAGNOSIS AND TREATMENT OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN.

Morrow RL, Garland EJ, Wright JM, et al.

Background: The annual cut-off date of birth for entry to school in British Columbia, Canada, is Dec. 31. Thus, children born in December are typically the youngest in their grade. We sought to determine the influence of relative age within a grade on the diagnosis and pharmacologic treatment of attention-deficit/ hyperactivity disorder (ADHD) in children.

Methods: We conducted a cohort study involving 937 943 children in British Columbia who were 6-12 years of age at any time between Dec. 1, 1997, and Nov. 30, 2008. We calculated the absolute and relative risk of receiving a diagnosis of ADHD and of receiving a prescription for a medication used to treat ADHD (i.e., methylphenidate, dextroamphetamine, mixed amphetamine salts or atomoxetine) for children born in December compared with children born in January.

Results: Boys who were born in December were 30% more likely (relative risk [RR] 1.30, 95% confidence interval [CI] 1.23-1.37) to receive a diagnosis of ADHD than boys born in January. Girls born in December were 70% more likely (RR 1.70, 95% CI 1.53-1.88) to receive a diagnosis of ADHD than girls born in January. Similarly, boys were 41% more likely (RR 1.41, 95% CI 1.33-1.50) and girls 77% more likely (RR 1.77, 95% CI 1.57-2.00) to be given a prescription for a medication to treat ADHD if they were born in December than if they were born in January.

Interpretation: The results of our analyses show a relative-age effect in the diagnosis and treatment of ADHD in children aged 6-12 years in British Columbia. These findings raise concerns about the potential harms of overdiagnosis and overprescribing. These harms include adverse effects on sleep, appetite and growth, in addition to increased risk of cardiovascular events. -® 2012 Canadian Medical Association or its licensors

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CNS Spectr. 2022.

FUNCTIONAL DYSCONNECTIVITY OF CEREBELLUM AND ATTENTION NETWORKS IN EMOTIONAL DYSREGULATION SHARED BETWEEN ATTENTION DEFICIT HYPERACTIVITY DISORDER AND MAJOR DEPRESSIVE DISORDER: A MULTIMODAL IMAGING STUDY.

Shun-Chin J, Hsu JW, Huang KL, et al.

Background: Emotional dysregulation (ED) is a common characteristic of both attention deficit hyperactivity disorder (ADHD) and major depressive disorder (MDD), especially in adolescents. However, whether specific shared neural networks in ED remains unknown.

Methods: In total adolescents with clinical ED-22 adolescents with ADHD and with MDD-were recruited; in addition, 29 sex-and age-matched healthy controls were included. Resting-state functional connectivity (RSFC) analysis, voxel-based morphometry, and diffusion tensor imaging analysis were performed for each patient. In addition, we determined the significant regions of interest in patients with ED due to ADHD and MDD as compared with healthy controls and tested their correlations with clinical rating scale scores.

Results: Compared with healthy controls, patients with ED had greater RSFC in the cerebellum and supramarginal gyrus (SMG), especially between vermis VI and the SMG in the attention networks, and lower RSFC between the right supplementary motor area and right lateral parietal area. Lower gray matter volume in the SMG was also found. RSFC was significantly correlated with clinical rating scale scores for all patients with ED due to ADHD or MDD. Gray matter change was correlated with ED and MDD rating scale scores.

Discussion: The cerebellum and attention networks might play major roles in ED pathophysiology in adolescents with ADHD and MDD. Increased connectivity of the vermis to the SMG serves as a possible underlying neural network

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Cochrane Database Syst Rev. 2014;2014.

TRICYCLIC ANTIDEPRESSANTS FOR ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) IN CHILDREN AND ADOLESCENTS.

Otasowie J, Castells X, Ehimare UP, et al.

Background: Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder of childhood onset, which may persist into adulthood. ADHD has a significant impact on a child's daily life, affecting relationships and academic performance. Its core symptoms include developmentally inappropriate levels of inattention, hyperactivity, and impulsive behaviour. Tricyclic antidepressants (TCAs) are sometimes used as second line of treatment in the reduction of ADHD symptoms in children and adolescents with ADHD. However, their efficacy is not yet known.

Objectives: To assess the efficacy of TCAs in the reduction of ADHD symptoms within the broad categories of hyperactivity, impulsivity, and inattentiveness in young people aged 6 to 18 years with established diagnoses of ADHD.

Search methods: On 26 September 2013, we searched CENTRAL, Ovid MEDLINE, Embase, PsycINFO, CINAHL, seven other databases, and two trials registers. We also searched the reference lists of relevant articles, and contacted manufacturers and known experts in the field to determine if there were any ongoing trials or unpublished studies available.

Selection criteria: Randomised controlled trials (RCTs), including both parallel group and cross-over study designs, of any dose of TCA compared with placebo or active medication in children or adolescents with ADHD, including those with comorbid conditions.

Data collection and analysis: Working in pairs, three review authors independently screened records, extracted data, and assessed trial quality. We calculated the standardised mean differences (SMD) for continuous data, the odds ratio (OR) for dichotomous data, and 95% confidence intervals (CIs) for both. We conducted the meta-analyses using a random-effects model throughout. We used the Cochrane 'Risk of bias' tool to assess the risk of bias of each included trial and the GRADE approach to assess the quality of the body evidence.

Main results: We included six RCTs with a total of 216 participants. Five of the six trials compared desipramine with placebo; the remaining trial compared nortriptyline with placebo. One trial compared desipramine with clonidine and placebo, and another compared two TCAs (desipramine and clomipramine) with methylphenidate and placebo. Of the six trials, one RCT primarily assessed the efficacy of TCA in children with ADHD and comorbid tic or Tourette disorder, and another one trial was in children with comorbid tic disorder. RCTs that met our inclusion criteria varied both in design and quality, and none were free of bias. The quality of the evidence was low to very low according to our GRADE assessments. TCA outperformed placebo regarding the proportions of patients achieving a predefined improvement of core ADHD symptom severity (OR 18.50, 95% CI 6.29 to 54.39, 3 trials, 125 participants, low quality evidence). In particular, there was evidence that desipramine improved the core symptoms of ADHD in children and adolescents as assessed by parents (SMD -1.42, 95% CI -1.99 to -0.85, 2 trials, 99 participants, low quality evidence), teachers (SMD -0.97, 95% CI -1.66 to -0.28, 2 trials, 89 participants, low quality evidence), and clinicians (OR 26.41, 95% CI 7.41 to 94.18, 2 trials, 103 participants, low quality evidence). Nortriptryline was also efficacious in improving the core symptoms of ADHD in children and adolescents as assessed by clinicians (OR 7.88, 95% CI 1.10 to 56.12). Desipramine and placebo were similar on "all-cause treatment discontinuation" (RD -0.10, 95% CI -0.25 to 0.04, 3 trials, 134 participants, very low quality evidence). Desipramine appeared more efficacious than clonidine in reducing ADHD symptoms as rated by parents (SMD -0.90, 95% CI -1.40 to -0.40, 1 trial, 68 participants, very low quality evidence) in participants with ADHD and comorbid tics or Tourette syndrome. Although this Cochrane Review did not identify serious adverse effects in patients taking TCAs, it did identify mild increases in diastolic blood pressure and pulse rates. Also, patients treated with desipramine had significantly higher rates of appetite suppression compared to placebo whilst nortriptyline resulted in weight gain. Other reported adverse effects included headache, confusion, sedation, tiredness, blurred vision, diaphoresis, dry mouth, abdominal discomfort, constipation, and urinary retention.

Authors' conclusions: Most evidence on TCAs relates to desipramine. Findings suggest that, in the short term, desipramine improves the core symptoms of ADHD, but its effect on the cardiovascular system remains an important clinical concern. Thus, evidence supporting the clinical use of desipramine for the treatment of children with ADHD is low

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Cochrane Database Syst Rev. 2022 Jul;7:CD013136.

STIMULANT AND NON-STIMULANT DRUG THERAPY FOR PEOPLE WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND EPILEPSY.

Eaton C, Yong K, Walter V, et al.

BACKGROUND: Attention Deficit Hyperactivity Disorder (ADHD) can co-occur in up to 40% of people with epilepsy. There is debate about the efficacy and tolerability of stimulant and non-stimulant drugs used to treat people with ADHD and co-occurring epilepsy. OBJECTIVES: To assess the effect of stimulant and non-stimulant drugs on children and adults with ADHD and co-occurring epilepsy in terms of seizure frequency and drug withdrawal rates (primary objectives), as well as seizure severity, ADHD symptoms, cognitive state, general behaviour, quality of life, and adverse effects profile (secondary objectives).

SEARCH METHODS: We searched the following databases on 12 October 2020: Cochrane Register of Studies (CRS Web), MEDLINE (Ovid, 1946 to 9 October 2020), CINAHL Plus (EBSCOhost, 1937 onwards). There were no language restrictions. CRS Web includes randomised or quasi-randomised controlled trials from PubMed, Embase, ClinicalTrials.gov, the World Health Organization International Clinical Trials Registry Platform (ICTRP), the Cochrane Central Register of Controlled Trials (CENTRAL), and the Specialised Registers of Cochrane Review Groups including Epilepsy.

SELECTION CRITERIA: We included randomised controlled trials of stimulant and non-stimulant drugs for people of any age, gender or ethnicity with ADHD and co-occurring epilepsy.

DATA COLLECTION AND ANALYSIS: We selected articles and extracted data according to predefined criteria. We conducted primary analysis on an intention-to-treat basis. We presented outcomes as risk ratios (RRs) with 95% confidence intervals (CIs), except for individual adverse effects where we quoted 99% CIs. We conducted best- and worst-case sensitivity analyses to deal with missing data. We carried out a risk of bias assessment for each included study using the Cochrane risk of bias tool and assessed the overall certainty of evidence using the GRADE approach.

MAIN RESULTS: We identified two studies that matched our inclusion criteria: a USA study compared different doses of the stimulant drug osmotic-release oral system methylphenidate (OROS-MPH) with a placebo in 33 children (mean age 10.5 Â± 3.0 years), and an Iranian study compared the non-stimulant drug omega-3 taken in conjunction with risperidone and usual anti-seizure medication (ASM) with risperidone and ASM only in 61 children (mean age 9.24 Â± 0.15 years). All children were diagnosed with epilepsy and ADHD according to International League Against Epilepsy and Diagnostic and Statistical Manual of Mental Disorders, fourth edition, criteria, respectively. We assessed both studies to be at low risk of detection and reporting biases, but assessments varied from low to high risk of bias for all other domains. OROS-MPH No participant taking OROS-MPH experienced significant worsening of epilepsy, defined as: 1. a doubling of the highest 14-day or highest two-day seizure rate observed during the 12 months before the trial; 2. a generalised tonic-clonic seizure if none had been experienced in the previous two years; or 3. a clinically meaningful intensification in seizure duration or severity (33 participants, 1 study; low-certainty evidence). However, higher doses of OROS-MPH predicted an increased daily risk of a seizure ($P < 0.001$; 33 participants, 1 study; low-certainty evidence). OROS-MPH had a larger proportion of participants receiving 'much improved' or 'very much improved' scores for ADHD symptoms on the Clinical Global Impressions for ADHD-Improvement tool (33 participants, 1 study; low-certainty evidence). OROS-MPH also had a larger proportion of people withdrawing from treatment (RR 2.80; 95% CI 1.14 to 6.89; 33 participants, 1 study; moderate-certainty evidence). Omega-3 Omega-3 with risperidone and ASM were associated with a reduction in mean seizure frequency by 6.6 seizures per month (95% CI 4.24 to 8.96; 56 participants, 1 study; low-certainty evidence) and an increase in the proportion of people achieving 50% or greater reduction in monthly seizure frequency (RR 2.79, 95% CI 0.84 to 9.24; 56 participants, 1 study; low-certainty evidence) compared to people on risperidone and ASM alone. Omega-3 with risperidone and ASM also had a smaller proportion of people withdrawing from treatment (RR 0.65, 95% CI 0.12 to 3.59; 61 participants, 1 study; low-

certainty evidence) but a larger proportion of people experiencing adverse drug events (RR 1.40, 95% CI 0.44 to 4.42; 56 participants, 1 study; low-certainty evidence) compared to people on risperidone and ASM alone.
AUTHORS' CONCLUSIONS: In children with a dual-diagnosis of epilepsy and ADHD, there is some evidence that use of the stimulant drug OROS-MPH is not associated with significant worsening of epilepsy, but higher doses of it may be associated with increased daily risk of seizures; the evidence is of low-certainty. OROS-MPH is also associated with improvement in ADHD symptoms. However, this treatment was also associated with a large proportion of treatment withdrawal compared to placebo. In relation to the non-stimulant drug omega-3, there is some evidence for reduction in seizure frequency in children who are also on risperidone and ASM, compared to children who are on risperidone and ASM alone. Evidence is inconclusive whether omega-3 increases or decreases the risk of adverse drug events. We identified only two studies - one each for OROS-MPH and omega-3 - with low to high risk of bias. We assessed the overall certainty of evidence for the outcomes of both OROS-MPH and omega-3 as low to moderate. More studies are needed. Future studies should include: 1. adult participants; 2. a wider variety of stimulant and non-stimulant drugs, such as amphetamines and atomoxetine, respectively; and 3. additional important outcomes, such as seizure-related hospitalisations and quality of life. Clusters of studies which assess the same drug - and those that build upon the evidence base presented in this review on OROS-MPH and omega-3 - are needed to allow for meta-analysis of outcomes

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Complement Ther Med. 2022;70.
PARENT-ADMINISTERED PEDIATRIC TUINA FOR THE TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER SYMPTOMS: PROCESS EVALUATION OF A PILOT RANDOMIZED CONTROLLED TRIAL.
Chen SC, Cheng HL, Han LF, et al.
Background: A pilot randomized controlled trial (RCT) was conducted in mainland China to examine the feasibility, acceptability, and preliminary effects of parent-administered pediatric tuina on attention deficit hyperactivity disorder (ADHD) symptoms in preschool children. An embedded process evaluation was performed to explore barriers and facilitators in the implementation, identify additional questions, and refine the study design for a future fully powered study.
Methods: The process evaluation comprises the following parts: (a) self-reported questionnaires on parents (n = 43), traditional Chinese medicine (TCM) practitioners (n = 2), outcome assessor (n = 1), and research assistant (n = 1); (b) parent logbook on parent-administered pediatric tuina (n = 32); and (c) focus group interview sessions (n = 15). Accomplishment of the self-report questionnaires was voluntary for all participants and compulsory for research personnel and TCM practitioners. The parent logbook on the intervention was filled out by all participants in the intervention group. Participants of focus group interviews were selected via purposive sampling, and data were analyzed with template analysis. Qualitative findings were summarized in tables, while the mean was calculated to reflect the quantitative findings.
Results: Perceived benefits, acceptability of parents and children, and professional support from the research team facilitated the implementation of the intervention. Meanwhile, the TCM pattern identification using online mode may limit the accuracy and lead to parents doubting the precision of the TCM pattern. This limitation was regarded as a major barrier. Parents perceived improvements in terms of children's appetite, sleep quality, and parent-child relationship. Participants were generally satisfied with the settings of parent-administered pediatric tuina and showed satisfactory adherence to the implementation.
Conclusions: Implementation of parent-administered pediatric tuina intervention is feasible and acceptable. The intervention can be refined by improving the TCM pattern identification procedure and adjusting outcome settings in a fully powered study in the future

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Computers in Biology and Medicine. 2022;148.

INVESTIGATING THE DISCRIMINATION OF LINEAR AND NONLINEAR EFFECTIVE CONNECTIVITY PATTERNS OF EEG SIGNALS IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND TYPICALLY DEVELOPING CHILDREN.

Talebi N, Motie Nasrabadi A.

Background: Analysis of effective connectivity among brain regions is an important key to decipher the mechanisms underlying neural disorders such as Attention Deficit Hyperactivity Disorder (ADHD). We previously introduced a new method, called nCREANN (nonlinear Causal Relationship Estimation by Artificial Neural Network), for estimating linear and nonlinear components of effective connectivity, and provided novel findings about effective connectivity of EEG signals of children with autism. Using the nCREANN method in the present study, we assessed effective connectivity patterns of ADHD children based on their EEG signals recorded during a visual attention task, and compared them with the aged-matched Typically Developing (TD) subjects.

Method: In addition to the nCREANN method for estimating linear and nonlinear aspects of effective connectivity, the direct Directed Transfer Function (dDTF) was utilized to extract the spectral information of connectivity patterns.

Results: The dDTF results did not suggest a specific frequency band for distinguishing between the two groups, and different patterns of effective connectivity were observed in all bands. Both nCREANN and dDTF methods showed decreased connectivity between temporal/frontal and temporal/occipital regions, and increased connection between frontal/parietal regions in ADHDs than TDs. Furthermore, the nCREANN results showed more left-lateralized connections in ADHDs compared to the symmetric bilateral inter-hemispheric interactions in TDs. In addition, by fusion of linear and nonlinear connectivity measures of nCREANN method, we achieved an accuracy of 99% in classification of the two groups.

Conclusion: These findings emphasize the capability of nCREANN method to investigate the brain functioning of neural disorders and its strength in preciously distinguish between healthy and disordered subjects

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Curr Opin Anaesthesiol. 2022 Aug;35:442-47.

LONG-TERM COGNITIVE AND BEHAVIORAL OUTCOMES FOLLOWING EARLY EXPOSURE TO GENERAL ANESTHETICS.

Ing C, Bellinger DC.

PURPOSE OF REVIEW: Nearly 100 clinical studies have been published evaluating neurodevelopmental outcomes in children following surgery and anesthesia. These studies have reported mixed results, likely attributable at least in part to significant heterogeneity in their study designs, types and numbers of exposures, patient populations evaluated, and most importantly, the outcomes that were assessed. This review aims to summarize the results from clinical studies evaluating behavioral outcomes in children exposed to surgery and anesthesia.

RECENT FINDINGS: Children with early exposure to surgery and anesthesia were found to have limited to no differences in intelligence when compared with unexposed children. However, several studies have reported more behavioral problems in children exposed to general anesthesia. An increased incidence of attention-deficit hyperactivity disorder has also been reported in anesthetic exposed children, particularly after multiple exposures.

SUMMARY: Nearly all clinical studies of anesthetic neurotoxicity are observational in nature, so the associations between anesthetic exposure and behavioral deficits cannot yet be directly attributed to the anesthetic medication. However, the finding of deficits in some neurodevelopmental domains and not others will help guide the selection of appropriate outcomes in future studies of anesthetic neurotoxicity that can further evaluate whether anesthetic medications have an impact on neurodevelopment in children

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Curr Opin Pediatr. 2022 Aug;34:306-12.

CARING FOR ADOLESCENTS AND YOUNG ADULTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN PRIMARY CARE: SEIZING OPPORTUNITIES TO ADDRESS YOUTH MENTAL HEALTH NEEDS.

Driscoll H, Kimberg AD, Chung RJ.

PURPOSE OF REVIEW: To provide primary care providers (PCPs) with updated practical guidance around the assessment and management of attention-deficit/hyperactivity disorder (ADHD) in adolescents and young adults (AYA).

RECENT FINDINGS: Of the three different presentations of ADHD delineated in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), the Predominantly Inattentive presentation is the most common among AYA. Multiple rating scales exist to assist clinicians in identifying ADHD symptoms and monitoring treatment effects. Importantly, ADHD frequently persists into adulthood with negative impacts in many life domains if left untreated. It is important for PCPs to provide support for AYA as they transition to adulthood, as treatment adherence often drops sharply at that time, and, once treatment is discontinued, it is rarely restarted. Further, clinicians should be aware of the negative psychological, behavioral, and social impacts that COVID-19 has had on AYA with ADHD.

SUMMARY: AYA with ADHD often seek care first from PCPs. However, diagnosis and management of ADHD among AYA are challenging, and many clinicians feel ill-equipped, creating concern that many youth may go undiagnosed and untreated. Despite these long-standing challenges, recent advances have opened up critical opportunities for PCPs to proactively address ADHD in primary care settings and make a profound impact on youth as they seek to realize their full potential

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Curr Med Res Opin. 2022.

PAEDIATRIC ADVERSE EVENT RATING SCALE: A MEASURE OF SAFETY OR EFFICACY? NOVEL ANALYSIS FROM THE MADDY STUDY.

Leung BMY, Srikanth P, Gracious B, et al.

Objective: The Pediatric Adverse Event Rating Scale (PAERS) measured adverse events of children aged 6-12 years with ADHD and emotional dysregulation in the Micronutrients for ADHD in Youth (MADDY) study, an eight week multi-site randomized clinical trial of a broad-spectrum multinutrient treatment. Treatment sensitivity of the PAERS was assessed by calculating the treatment difference in change of the item scores from baseline to end of the RCT.

Methods: Principal component analysis retained 14 adverse events (out of 43 in the PAERS) that reflected ADHD symptoms and emotional dysregulation and was used to group the variables of interest. A combined score ranging from 0 to 5 was created based on symptom presence, functional impairment, and severity. Mean score change was calculated from baseline to week 8 by treatment (multinutrient vs placebo) with intention-to-treat and per-protocol samples. The study has been registered on clinicaltrials.gov as Micronutrients for ADHD in Youth (MADDY) Study, trial registration # NCT03252522 (https://clinicaltrials.gov/ct2/show/NCT03252522).

Results: The 126 children in the ITT sample had a mean age of 9.8 (SD = 1.7), with majority (73%) male, and 72% diagnosed with ADHD prior to the study screening. Baseline presence of PAERS symptoms was similar between treatment groups: the highest proportion was ADHD symptoms, followed by Irritable symptoms. The micronutrient group showed a greater decrease (improvement) in the mean anxiety combined score than the placebo group with a between-group difference in change of 0.36 (95% CI: 0.67, 0.04; p =.03) with ITT data and 0.48 (95% CI: 0.81, 0.15; p =.005) with per-protocol (n = 93) data.

Conclusion: The multinutrient supplement did not result in more adverse events than placebo, suggesting it is a safe intervention. In addition to assessing actual adverse events, the PAERS may be a useful adjunct outcome measure for ADHD behaviors

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Dev Med Child Neurol. 2022;64:69-70.

PARENT'S PERSPECTIVES ON PARTICIPATION OF YOUNG CHILDREN WITH ATTENTION DEFICIT HYPERACTIVE DISORDER, DEVELOPMENTAL COORDINATION DISORDER, AND/OR AUTISM SPECTRUM DISORDER: A SYSTEMATIC REVIEW.

Coussens M, Van Waelvelde H, Desoete A, et al.

Introduction: During the early years of a child's life, participation is essential for learning and development. Children with disabilities are at risk for decreased participation. The interplay between environment and participation is identified as one of the most important factors influencing successful participation. The objective of this scoping review was to synthesize peer-reviewed literature about barriers and facilitators of participation according to the perspective of parents of children younger than six years with attention deficit hyperactivity disorder, autism spectrum disorder and/or developmental coordination disorder.

Methods: The scoping review followed Arksey and O'Malley's framework. Relevant. studies were identified by a comprehensive search of scientific databases (PubMed and Web of Science). Studies describing perspectives of parents regarding their child's participation, written in English, published between 2001-September 2017 were included.

Results: A total of 854 articles were retrieved with 13 meeting the criteria. Elements contributing to perceived barriers and facilitators were identified and organized according to the International Classification of Functioning, Child-Youth (ICF-CY) framework. Concepts contained in these studies were linked to 'activities and participation' (general tasks and demands such as bedtime and dinner routines and social, civic life such as play and leisure). Environment-focused factors identified were situated on 'support and relationships', 'attitudes', 'services, systems and policies'.

Conclusion: The review revealed guidelines focusing on family-centered care, communication with and providing information to parents with young children with developmental disabilities (ADHD, DCD and/or ASD)

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Dev Neuropsychol. 2022 Jul;47:193-209.

DECISION-MAKING AND RISKY BEHAVIOR IN INDIVIDUALS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A 10-YEAR LONGITUDINAL STUDY.

Orm S, Pollak Y, Fossum IN, et al.

We assessed 85 children with Attention-Deficit/Hyperactivity Disorder (ADHD) and 50 typically developing children (TD) (Mage = 11.59, 57.8% boys) with the Hungry Donkey Task (HDT) at baseline and 2-year follow-up, and the Iowa Gambling Task at 10-year follow-up (75% retention). Improvement in the proportion of advantageous choices was observed from two- to 10-year follow-up, but the ADHD group improved less and was outperformed by the TD group at the 10-year follow-up. More advantageous choices on the HDT at baseline predicted less risky behavior at 10-year follow-up. Male sex and more inattentive or externalizing symptoms at baseline predicted more risky behavior

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Emot Behav Difficulties. 2022;27:1-2.

EDITORIAL.

Daniels H.

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Environ Res. 2022;214.

PM2.5 EXPOSURE AND INCIDENT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER DURING THE PRENATAL AND POSTNATAL PERIODS: A BIRTH COHORT STUDY.

Chang YC, Chen WT, Su SH, et al.

Only a few studies have assessed the effects of fine particulate matter (PM2.5) exposure during the prenatal and postnatal periods on the development of attention-deficit/hyperactivity disorder (ADHD). We investigated

the association of exposure to PM2.5 during pregnancy and early life with ADHD. This birth cohort consisted of 425,736 singleton live-term births between 2004 and 2015 in Taiwan. Daily PM2.5 concentrations were derived from a 1-km satellite-based estimation model. A time-dependent Cox model was used to assess the effects of PM2.5 on ADHD during the first, second, and third trimesters and from age 1ΓÇô5 years after birth. The distributed lag nonlinear model was utilized to explore the doseΓÇôresponse relationship. Total 9,294 children were diagnosed with ADHD during the study period. The hazard ratio (HR) of ADHD was significantly associated with a 10 ++g/m3 increase in PM2.5 during the first trimester (HR = 1.26; 95% confidence interval [CI]: 1.13-1.40) and increased at PM2.5 over 16 ++g/m3. For postnatal periods, the HR of ADHD was significantly associated with increased PM2.5 at the first to third year of life (HR ranged between 1.40 and 1.87). According to the dose-response relationship of exposure to PM2.5 at the third year of life, the HR of ADHD was significantly associated with PM2.5 above 16 ++g/m3 and sharply increased as PM2.5 >50 ++g/m3. We did not observe a significant modification of sex on the relation between PM2.5 and ADHD. Exposure of pregnant women to PM2.5 above 16 ++g/m3 from conception to the early life of their children may increase the risk of ADHD. The government should improve the criteria for air quality control and meet the WHO air quality guidelines to protect pregnant women and children from developing ADHD in the future

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Eur Arch Psychiatry Clin Neurosci. 2022 Aug;272:827-38.

HANDEDNESS IN BIPOLAR DISORDERS IS ASSOCIATED WITH SPECIFIC NEURODEVELOPMENTAL FEATURES: RESULTS OF THE BD-FACE COHORT.

Mallet J, Godin O, Mazer N, et al.

OBJECTIVES: High rates of non-right-handedness (NRH) and mixed-handedness exist in neurodevelopmental disorders. Dysfunctional neurodevelopmental pathways may be implicated in the underlying pathophysiology of bipolar disorders (BD), at least in some subgroups. Yet little is known about correlates of NRH and mixed-handedness in BD. The objectives of this national study are to determine (i) the prevalence of NRH and mixed-handedness in a well-stabilized sample of BD individuals; (ii) if NRH/mixed-handedness in BD is associated with a different clinical, biological and neurocognitive profile.

METHODS: We included 2174 stabilized individuals. Participants were tested with a comprehensive battery of neuropsychological tests. Handedness was assessed using a single oral question. Learning and/or language disorders and obstetrical complications were recorded using childhood records. Common environmental, clinical and biological parameters were assessed.

RESULTS: The prevalence of NRH and mixed-handedness were, respectively, 11.6 and 2.4%. Learning/language disorders were found in 9.7% out of the total sample and were associated with atypical handedness (only dyslexia for mixed-handedness ($p<0.01$), and dyslexia and dysphasia for NRH ($p=0.01$ and $p=0.04$, respectively). In multivariate analyses, NRH was associated with a younger age of BD onset (aOR 0.98 (95% CI 0.96-0.99) and lifetime substance use disorder (aOR 1.40 (95% CI 1.03-1.82) but not with any of the cognitive subtasks. Mixed-handedness was associated in univariate analyses with lifetime substance use disorder, lifetime cannabis use disorder (all $p<0.01$) and less mood stabilizer prescription ($p=0.028$). No association was found between NRH or mixed-handedness and the following parameters: trauma history, obstetrical complications, prior psychotic symptoms, bipolar subtype, attention deficit/hyperactivity disorder, peripheral inflammation or body mass index.

CONCLUSIONS: Handedness may be associated with specific features in BD, possibly reflecting a specific subgroup with a neurodevelopmental load

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Eur J Paediatr Neurol. 2022 Jul;39:30-34.

MELATONIN USAGE IN CHILDREN AND YOUNG ADULTS, A REGISTRY-BASED COHORT STUDY.

Tedroff K, von EM, DahlÃ©n E.

Sleep disorder is common in children and adolescents, particularly in those with attention deficit hyperactivity disorder (ADHD) or autism spectrum disorder (ASD). While non-pharmacological treatment is first line, occasionally an add-on of an oral drug is needed. The endogenous hormone melatonin is increasingly used

for sleep disorders in children and adolescents. In this registry-based cohort study we follow dispensation of melatonin in young individuals, 0-25 years of age, in Stockholm, Sweden during 2016-2019. In all 9980 individuals, were dispensed melatonin in 2016 and followed for 3 years. Child psychiatrist was the most common prescribing specialty, 55% of all prescriptions. Only 20% had a recorded diagnosis of sleep disorder. The majority, 65% had a neuro psychiatric diagnose. Half of the individuals had at least 4 prescribed drugs dispensed during the follow-up. Almost half of our cohort were dispensed melatonin during the entire study period and doses and volumes of drug dispensed increased by 50 and 100%, respectively. Continuous medication was most common among children 6-12 years, where 7 out of 10 individuals were still adherent after three years. As long-term safety data is lacking, we find this concerning, and this illustrates the need of long-term follow-up of melatonin use in children and young individuals

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Eur Child Adolesc Psychiatry. 2021.

AGE AT SCHOOL ENTRY AND REPORTED SYMPTOMS OF ATTENTION-DEFICIT/HYPERACTIVITY IN FIRST GRADERS: RESULTS OF THE PROSPECTIVE COHORT STUDY IKIDS.

Diefenbach C, Schmidt MF, Huss M, et al.

Young age at school entry (ASE) is related to attention-deficit/hyperactivity disorder in higher grades. The reason for this association is unclear, but medical oversupply and stress-related factors are discussed. We aimed to investigate whether ASE is associated with reported symptoms of attention-deficit/hyperactivity (ADH) already in first grade. Data of a population-based prospective cohort study (N = 2003; Mainz-Bingen region; Rhineland-Palatinate; Germany) with baseline assessments prior to school entry and two follow-ups during first grade were analysed. ADH symptoms were assessed by parent and teacher versions of the Strengths and Difficulties Questionnaire. Associations between ASE and scores of the hyperactivity/inattention subscale (range 0ΓÇô10) were investigated by regression analysis and adjusted for potential confounders and baseline symptoms prior to school entry. In total, 1633 children (52% boys, mean ASE 6.5-áyears) were included. There were no relationships between ASE and parent-reported scores of the hyperactivity/inattention subscale prior to school entry and 3-ámonths thereafter. However, at the end of first grade, ASE was negatively associated with the hyperactivity/inattention subscale in parent (ΓêÆ-á0.7 subscale points per year ASE, standard error = 0.16, p < 0.0001) and teacher reports (ΓêÆ-á1.2 subscale points per year ASE, standard error = 0.25, p < 0.0001). This ASE effect appeared more pronounced in girls than in boys. Young ASE is related to more reported symptoms of ADH at the end of first grade, but not before. The evolvement of this effect during first grade may be a clue to ASE-related stress factors

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Eur Child Adolesc Psychiatry. 2022.

MATERNAL PRE-PREGNANCY BMI AND OFFSPRING HYPERACTIVITYΓÇÔINATTENTION TRAJECTORIES FROM 3 TO 8-ÁYEARS IN THE EDEN BIRTH COHORT STUDY.

Dow C, Galera C, Charles MA, et al.

Evidence suggests obesity during pregnancy is associated with offspring attention-deficit hyperactivity disorder. However, studies have been limited to evaluating the association at a single age with inadequate data on important maternal lifestyle confounders and unmeasured familial confounding. The objective of this study was to examine the association between maternal pre-pregnancy body mass index (BMI) and child hyperactivity-inattention symptoms (HIS) at 3, 5 and 8-áyears. Data came from the EDEN mother-child cohort. Maternal pre-pregnancy BMI status (kg/m2) was calculated using pre-pregnancy weight and height (self-reported by mothers or measured by midwives). HIS were assessed by parental-report on the Strengths and Difficulties Questionnaire at 3, 5 and 8-áyears of age and used to derive developmental trajectories of HIS (n = 1428). Multivariate models were adjusted for confounders including socioeconomic status, maternal lifestyle behaviours (exercise, diet, smoking, alcohol), childcare and a stimulating home environment. Paternal BMI was used as a negative control. Compared to a normal pre-pregnancy BMI, pre-pregnancy maternal obesity was positively associated with increased odds of a high HIS trajectory between 3 and 8-áyears old in both unadjusted and adjusted logistic regression (adjusted odds ratio [aOR] 1.87 [95% CI 1.12,

3.12]). Pre-pregnancy overweight was not significantly associated after adjustment for confounders (aOR 1.32 [0.87, 2.01]). Maternal pre-pregnancy obesity, but not overweight, was associated with increased likelihood of a high HIS trajectory in children from 3 to 8-áyears old. This association persisted despite controlling for many important maternal lifestyle factors and paternal BMI. Further research is warranted to identify possible mediators involved

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Eur Child Adolesc Psychiatry. 2022.

TRENDS IN USE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER MEDICATION AMONG CHILDREN AND ADOLESCENTS IN SCANDINAVIA IN 2010-2020.

Sorensen AMS, Wesselh+Âft R, Andersen JH, et al.

The objective of the study was to compare the use of attention deficit hyperactivity disorder (ADHD) medication among children and adolescents in Scandinavia 2010ΓÇô2020. Using aggregated prescription data for individuals aged 5-19years, we calculated annual prevalence proportions of ADHD medication (users/1000 inhabitants) for each country, overall and stratified by age and sex. Overall, use of ADHD medication increased during 2010-2020 in all countries. The increase was pronounced in Sweden reaching 35 users/1000 inhabitants in 2020 (119% increase), whereas it reached 22/1000 in Denmark and Norway (equivalent to a 38% and 16% increase, respectively). Methylphenidate was the most frequently used drug and Sweden had the highest use reaching 25/1000 in 2020 compared to 16/1000 and 18/1000 in Denmark and Norway, respectively. Lisdexamfetamine use increased steadily and was also highest in Sweden (13/1000 in 2020). In 2020, atomoxetine use was higher in Sweden (4.6/1000) and Denmark (4.5/1000) compared to Norway (2.2/1000). From 2015, use of guanfacine increased in Sweden reaching 4.4/1000 in 2020 but remained low in Denmark (0.4/1000) and Norway (0.7/1000). Use of dexamphetamine was low (ranging from 0.47 to 0.75/1000 in 2020) in the three countries. ADHD medication use was highest in Sweden across all age groups. In all countries, the prevalence was higher in males compared to females.-áIn conclusion, use of ADHD medication among children and adolescents in Scandinavia is increasing. The prevalence of use is higher in Sweden for all drug groups compared to Norway and Denmark

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Eur Child Adolesc Psychiatry. 2022.

OPTIMISING THE MANAGEMENT OF CHILDREN WITH CONCOMITANT BLADDER DYSFUNCTION AND BEHAVIOURAL DISORDERS.

Eliezer DD, Lam C, Smith A, et al.

Bladder dysfunction and behavioural disorders in children are commonly concomitant; hence, it is difficult to treat each in isolation. Pharmacotherapy is common treatment for behavioural disorders, and these medications may have intended or unintended positive or negative bladder sequelae. This review identifies the literature regarding the effects of behavioural pharmacotherapy on bladder functioning and possible bladder management strategies in children with concomitant behaviour and bladder disorders to enable clinicians to better manage both conditions. A PROSPERO registered PRISMA-guided review of three major databases was performed. After an initial scoping study revealed significant heterogeneity, a narrative approach was undertaken to discuss the results of all relevant cases relating to children being treated with pharmacotherapy for behaviour disorders and outcomes related to bladder function. Studies were screened to identify those that described effects of commonly prescribed medications in children with behavioural disorders such as stimulants, alpha 2 agonists, tricyclic antidepressants (TCA), serotonin and noradrenergic reuptake inhibitors (SNRI), selective serotonin reuptake inhibitors (SSRI) and antipsychotics, and the findings and implications were summarised. The review identified 46 studies relevant to behavioural pharmacotherapy and bladder function (stimulants (n = 9), alpha 2 agonists (n = 2), TCAs (n = 7), SNRIs (n = 8), SSRIs (n = 8) and antipsychotics (n = 6). Six studies focused specifically on bladder management in children with behavioural disorders with concurrent behavioural pharmacotherapy. This review identifies useful factors that may assist clinicians with predicting unintended bladder effects following initiation of behavioural pharmacotherapy to facilitate the best approach to the treatment of bladder dysfunction in

children with behavioural disorders. With this evidence, we have provided a useful decision-making algorithm to aide clinicians in the management of these dual pathologies

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Eur Child Adolesc Psychiatry. 2022.

THE PERSISTENT EFFECTS OF FOETAL GROWTH ON CHILD AND ADOLESCENT MENTAL HEALTH: LONGITUDINAL EVIDENCE FROM A LARGE POPULATION-BASED COHORT.

Dooley N, Healy C, Cotter D, et al.

Low birth weight for oneΓÇÖs gestational age is associated with higher rates of child psychopathology, however, most studies assess psychopathology cross-sectionally. The effect of such foetal growth restriction appears to be strongest for attention problems in childhood, although adult studies have found associations with a range of outcomes, from depression to psychosis. We explore how associations between foetal growth and psychopathology change across age, and whether they vary by sex. We used a large nationally representative cohort of children from Ireland-á(N ~ 8000). Parents completed the Strengths and Difficulties Questionnaire (SDQ) at 3 time points (age 9, 13 and 17). Outcomes included a total problems scale and subscales measuring attention/hyperactivity, peer, conduct and emotional problems. Foetal growth had significant associations with all problem scales, even after controlling for sex, socioeconomic factors and parental mental health. The magnitude of these effects was small but relatively stable across ages 9ΓÇô17. In males, foetal growth had the strongest associations with attention/hyperactivity and peer problems, whereas females showed more widespread associations with all four subscales. There was a trend for the association between foetal growth and emotional problems to increase with advancing age, approaching the borderline-abnormal threshold by age 17. Reduced foetal growth predicted persistently higher scores on all measured aspects of child and adolescent psychopathology. Associations with child attention/hyperactivity may generalize to a wider array of adult psychopathologies via adolescent-onset emotional problems. Future studies should explore potential age-dependent effects of foetal growth into the early 20s

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European Journal of Contraception and Reproductive Health Care. 2022;27:253-60.

MATERNAL POLYCYSTIC OVARY SYNDROME AND THE POTENTIAL RISK OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND AUTISM SPECTRUM DISORDER IN THE OFFSPRING: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Abu-Zaid A, Bhagavathula AS, Rahmani J, et al.

Objective: Autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) are two increasing important problems among children. This study aims to explore the link between maternal polycystic ovary syndrome (PCOS) and the risk of ASD and ADHD in the offspring.

Method: The MOOSE guidelines were followed in the conduct of this meta-analysis. A literature search was done in PubMed/MEDLINE, Scopus, and Web of Science from inception until January 2021. The DerSimonian and Laird random-effects model was used to estimate the combined risk ratios (RR) and 95% confidence intervals (CI). Sensitivity analysis was also used to investigate the effect of each study on the combined results.

Results: Seven studies, with 1,358,696 participants, comprising 7,334 ADHD cases and 3,920 ASD cases, were included in this study. Children born to mothers with maternal PCOS had higher risks of developing ASD (RR = 1.46, 95% CI: 1.26-1.69, I2 = 64%) and ADHD (RR = 1.43, 95% CI: 1.35-1.41, I2 = 0%) when compared with children born to mothers without maternal PCOS.

Conclusion: This study showed that there might be a link between maternal PCOS and the risk of developing ASD and ADHD in the offspring. This important issue must be considered in PCOS women during and after pregnancy

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Front Human Neurosci. 2022 Jun;16.

INTRINSIC FUNCTIONAL CONNECTIVITY IN THE DEFAULT MODE NETWORK DIFFERENTIATES THE COMBINED AND INATTENTIVE ATTENTION DEFICIT HYPERACTIVITY DISORDER TYPES.

Saad JF, Griffiths KR, Kohn MR, et al.

Neuroimaging studies have revealed neurobiological differences in ADHD, particularly studies examining connectivity disruption and anatomical network organization. However, the underlying pathophysiology of ADHD types remains elusive as it is unclear whether dysfunctional network connections characterize the underlying clinical symptoms distinguishing ADHD types. Here, we investigated intrinsic functional network connectivity to identify neural signatures that differentiate the combined (ADHD-C) and inattentive (ADHD-I) presentation types. Applying network-based statistical (NBS) and graph theoretical analysis to task-derived intrinsic connectivity data from completed fMRI scans, we evaluated default mode network (DMN) and whole-brain functional network topology in a cohort of 34 ADHD participants (aged 8–17 years) defined using DSM-IV criteria as predominantly inattentive (ADHD-I) type (n = 15) or combined (ADHD-C) type (n = 19), and 39 age and gender-matched typically developing controls. ADHD-C were characterized from ADHD-I by reduced network connectivity differences within the DMN. Additionally, reduced connectivity within the DMN was negatively associated with ADHD-RS hyperactivity-impulsivity subscale score. Compared with controls, ADHD-C but not ADHD-I differed by reduced connectivity within the DMN; inter-network connectivity between the DMN and somatomotor networks; the DMN and limbic networks; and between the somatomotor and cingulo-frontoparietal, with ventral attention and dorsal attention networks. However, graph-theoretical measures did not significantly differ between groups. These findings provide insight into the intrinsic networks underlying phenotypic differences between ADHD types. Furthermore, these intrinsic functional connectomic signatures support neurobiological differences underlying clinical variations in ADHD presentations, specifically reduced within and between functional connectivity of the DMN in the ADHD-C type

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Front Human Neurosci. 2022;16.

NEURAL MECHANISMS UNDERLYING THE EFFECTS OF NOVEL SOUNDS ON TASK PERFORMANCE IN CHILDREN WITH AND WITHOUT ADHD.

Tegelbeckers J, Brechmann A, Breitling-Ziegler C, et al.

Distractibility is one of the key features of attention deficit hyperactivity disorder (ADHD) and has been associated with alterations in the neural orienting and alerting networks. Task-irrelevant stimuli are thus expected to have detrimental effects on the performance of patients with ADHD. However, task-irrelevant presentation of novel sounds seems to have the opposite effect and improve subsequent attentional performance particularly in patients with ADHD. Here, we aimed to understand the neural modulations of the attention networks underlying these improvements. Fifty boys (25 with ADHD) participated in a functional magnetic resonance imaging (fMRI) study in which unique (novel) or repeatedly presented (familiar) sounds were placed before a visual flanker task in 2/3 of the trials. We found that presenting any sound improved task performance in all participants, but the underlying neural mechanisms differed for the type of sound. Familiar sounds led to a stronger increase in activity in the left posterior insula in patients with ADHD compared to typically developing peers. Novel sounds led to activations of the fronto-temporoparietal ventral attention network, likewise in ADHD and TD. These changes in signaling by novelty in the right inferior frontal gyrus were directly related to improved response speed showing that neural orienting network activity following novel sounds facilitated subsequent attentional performance. This mechanism of behavioral enhancement by short distractions could potentially be useful for cognitive trainings or homework situations

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Frontiers in Neurology. 2022;13.

SLUGGISH COGNITIVE TEMPO IN PEDIATRIC SICKLE CELL DISEASE.

Hardy SJ, Forman S, Hardy KK, et al.

Background: Sickle cell disease (SCD) imparts risk for a range of neurodevelopmental and neurocognitive disorders. Sluggish cognitive tempo (SCT) is a distinct syndrome that often co-occurs with attention-

deficit/hyperactivity disorder (ADHD) but has not been described in SCD. We investigated the reliability and validity of a SCT measure in SCD and examined associations with biopsychosocial risk factors and functional outcomes.
Materials and Methods: Caregivers (n = 85) of children with SCD ages 7-16 reported on socio-demographics and the Kiddie-Sluggish Cognitive Tempo (K-SCT) measure, Behavior Rating Inventory of Executive Function, and Conners 3. Disease-related characteristics were extracted from health records.
Results: The K-SCT demonstrated excellent internal consistency (+¦ = 0.92) and test-retest reliability (r = 0.82, p < 0.001). K-SCT scores were correlated with ADHD-Inattention (r = 0.64, p < 0.001) and ADHD-Hyperactive/Impulsive (r = 0.46, p < 0.001) scores, as well as functional outcomes, including learning problems (r = 0.69, p < 0.001). In multivariate analyses controlling for ADHD symptoms, SCT accounted for unique variance in learning (b = 9.67, p < 0.01) and executive functioning (b = 5.93, p < 0.01). Nearly all participants (93%) with elevated levels of co-occurring SCT and ADHD-Inattention symptoms had significant learning problems.
Conclusion: The K-SCT is a reliable and valid measure of SCT in SCD. SCT symptoms are associated with learning difficulties even after controlling for ADHD symptoms. Further research is needed to understand the biopsychosocial factors that lead to SCT symptoms in SCD and examine long-term implications of SCT

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Frontiers in Neuroscience. 2022;16.
DISSOCIATION IN NEURAL CORRELATES OF HYPERACTIVE/IMPULSIVE VS. INATTENTIVE SYMPTOMS IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Luo Y, Adamek JH, Crocetti D, et al.
Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders characterized in current diagnostic criteria by two dominant symptoms, inattention and hyperactivity/impulsivity. Here, we show that task-related alpha (8ΓÇô12 Hz) interhemispheric connectivity changes, as assessed during a unimanual finger-tapping task, is correlated with inattentive symptom severity (r = 0.55, p = 0.01) but not with severity of hyperactive/impulsive symptoms. Prior published analyses of the same dataset have already show that alpha event-related desynchronization (ERD) in the hemisphere contralateral to unimanual tapping is related to hyperactive/impulsive symptom severity (r = 0.43, p = 0.04) but not to inattentive symptom severity. Our findings demonstrate a neurobiological dissociation in ADHD symptom severity, with implications for understanding the structure of endophenotypes in the disorder as well as for biomarker development

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Frontiers in Neuroscience. 2022;16.
SLEEP DISTURBANCE AND ITS ASSOCIATION WITH SLUGGISH COGNITIVE TEMPO AND ATTENTION IN PEDIATRIC BRAIN TUMOR SURVIVORS.
Olsthoorn IM, Holland AA, Hawkins RC, et al.
Background: Pediatric brain tumor (PBT) survivors are at risk for developing sleep disturbances. While in other pediatric populations sleep disturbance has been associated with worse cognitive functioning, it is unclear to what extent this relationship generalizes to PBT survivors. The aim of the current study was to assess the relationship between sleep disturbance and aspects of cognition, including sluggish cognitive tempo (SCT) as well as attention and working memory.
Materials and Methods: Eighty-three PBT survivors 6ΓÇô18 years of age who were at least 3 months post-treatment were included in the present cross-sectional study. Level of sleep disturbance was measured as a composite score reflecting various sleep problems as rated by caregivers. Cognitive measures included caregiver-ratings of sluggish cognitive tempo and attention problems, as well as performance-based cognitive measures assessing attention and executive functioning. Hierarchical regression analysis was used to assess associations between sleep and cognition.
Results: Of all caregivers, 32.5% reported one or more sleep disturbances as very/often true and over 68% of caregivers rated at least one sleep-related item as somewhat true. Of all cognitive variables, scores were

most frequently impaired for SCT (30%). A higher level of sleep disturbance was associated with worse SCT and parent-rated attention problems. Associations between sleep and performance-based cognitive measures assessing attention and working memory were not statistically significant.
Conclusion: Findings of the current study highlight the importance of further investigation into the relationship between sleep and cognition in PBT survivors, which may assist efforts to maximize cognitive outcome and health-related quality of life in PBT survivors. The current study additionally suggests further investigation of SCT in this population is warranted, as it may be more sensitive to detecting possible associations with sleep disturbance relative to discrete measures that assess cognitive performance under ideal circumstances

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Frontiers in Pediatrics. 2022;10.
ATTITUDES OF PRIMARY SCHOOL TEACHERS AND ITS ASSOCIATED FACTORS TOWARD STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN DEBRE MARKOS AND DEJEN TOWNS, NORTHWEST ETHIOPIA.
Amha H, Azale T.
Background: Although most instructors appear to understand visible disability, they appear to have a negative attitude toward children with attention deficit hyperactivity disorder (ADHD), considering them to be lazy or purposefully disruptive. In Ethiopia, there is a scarcity of data on teachersΓÇÖ attitudes toward children with ADHD.
Methods: An institution-based cross-sectional study was conducted. A pre-tested questionnaire that contains a case vignette was administered through face-to-face interview with 417 teachers. The data was entered into Epi-data version 4.2 and exported into SPSS version 25.0 for analysis. Multiple linear regression analyses were used to assess the correlates of attitude in the participants and a B coefficient with 95% confidence interval (CI) were used. The statistical significance was accepted at p-value < 0.05.
Results: The mean score of the teachers attitude toward ADHD was 41.6 -¦ 5.4 (95% CI; 41.12, 42.16) and 46% of the participants had unfavorable attitudes. Low level of educational status, knowledge, teaching experience, familiarity in teaching students with ADHD, and having training were significantly associated with attitude of the teachers.
Conclusion: The study revealed that nearly half of the participants had an unfavorable attitude toward students with ADHD. Based on the findings, it was recommended that it is better to strengthen training of teachers to recognize students with ADHD

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Front Psychiatry. 2022;13.
PREPULSE INHIBITION AND P50 SUPPRESSION IN RELATION TO CREATIVITY AND ATTENTION: DISPERSED ATTENTION BENEFICIAL TO QUANTITATIVE BUT NOT QUALITATIVE MEASURES OF DIVERGENT THINKING.
Stolte M, Oranje B, Van Luit JEH, et al.
The current study investigated whether lower sensory and sensorimotor gating were related to higher levels of creativity and/or attentional difficulties in a natural population of primary school children (9- to 13-year-old). Gating abilities were measured with P50 suppression and prepulse inhibition of the startle reflex (PPI). The final sample included 65 participants in the P50 analyses and 37 participants in the PPI analyses. Our results showed that children with a high P50 amplitude to testing stimuli scored significantly higher on the divergent outcome measures of fluency and flexibility but not originality compared to children with a lower amplitude. No significant differences were found on any of the creativity measures when the sample was split on average PPI parameters. No significant differences in attention, as measured with a parent questionnaire, were found between children with low or high levels of sensory or sensorimotor gating. The data suggest that quantitative, but not qualitative measures of divergent thinking benefit from lower psychophysiological gating and that attentional difficulties stem from specific instead of general gating deficits. Future studies should take the effect of controlled attention into consideration

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Front Psychiatry. 2022;13.

GRAY MATTER NETWORK ASSOCIATED WITH ATTENTION IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Wang XK, Wang XQ, Yang X, et al.

Background: Attention deficit hyperactivity disorder (ADHD) is one of the most prevalent childhood-onset neurodevelopmental disorders; however, the underlying neural mechanisms for the inattention symptom remain elusive for children with ADHD. At present, the majority of studies have analyzed the structural MRI (sMRI) with the univariate method, which fails to demonstrate the interregional covarying relationship of gray matter (GM) volumes among brain regions. The scaled subprofile model of principal component analysis (SSM-PCA) is a multivariate method, which can detect more robust brain-behavioral phenotype association compared to the univariate analysis method. This study aims to identify the GM network associated with attention in children with ADHD by applying SSM-PCA to the sMRI.

Methods: The sMRI of 209 children with ADHD and 209 typically developing controls (TDCs) aged 7-14 years from the ADHD-200 dataset was used for anatomical computation, and the GM volume in each brain region was acquired. Then, SSM-PCA was applied to the GM volumes of all the subjects to capture the GM network of children with ADHD (i.e., ADHD-related pattern). The relationship between the expression of ADHD-related pattern and inattention symptom was further investigated. Finally, the influence of sample size on the analysis of this study was explored.

Results: The ADHD-related pattern mainly included putamen, pallium, caudate, thalamus, right accumbens, superior/middle/inferior frontal cortex, superior occipital cortex, superior parietal cortex, and left middle occipital cortex. In addition, the expression of the ADHD-related pattern was related to inattention scores measured by the ConnersI¨ÇÖ Parent Rating Scale long version (CPRS-LV; r = 0.25, p = 0.0004) and the DuPaul ADHD Rating Scale IV (ADHD-RS; r = 0.18, p = 0.03). Finally, we found that when the sample size was 252, the results of ADHD-related pattern were relatively reliable. Similarly, the sample size needed to be 162 when exploring the relationship between ADHD-related pattern and behavioral indicator measured by CPRS-LV.

Conclusion: We captured a GM network associated with attention in children with ADHD, which is different from that in adolescents and adults with ADHD. Our findings may shed light on the diverse neural mechanisms of inattention and provide treatment targets for children with ADHD

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Front Psychiatry. 2022;13.

MENTAL HEALTH OF CHILDREN WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER AND THEIR PARENTS DURING THE COVID-19 LOCKDOWN: A NATIONAL CROSS-SECTIONAL STUDY.

Bobo E, Fongaro E, Lin L, et al.

The coronavirus disease 2019 (COVID-19) pandemic has caused a real disruption of children's lives. Children with neurodevelopmental disorders and their parents seem to be particularly vulnerable to adverse mental health effects due to lockdown policies. This study explores the psychological state of children with Attention Deficit Hyperactivity Disorder (ADHD) and their parents during the first lockdown in France. A national prospective cross-sectional parent-reported study was conducted using an online survey disseminated through different social networks of French ADHD associations during the first lockdown. The survey consisted of open-ended, multiple-choice questions and standardized questionnaires such as the Strengths and Difficulties Questionnaire (SDQ), the coping self-report questionnaire (Brief COPE) and the Patient Health Questionnaire-2 (PHQ-2). A total of 538 parents completed the online survey between the 6th and the 15th of April 2020. These results suggest that most children (65.29%) did not experience a worsening of their behavior but still had pathological levels of hyperactivity (56.47%) and behavioral (57.60%) symptoms at the time of the first lockdown. In addition, some parents (26.27%) showed responses indicating possible major depressive disorder. Positive parental coping strategies were associated with both improved child behavior and fewer parental depressive symptoms. Strengthening parents' coping strategies may be an effective intervention to protect both parents and children with ADHD from the negative psychological effects of lockdown. In times of pandemic, psychological care modalities must evolve to provide quality online interventions for families of children with ADHD

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Front Psychiatry. 2022;13.

PRESCHOOL TEMPERAMENT AS A FACTOR OF RISK AND PROTECTION FOR LATER CHILDHOOD PSYCHOPATHOLOGY.

Paulus FW, et al.

Background: Temperament might be considered as a risk factor as well as a resilience factor for later externalizing and internalizing disorders. Therefore, this study examines different dimensions of temperament in preschool age with regard to their predictive value for psychopathology later in childhood.

Methods: A total of 76 patients (63.2% male) were assessed in a special psychiatric consultation for preschool age at measuring point time t1 (x = 4.2) and measuring point time t2 (x = 9.2). At t1, the Integrative Child Temperament Inventory (ICTI) was used for assessment. At t2, parents completed the Strengths and Difficulties Questionnaire SDQ. Multiple regression analyses were used to test if the temperament factors of the ICTI predicted clinical abnormalities in the SDQ subscales or total difficulties score.

Results: SDQ total difficulties score as an indicator of total psychiatric disturbance in childhood appears to be good predicted by the temperament factor frustration/anger. Sensory sensitivity in preschoolers serves as a risk factor for later emotional symptoms, whereas high activity levels appear to prevent later emotional symptoms. Behavioral inhibition appears to protect against hyperactivity/inattention.

Conclusion: Our data suggests that preschool temperament contributes differently to the development of externalizing and internalizing problems in childhood. The temperament factor frustration/anger in preschool children might be a strong predictor of the general mental condition in childhood at nine years of age and can therefore be used as a target for prevention of psychopathology in children. On one hand, high sensory sensitivity can be a predictor to identify preschool children at risk for later emotional symptoms, on the other hand, activity level acts as a protective factor against later emotional symptoms. An increased level of behavioral inhibition might be protective against the development of hyperactivity/inattention symptoms. Overall, this study illustrates the complexity and ambiguity of temperament in child development

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Front Psychiatry. 2022;13.

UNDERSTANDING THE DIVERSITY OF PHARMACOTHERAPEUTIC MANAGEMENT OF ADHD WITH CO-OCCURRING AUTISM: AN AUSTRALIAN CROSS-SECTIONAL SURVEY.

Mellahn OJ, Knott R, Tiego J, et al.

Objectives: Attention deficit hyperactivity disorder (ADHD) frequently co-occurs with other neurodevelopmental diagnoses, such as autism spectrum disorder (autism), which can make clinical decision making around symptom management challenging for clinicians. There is a paucity of research examining pharmacotherapeutic management of children who have ADHD with co-occurring diagnoses. We aimed to report on the co-occurring diagnoses and symptom profile of children, and report on medication use, stratified by ADHD, autism and ADHD + autism diagnoses.

Methods and Materials: Caregivers of 505 children (2ΓÇô18 years) with ADHD (n = 239), autism (n = 117), and co-occurring ADHD + autism (n = 149) completed a questionnaire on current medication use and clinical rating scales about their child's symptoms, as part of a broader project investigating diagnosis and management of symptoms in children with ADHD or autism.

Results: The parents of the ADHD group reported a higher proportion of their children had learning disorders (17.15%) and speech and language disorders (4.60%) compared to the parents of the autism and ADHD + autism groups. Parents of the ADHD + autism group reported higher proportions of intellectual disability (5.37%), oppositional defiant disorder (20.13%), anxiety (38.93%), depression (6.71%) and genetic conditions (3.36%) in their children, in comparison to the parents of the ADHD and autism groups. Children with ADHD were reported to be taking a higher proportion of psychotropic medication (90%), followed by ADHD + autism (86%) and autism (39%). The parents of children with ADHD + autism reported a higher proportion of non-stimulant ADHD medication (25.5%), antipsychotic (18.79%), antidepressant (22.15%) and melatonin (31.54%) use by their children, compared to the parents of the ADHD and autism groups.

Conclusions: A similar proportion of children with ADHD + autism and ADHD were reported to be taking medication. However, the types of medication taken were different, as expected with reported co-occurring diagnoses. The complexity of symptoms and diagnoses in ADHD + autism warrants targeted research to optimize management and therapeutic outcomes

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Genes. 2022;13.

LRRTM4 TERMINAL EXON DUPLICATED IN FAMILY WITH TOURETTE SYNDROME, AUTISM AND ADHD.

Clarke RA, Eapen V.

Tourette syndrome (TS) is a neurodevelopmental disorder characterised by motor and vocal tics and strong association with autistic deficits, obsessiveΓÇôcompulsive disorder (OCD) and attention-deficit/hyperactivity disorder (ADHD). The genetic overlap between TS and autism spectrum disorder (ASD) includes those genes that encode the neurexin trans-synaptic connexus (NTSC) inclusive of the presynaptic neurexins (NRXNs) and postsynaptic neuroligins (NLGNs), cerebellin precursors (CBLNs in complex with the glutamate ionotropic receptor deltas (GRIDs)) and the leucine-rich repeat transmembrane proteins (LRRTMs). In this study, we report the first evidence of a TS and ASD association with yet another NTSC gene family member, namely LRRTM4. Duplication of the terminal exon of LRRTM4 was found in two females with TS from the same family (mother and daughter) in association with autistic traits and ASD

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Growth Hormone and IGF Research. 2022;65.

REDUCED EXERCISE-INDUCED GROWTH HORMONE SECRETION AMONG CHILDREN WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Nemet D, Ben-Zaken S, Eliakim RA, et al.

Purpose: Attention-deficit/hyperactivity disorder (ADHD) is typically a chronic, often lifelong condition. Data suggest that ADHD itself and its treatment may be associated with dysregulated growth, including height and BMI. The reason for this association is yet unknown. The objective of this study was to examine differences in growth hormone (GH) response to exercise between children who had received a diagnosis of ADHD and age- and gender-matched controls. We reasoned that the normal increase in circulating GH seen in response to exercise would be blunted in children with ADHD.

Methods: We recruited 13 treatment-na+»ve children with newly diagnosed ADHD and 14 age-matched controls (all male) and measured GH response to an exercise test in which the work was scaled to each subject's physical capability.

Results: There was no difference in the peak heart rate achieved during exercise between controls and ADHD participants (196.6 -¦ 1.5 vs. 196.5 -¦ 2.1 bpm, respectively) and lactate response to exercise (53.8 -¦ 5.0 vs. 47.9 -¦ 3.8 mg/dl, respectively). After exercise, GH increased significantly in the control subjects ($p < 0.005$), while GH responses were substantially blunted in the ADHD group (p = NS) even though the work performed did not differ from controls.

Conclusions: Our data suggest that GH excretion after exercise challenge in children with ADHD is impaired. This can be detected using a minimally invasive, nonpharmacologic challenge and may link ADHD with growth impairment in some children. Trial registration number: NCT00945971

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Haseki Tip Bulteni. 2022;60:220-27.

THE MENTAL HEALTH AND MARITAL ADJUSTMENT OF MOTHERS OF CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Karacan FA, Yilmaz S, Kara T.

Aim: The mental health of parents is affected by the behavior of their children due to parent-child relationships. This study aimed to examine the marital adjustment, emotional problems, and attention deficit hyperactivity disorder (ADHD) symptoms in the mothers of children with ADHD, and the relationships of these parameters with each other and with the offspring's behavioral problems.

Methods: This study was conducted with 152 mothers, 90 of whom had children with ADHD, between October 2020 and April 2021. The Conners parent rating scale-revised long version (CPRS-RL) was used to rate the childrenΓÇÖs symptoms. Mothers were evaluated using a sociodemographic information form, the Beck anxiety inventory (BAI), the Beck depression inventory (BDI), the adult ADHD self-report scale (ASRS), and the marriage adjustment scale (MAS). Statistical comparisons were made between the data obtained from scales and hospital records.

Results: Significant associations were observed between oppositional and anxious-shy symptoms in children and the BAI and ASRS; between social problems and psychosomatic symptoms and the BAI, BDI, ASRS, and MAS; between restless-impulsive symptoms and BAI-BDI, ASRS, and MAS; between emotional lability and BAI, BDI, and ASRS; between inattention and BAI; and between hyperactivity-impulsivity and ASRS scores ($p<0.05$). The BAI, BDI, and ASRS scores were significantly higher, and MAS scores were significantly lower in the mothers of children with ADHD compared to the controls ($p<0.05$). A positive correlation was observed between ASRS scores and BAI ($r=0.497$ $p=0.001$) and BDI ($r=0.04$ $p=0.001$) scores. MAS scores were significantly negatively correlated with ASRS ($r=-0.383$ $p=0.001$), BAI ($r=-0.477$ $p=0.001$), and BDI ($r=-0.437$ $p=0.001$) scores.
Conclusion: This study demonstrated that in children with ADHD, problematic behaviors exacerbate anxiety, depression, and adult attention deficiency symptoms and reduce marital adjustment in mothers

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Health Rep. 2022 Jul;33:24-35.
CORRELATES OF VAPING AMONG ADOLESCENTS IN CANADA.
Rotermann M, Gilmour H.
BACKGROUND: Vaping is more prevalent among younger than older Canadians. While vaping is less harmful than combustible tobacco, it is not without health risk.
DATA AND METHODS: Data from the 2019 Canadian Health Survey on Children and Youth were used to estimate vaping prevalence. Logistic regression models assessed the association of sociodemographic, youth, parenting and peer factors with vaping. The 2020 Canadian Community Health Survey identified adolescents who reported vaping before tobacco smoking. Data from the 2019 Canadian Tobacco and Nicotine Survey were used to examine vaping of e-liquids containing nicotine and flavours.
RESULTS: Vaping rates for 15- to 17-year-olds were nearly four times (21.3%) higher than those of 12- to 14-year-olds (5.4%). Two-thirds (66.1%) of 12- to 17-year-olds who had used both tobacco and e-cigarettes reported trying e-cigarettes first. E-liquids containing nicotine were used by 89.3% of 15- to 19-year-olds who reported vaping in the past 30 days; comparable with older adults. For both younger and older adolescents, having friends who engaged in negative behaviours, having been employed, and having consumed alcohol increased the odds. For 12- to 14-year-olds, attention deficit hyperactivity disorder was a risk factor, whereas having parents who usually knew who they were with and higher relatedness scores were protective. Among older adolescents, being male, being Canadian-born, having lower grades, and using tobacco or cannabis increased the odds of vaping.
INTERPRETATION: An adolescent's risk of vaping was most strongly correlated with other substance use, although other youth, parenting and peer characteristics also mattered. Because most of the data presented were collected before the COVID-19 pandemic and new vaping regulations, ongoing monitoring remains important

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Hum Brain Mapp. 2022.
EFFECTS OF A SINGLE-DOSE METHYLPHENIDATE CHALLENGE ON RESTING-STATE FUNCTIONAL CONNECTIVITY IN STIMULANT-TREATMENT NAIVE CHILDREN AND ADULTS WITH ADHD.
Kaiser A, Broeder C, Cohen JR, et al.
Prior studies suggest that methylphenidate, the primary pharmacological treatment for attention-deficit/hyperactivity disorder (ADHD), alters functional brain connectivity. As the neurotransmitter systems targeted by methylphenidate undergo significant alterations throughout development, the effects of methylphenidate on functional connectivity may also be modulated by age. Therefore, we assessed the effects of a single methylphenidate challenge on brain network connectivity in stimulant-treatment na+»ve children and adults with ADHD. We obtained resting-state functional MRI from 50 boys (10ΓÇô12 years of age) and 49 men (23ΓÇô40 years of age) with ADHD (DSM IV, all subtypes), before and after an oral challenge with 0.5 mg/kg methylphenidate; and from 11 boys and 12 men as typically developing controls. Connectivity strength (CS), eigenvector centrality (EC), and betweenness centrality (BC) were calculated for

the striatum, thalamus, dorsal anterior cingulate cortex (dACC), and prefrontal cortex (PFC). In line with our hypotheses, we found that methylphenidate decreased measures of connectivity and centrality in the striatum and thalamus in children with ADHD, but increased the same metrics in adults with ADHD. Surprisingly, we found no major effects of methylphenidate in the dACC and PFC in either children or adults. Interestingly, pre-methylphenidate, participants with ADHD showed aberrant connectivity and centrality compared to controls predominantly in frontal regions. Our findings demonstrate that methylphenidate's effects on connectivity of subcortical regions are age-dependent in stimulant-treatment na+»ve participants with ADHD, likely due to ongoing maturation of dopamine and noradrenaline systems. These findings highlight the importance for future studies to take a developmental perspective when studying the effects of methylphenidate treatment

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Hum Brain Mapp. 2022.

AMYGDALA SUBNUCLEI VOLUMES AND ANXIETY BEHAVIORS IN CHILDREN AND ADOLESCENTS WITH AUTISM SPECTRUM DISORDER, ATTENTION DEFICIT HYPERACTIVITY DISORDER, AND OBSESSIVE-COMPULSIVE DISORDER.

Seguin D, Pac S, Wang J, et al.

Alterations in the structural maturation of the amygdala subnuclei volumes are associated with anxiety behaviors in adults and children with neurodevelopmental and associated disorders. This study investigated the relationship between amygdala subnuclei volumes and anxiety in 233 children and adolescents (mean age=11.02 years; standard deviation=3.17) with autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and children with obsessive compulsive disorder (OCD), as well as typically developing (TD) children. Parents completed the Child Behavior Checklist (CBCL), and the children underwent structural MRI at 3 T. FreeSurfer software was used to automatically segment the amygdala subnuclei. A general linear model revealed that children and adolescents with ASD, ADHD, and OCD had higher anxiety scores compared to TD children (p <.001). A subsequent interaction analysis revealed that children with ASD (B=0.09, p <.0001) and children with OCD (B=0.1, p <.0001) who had high anxiety had larger right central nuclei volumes compared with TD children. Similar results were obtained for the right anterior amygdaloid area. Amygdala subnuclei volumes may be key to identifying children with neurodevelopmental disorders or those with OCD who are at high risk for anxiety. Findings may inform the development of targeted behavioral interventions to address anxiety behaviors and to assess the downstream effects of such interventions

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Indian J Pediatr. 2022.

EFFECT OF L-CARNOSINE ON CHILDREN WITH ADHD.

Ann Abraham D, Muhasaparur Ganesan R.

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Indian J Psychiatry. 2022;64:S580-S581.

INNOVATIVE INTERVENTIONAL STRATEGIES FOR ATTENTION DEFICIT HYPERACTIVITY DISORDER CHILDREN: A COMPARATIVE STUDY.

Dwivedi N, Chaudhuri P, Rathi M.

The features of inattention and hyperactivity are very prominent in children and require comprehensive cognitive training along with pharmacotherapy. Keeping the need for novelty and challenging tasks in these children, this study attempts to explore the effective management plan for children with attention deficit hyperactivity disorder (ADHD). Forty children, between the age group of 6-10 years meeting the diagnostic criteria of ADHD were included in the study. Twenty children were given structured video and paper games as cognitive training task whereas twenty children were subjected to regular cognitive training. IQ was assessed using WISC IV India. Baseline measures included Conner's III Parent's form and memory functioning subtests to evaluate executive functioning. Following two months of intervention, assessment

was repeated. Results indicate that structured video and paper games channelize the energy of ADHD children constructively. Results also showed significant improvement in inattention and executive functioning features following intervention amongst the study group. This study has a significant implicative value in designing an innovative and creative management plan for children with ADHD

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Indian J Psychiatry. 2022;64:S606.

INTELLECTUAL DISABILITY (ID), ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) AND OPPOSITIONAL DEFIANT DISORDER (ODD) IN A PATIENT OF DUCHENNE MUSCULAR DYSTROPHY (DMD): A CASE REPORT.

Chowdhry S, Prasanna Kumar N.

INTRODUCTION: Duchenne muscular dystrophy (DMD) is a rare muscular disorder, affecting 1 in 3500 live born males. It is characterized by weakness and wasting(atrophy) of the muscles of the pelvic area followed by the involvement of the shoulder muscles and less well described non progressive central nervous system manifestations. Uncommonly associated neuropsychiatric elements include intellectual disability, attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders and emotional behavioural problems-internalizing and externalizing (oppositional/aggressive) behaviours.

CASE SUMMARY: Diagnosed with DMD using molecular testing revealing hemizygous deletion of exon 52 in DMD gene in 2019, an 11 year old male child born out of non-consanguineous marriage presented with. delayed developmental milestones, difficulty in sitting, walking and holding things, temper tantrums, poor scholastic performance, frequently losing interest in activities, irritability, picking up quarrels with peers, parents and assaulting them, self harm behaviour and breaking household items. H/o absence seizures in the mother since 14 years of age, multiple episodes during the antenatal period and intellectual disability in the maternal aunt. Psychological assessment revealed IQ=44 A diagnosis of ID, ADHD and ODD was made in the patient based on detailed patient history, thorough clinical evaluation and psychological assessment. Patient was started on T. Atomoxetine 5 mg for his neuropsychiatric symptoms resulting in partial improvement.

DISCUSSION: Dystrophin and its isoforms influence brain development and function. A proportion of DMD patients also experience behavioral and cognitive impairment

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Indian J Psychiatry. 2022;64:S670-S671.

ADHD IN THE CONTEXT OF LENNOX GASTAUT SYNDROME: A RARE PRESENTATION.

Kavitha B, Ephraim RY.

Background: Lennox Gastaut Syndrome (LGS) is an age related, epileptic encephalopathy of varied etiology. The syndrome is characterized by multiple seizure types, intellectual failure and/or behavioural disturbance and by EEG abnormalities. ADHD and epilepsy are both common childhood disorders and can have negative consequences on child's health.

Aim: To highlight the psychiatric manifestations of LGS

Method: A 11 year old male child presented with complaints of aggressiveness, self injurious behavior, increased activity, impulsive behavior since 9 years, on in-patient basis. The patient has H/o delayed cry at birth, delayed milestones, epilepsy (GTCS, myoclonic and absence seizure type). Last seizure episode is 1 month back. It is associated with severe intellectual disability. There is presence of multiple self injury marks on left foot and right thigh. Family history of intellectual disability in father and maternal uncle. Disturbed family environment is present. IQ-32; EEG report: awaited

Results: The patient is on Tab Sodium Valproate 750mg, Tab Clonidine 125 g, Tab Risperidone 4mg, Tab Aripiprazole 2.5mg. Neurologist opinion Is taken. Follow up is awaited.

Conclusion: LGS is a disease that evolves, and therefore the challenges of diagnosis can cause delays in treatment, resulting in poorer overall outcomes. Behavioural problems, including hyperactivity, agitation, aggression could be present. Hence it should be approached holistically. Ninety-nine respondents participated in the study (female: 63.6%; Malay: 41.4%; mean age: 46.4 years). The median duration of illness was 6.0 years. More respondents were taking combination therapy (59.6%). There was a statistically

significant correlation between ISMI and MDIS scores (rs = 0.339, P = 0.001). On bivariate analyses, intact insight was associated with non-Malay race, combination therapy, higher average ISMI scores and subscores for alienation, stereotype endorsement, discrimination experience, and social withdrawal. Combination therapy, higher scores for alienation, and social withdrawal subscales were associated with a greater likelihood for intact insight in logistic regression model

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Indian J Psychiatry. 2022;64:S651.

DIAGNOSTIC INTRICACIES OF ADULT ADHD.

Anon.

Some clinicians are too conservative to diagnose adult ADHD; considering that adult ADHD doesn't exists. In line with this observation, Margaret D Weiss &Jaqueline R Weiss mentioned (J Clin Psychiatry 2004;65[suppl 3]:27-37) that clinicians fall short of training to diagnose &treat adult ADHD. Reasons they attribute in line with our observation are not only clinician's unfamiliarity with adult ADHD but dynamic &evolutionary process of childhood ADHD &its presentaion in adult life. Symptomatology of adult ADHD is not mere extention of childhood ADHD but an aggregate result of influence of multiple factors like epigenetic, family dynamics, parental issues, emotional growth, attitde towards challenges in personal life, affect regulation, support system, including neurobiological development, etc. Most of the ADHD children, diagnosed or undiagnosed, grow up to become adult ADHD with varying degree of symptomatology &dysfunction against the belief of many. (Sandra JJ Kooij et al https://doi. org/10.1186/1471-244X-10-67). Dysfunction of executive function is the main obstacle in diagnosis &treatment of adut ADHD; demanding repeated &extensive training. Unavailability of repeated training activities result into diagnosis/treatment of these individuals for essential insomnia, depression, chronic stress, substance dependence, OCD, dementia, etc. and then they are prescribed sedatives, antipsychotics, antidepressants, and anxiolytics. Hence, this workshop aims not only to prepare clinicians with well informed diagnostic skills but help them adapt to think holisitically to strike the diagnosis offering a real situation/virtual patient. So workshop is divided into two parts; first part will deal with information &second part will invite participants to participate in diagnosis of actual cases in relation to symptoms description; discussion will follow to reinforce newly learned diagnostic skills. In line with this method R A Barkley mentioned that symptomatic dysfunction decides treatment (DOI: 10.4088/jcp.1208e36). Hence this workshop is designed to revolve around diagnostic &treatment issues of adult ADHD on a case to case basis

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Indian J Psychiatry. 2022;64:257-63.

ROLE OF CALCIUM METABOLISM IN ADHD: THE RELATIONSHIP BETWEEN PARATHYROID HORMONE AND ADHD SYMPTOM SEVERITY.

Varmif D, Kaypakli GY, et al.

Background: Vitamin D has been found to be associated with the pathogenesis of attention deficit hyperactivity disorder (ADHD). However, the potential role of parathyroid hormone (PTH) is still unclear. Aim: We aimed to investigate the association between calcium metabolism and ADHD symptomatology.

Methods: We included 106 participants aged between 7 and 13 years old (51 ADHD patients, mean age: 9.54 -¦ 1.77, 55 healthy controls mean age: 9.97 -¦ 0.94) to this study. K-SADS-PL and Conners' Parent/Teacher Rating Scales, Stroop Test were performed. Blood samples to measure serum levels of Vitamin D, PTH, calcium (Ca), magnesium (Mg), phosphorus (P), and alkaline phosphatase (ALP) were collected in the spring (March-April-May) to prevent seasonal variability.

Results: PTH, P, and ALP values were significantly lower and Vitamin D, Ca, and Mg values were significantly higher in the ADHD group (P < 0.05, for all). Both groups had Vitamin D deficiency. Control group has lower Vitamin D levels than the ADHD group (respectively; 17.66 -¦ 9.07, 21.99 -¦ 10.99, P < 0.05). There was a negative correlation between PTH and CTRS hyperactivity, CGI-RI and CGI-EL sub-scores, CGI-Total, DSM-IV-Inattention, DSM-IV Hyperactivity/Impulsivity, DSM-IV-Total scores (P < 0.05, for all).

Conclusions: We found lower PTH levels in ADHD patients and a strong and negative correlation between PTH and symptom severity. Future studies are needed to clarify if these findings are due to the key role of PTH in ADHD pathology or PTH's function in activating vitamin D

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Int Arch Occup Environ Health. 2022 Aug;95:1231-41.

ATTENTION DEFICIT HYPERACTIVITY DISORDER AMONG CHILDREN RELATED TO MATERNAL JOB STRESS DURING PREGNANCY IN TAIWAN: A PROSPECTIVE COHORT STUDY .

Shih P, Huang CC, Chiang TL, et al.

OBJECTIVE: Attention deficit hyperactivity disorder (ADHD) is the most common neurobehavioral disorders. Although studies have suggested relationships between ADHD in children and maternal psychosocial stress during pregnancy, little is known about the effects of work-related mental stress. Considering the increasing number of pregnant women who continue to work during the gestation period, this study investigated whether work-related stress during pregnancy is related to offspring ADHD.

METHODS: The Taiwan Birth Cohort Study followed selected representative mother-infant pairs in a face-to-face interview since a child was 6 months old. A total of 10,556 working pregnant women who completed follow-up 8 years later were included. Whether the 8-year-old child had ever received a diagnosis of ADHD were inquired. Self-reported job stress during pregnant period was obtained 6 months after delivery. Factors including perinatal and socioeconomic factors as well as the mother's job conditions were further analyzed with logistic regression.

RESULTS: Among those who continued working during pregnancy, 3850 (36.5%) mothers reported having job stress during pregnancy, and 210 (2.0%) of the children were diagnosed as having ADHD before 8 years of age. Compared with mothers who reported no job stress, the adjusted odds ratio of child ADHD was 1.91 (95% CI 1.21-3.07) for mothers with "very stressful" jobs during pregnancy and 1.53 (95% CI 1.04-2.25) for mothers with "rather stressful" jobs.

CONCLUSION: Among pregnant female workers, higher levels of job stress were related to the higher occurrence of ADHD in their children

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Int Dent J. 2022 Aug;72:565-71.

ATTENTION-DEFICIT DISORDER, FAMILY FACTORS, AND ORAL HEALTH LITERACY.

de Moura MFL, Firmino RT, Neves ÃT, et al.

INTRODUCTION: Relationships amongst attention-deficit/hyperactivity disorder (ADHD), family factors, and oral health literacy (OHL) in adolescents are unclear. The objective of this research was to investigate whether family environment and signs of ADHD are associated with OHL at the onset of adolescence.

METHODS: A cross-sectional study was performed with 448 twelve-year-old adolescents enrolled in schools in Cajazeiras, Brazil. Adolescents responded to an instrument measuring OHL (Brazilian version of the Rapid Estimate of Adult Literacy in Dentistry [BREALD-30]) and a validated questionnaire addressing family cohesion and adaptability (Family Adaptability and Cohesion Scales [FACES III]). Parents and teachers answered subscales of the Swanson, Nolan, and Pelham Questionnaire (SNAP-IV) and a socioeconomic questionnaire. Adjusted Poisson regression analysis was employed for the data analysis ($P < .05$).

RESULTS: Greater OHL was found in adolescents with higher family cohesion scores (rate ratio [RR], 1.02; 95% confidence interval [CI], 1.01-1.03), those whose mothers had more than 8 years of schooling (RR, 1.07; 95% CI, 1.03-1.12), and those whose families earned more than the Brazilian minimum salary (RR, 1.08; 95% CI, 1.03-1.12). Higher family adaptability scores (RR, 0.99; 95% CI, 0.98-0.99) and more signs of ADHD (teachers' reports) (RR, 0.95; 95% CI, 0.91-0.99) were associated with lower OHL.

CONCLUSIONS: OHL in adolescents was influenced by family adaptability and cohesion, signs of ADHD, maternal schooling, and family income

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Int J Adolesc Med Health. 2022;34.

ADVERSE EFFECTS OF STIMULANT MEDICATIONS IN CHILDREN AND ADOLESCENTS: FOCUS ON SLEEP AND GROWTH DISTURBANCES.

Greydanus DE, Cates KW, Sadigh N.

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International Journal of Developmental Disabilities. 2022.

KNOWLEDGE OF DEVELOPMENTAL DISABILITIES AND REFERRAL SOURCES AMONG HEALTH WORKERS IN TWO GHANAIAN HOSPITALS.

Sheriff B, Sakyi K, Malm EK, et al.

Proper treatment of developmental disabilities requires health workers to have adequate knowledge of etiology and referral procedures. There is a dearth of research on knowledge of developmental disabilities among health workers in Ghana. The purpose of this study was to document knowledge about developmental disorders, causes, and referral procedures among health workers. Researchers used a successive free-listing method to interview 37 health workers. Developmental disabilities which present with physical symptoms were the most salient disorders identified among health workers, while learning disabilities and attention deficit disorder were largely overlooked. The most commonly listed developmental disabilities were cerebral palsy, Down syndrome, and autism spectrum disorder. Respondents had limited knowledge about the causes of and referral resources for developmental disabilities. Results show the need for continuing medical education, public awareness, and enhanced resources to support the identification and care of children with developmental disabilities in Ghana

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Int J Dev Neurosci. 2022.

CORTICAL THICKNESS ABNORMALITIES IN ATTENTION DEFICIT HYPERACTIVITY DISORDER REVEALED BY STRUCTURAL MAGNETIC RESONANCE IMAGING: NEWBORNS TO YOUNG ADULTS.

Levman J, Forgeron C, Shiohama T, et al.

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition for which we have an incomplete understanding, and so brain imaging methods, such as magnetic resonance imaging (MRI), may be able to assist in characterising and understanding the presentation of the brain in an ADHD population. Statistical and computational methods were used to compare participants with ADHD and neurotypical controls at a variety of developmental stages to assess detectable abnormal neurodevelopment potentially associated with ADHD and to assess our ability to diagnose and characterise the condition from real-world clinical MRI examinations. T1-weighted structural MRI examinations (n =-á993; 0ΓÇô31 years old [YO]) were obtained from neurotypical controls, and 637 examinations were obtained from patients with ADHD (0ΓÇô26 YO). Measures of average (mean) regional cortical thickness were acquired, alongside the first reporting of regional cortical thickness variability (as assessed with the standard deviation [SD]) in ADHD. A comparison between the inattentive and combined (inattentive and hyperactive) subtypes of ADHD is also provided. A preliminary independent validation was also performed on the publicly available ADHD200 dataset. Relative to controls, subjects with ADHD had, on average, lowered SD of cortical thicknesses and increased mean thicknesses across several key regions potentially linked with known symptoms of ADHD, including the precuneus and supramarginal gyrus

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International Journal of Medical Toxicology and Forensic Medicine. 2022;12.

COGNITIVE REHABILITATION TRAINING IN IMPROVING EXECUTIVE FUNCTION, ANTISOCIAL BEHAVIORS, AND LEGAL PROBLEMS IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Jalilvand M, Nikmanesh Z, Bagheri F.

Background: Attention Deficit Disorder/Attention-Deficit/Hyperactivity Disorder (ADD/ ADHD) is one of the most prevalent childhood diseases, and it may substantially influence social behaviors, legal issues, and

disputes. The goal was to see how cognitive rehabilitation training affected executive functioning and impulsivity in children with ADHD in Tehran, District 5.
Methods: A quasi-experimental design was used, with two groups (experimental and control) and a pretest-posttest. All students with ADHD disorder aged 7 to 12 years were included in the statistical population. The sample comprised 30 kids who were age-matched and randomly split into two groups. They were tested for two months in February and March 2021. Slow cognitive rehabilitation training was given to the experimental group. Both groups were given a pretest and a posttest. Information was gathered using the BRIEF (parent form) and ConnersΓÇÖ (parent form) questionnaires. MANCOVA was used to analyze the data, using the SPSS software v. 26, with a significance threshold of 0.05.
Results: There was a significant difference in executive function variables (inhibition, attention transfer, emotional control, initiation, working memory, planning, material organization, and control) and reduced impulsivity (attention deficit, hyperactivity, opposition, and ADHD) (P 0.001).
Conclusion: Cognitive rehabilitation improves executive skills and impulsivity in children with ADHD aged 7-12 years. Cognitive rehabilitation training should be utilized with other educational approaches to rectify social behaviors, minimize conflict, and improve executive functions

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Int J Neurosci. 2022.
SERUM CILIARY NEUROTROPHIC FACTOR LEVELS IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.
Buyuktaskin D, Guney E, Gulbahar O, et al.
Purpose/aim of the study: The study aimed to highlight the possible role of ciliary neurotrophic factor (CNTF) in the pathophysiology of attention deficit hyperactivity disorder (ADHD) and determine whether CNTF can be used as a biomarker for ADHD.
Materials and methods: Patients with a diagnosis of ADHD and neurotypical subjects aged 6-12 years were recruited prospectively. The study applied Conners Teacher Rating Scale (CTRS) to determine the patientsΓÇÖ ADHD predominance and severity. Serum CNTF levels were measured with an enzyme-linked immunosorbent assay (ELISA) kit.
Results: A total of 43 ADHD patients and 33 healthy controls were included in the study. A significant difference was found between the serum CNTF levels of the ADHD patients (22.17 pg/ml) and the controls (22.80 pg/ml). Correlations between the CNTF levels and CTRS scores were not significant.
Conclusions: The study identified an alteration of serum CNTF levels in ADHD patients and thus asserted a link between CNTF and ADHD pathophysiology; children with ADHD had significantly lower serum CNTF levels compared to the neurotypical controls. Further research is needed to understand the mechanisms of CNTF

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Iran J Child Neurol. 2022;16:67-77.
THE EFFECT OF LONG-ACTING METHYLPHENIDATE AND MODAFINIL ON ATTENTION AND IMPULSIVITY OF CHILDREN WITH ADHD USING A CONTINUOUS PERFORMANCE TEST: A COMPARATIVE STUDY.
Zahed G, Roozbakhsh M, Davari Ashtiani R, et al.
Objectives Given the importance of having a continuous performance for the academic and social life of children with attention-deficit/hyperactivity disorder (ADHD). in this study, a Continuous Performance Test (CPT) was used to compare the effect of long-acting methylphenidate and modafinil on attention and impulsivity of these children.
Materials & Methods A randomized clinical trial was conducted on 50 children with ADHD aged 6 to 12 years in the child and adolescent psychiatric departments of Imam Hossein and Mofid hospitals, Tehran, Iran. The children were selected by availability sampling and randomly assigned into two equal groups (n=25 in each). While the first group was treated with long-acting methylphenidate, the second was treated with modafinil for 14 days. The CPT was carried out before and after the treatment. The obtained data were analyzed by F and t tests.

Results Long-acting methylphenidate and modafinil were both effective in improving attention and impulsivity in children with ADHD. There was no significant difference between the two drugs in terms of effectiveness on attention and impulsivity.
Conclusion The findings of this study showed that long-acting methylphenidate and modafinil are equally effective in improving attention and impulsivity in children with ADHD aged 6 to 12 years

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Iran J Child Neurol. 2022;16:121-32.
STUDY OF CHANGES IN RS2283265 POLYMORPHISMS IN DOPAMINE RECEPTOR D2 AND RS27072 IN DOPAMINE TRANSPORTER GENE (SLC6A3) IN PATIENTS WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER.
Safavi P, Soleimani Farsani H, Farrokhi E, et al.
Objectives Attention-deficit hyperactivity disorder (ADHD) is one of the most common psychiatric disorders in children that lead to numerous complications. This study examined the changes in rs2283265 polymorphisms in the dopamine receptor D2 (DRD2) and rs27072 in the dopamine transporter gene (SLC6A3) in ADHD patients.
Materials & Methods This descriptive-analytical study was performed on children aged 4-12 years with ADHD. In this study, 100 patients in the ADHD group (according to DSM-IV-TR criteria and diagnosed by interview by a child and adolescent psychiatrist) and 100 children in the control group (including patients referring to the pediatrician without hyperactivity) were enrolled. Two polymorphisms rs2283265 and rs27072 in two groups were comparatively investigated using PCR-RFLP method and restriction enzymes. Data were analyzed using SPSS 17.
Results There was a significant correlation between gender and ADHD, and the disease was more common in boys (P=0.021). In this study, there was no significant relationship between ADHD types and frequency distribution of rs2283265 (DRD2) and rs27072 (SLC6A3) polymorphism genotypes (P<0.05). However, there was a significant correlation between distribution of rs2283265 (DRD2) and rs27072 (SLC6A3) polymorphisms and ADHD (P<0.05).
Conclusion It seems that the changes in DRD2 and SLC6A3 genes are associated with ADHD, and study of these genes can be helpful in diagnosis and genetic screening

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J Atten Disord. 2022 Sep;26:1381-93.
PARENTAL FACTORS THAT CONFER RISK AND RESILIENCE FOR REMOTE LEARNING OUTCOMES DURING THE COVID-19 PANDEMIC AMONG CHILDREN WITH AND WITHOUT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Silverman MR, Stadterman J, Lorenzi D, et al.
OBJECTIVE: To test whether parental factors including internalizing symptoms, parenting style, and confidence in assisting with remote learning conferred risk/resilience for children with/without ADHD's learning and emotional outcomes during the COVID-19 pandemic.
METHOD: 291 parents of children (ages 6-13; n = 180 males) with (n = 148) and without ADHD completed questionnaires online (April-July 2020).
RESULTS: Structural equation modeling identified parental risk/resilience factors. Across groups, risk predicted greater difficulties with learning, internalizing and externalizing symptoms, while parent confidence in educating their child predicted better outcomes. A positive association was observed between parental involvement and child difficulties, which was stronger in families of children with ADHD. Children with/without ADHD did not differ in remote learning difficulties.
CONCLUSION: Parent factors impacted child emotional and learning outcomes during the pandemic. With increases in remote learning practices, there is a need for improved understanding of how parent factors impact outcomes of children with/without ADHD

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J Atten Disord. 2022 Sep;26:1452-63.

ADHD Symptoms and Obesity in Chinese Children and Adolescents: A Longitudinal Study With Abnormal Eating Behaviors as Moderating Factors.

Zhang S, Huang Y, Zaid M, et al.

BACKGROUND: Emerging studies have explored the possibility of ADHD and associated abnormal eating behaviors as catalysts for obesity in children and adolescents. However, results were largely inconsistent. This study aims to explore the effects of ADHD and abnormal eating behaviors (including eating disorders, emotional eating, and bedtime eating) on obesity, and to assess the moderating role of abnormal eating behaviors between ADHD symptoms and BMI in Chinese children and adolescents.

METHODS: We recruited 546 grade 3 to 11 students and their parents by stratified random sampling from three primary schools and four middle schools in Shanghai, China. This study used parent-reported versions of the ADHD Rating Scale-IV to assess ADHD symptoms, the Eating Attitudes Test and the Children's Eating Attitude Test to assess eating disorder (ED) symptoms, and the Child Eating Behavior Questionnaire to collect information about other abnormal eating behaviors at baseline and at a follow-up survey 1 year later.

RESULTS: Hierarchical linear regression analysis revealed that ED played a moderating role in the relationship between ADHD symptoms and BMI in addition to age ($\hat{I}^2$ = .003, p = .008). The simple slope test showed that ADHD symptoms positively correlated with BMI ofs in the older age group with a high level of ED symptoms ($\hat{I}^2$ = .16, p < .001). Moreover, the baseline ED symptoms ($\hat{I}^2$ = .03, p = .032) and ADHD symptoms ($\hat{I}^2$ = .12, p = .015) increased the students' BMI one year later after controlling for confounding factors.

CONCLUSION: Findings of this study suggest that ADHD and ED symptoms raised the students' BMI separately. Moreover, ADHD and ED symptoms raised the students' BMI separately. Moreover, a combined high level of ADHD and ED symptoms is correlated with students' high BMI in the older age group

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J Atten Disord. 2022 Sep;26:1394-411.

Quantifying ADHD Symptoms in Open-Ended Everyday Life Contexts With a New Virtual Reality Task.

Seesjarvi E, Puhakka J, Aronen ET, et al.

OBJECTIVE: To quantify goal-directed behavior and ADHD symptoms in naturalistic conditions, we developed a virtual reality task, EPELI (Executive Performance in Everyday LIving), and tested its predictive, discriminant and concurrent validity.

METHOD: We collected EPELI data, conventional neuropsychological task data, and parent-ratings of executive problems and symptoms in 38 ADHD children and 38 typically developing controls.

RESULTS: EPELI showed predictive validity as the ADHD group exhibited higher percentage of irrelevant actions reflecting lower attentional-executive efficacy and more controller movements and total game actions, both indicative of hyperactivity-impulsivity. Further, the five combined EPELI measures showed excellent discriminant validity (area under curve 88 %), while the correlations of the EPELI efficacy measure with parent-rated executive problems (r = .57) and ADHD symptoms (r = .55) pointed to its concurrent validity.

CONCLUSION: We provide a proof-of-concept validation for a new virtual reality tool for ecologically valid assessment of ADHD symptoms

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J Atten Disord. 2022 Sep;26:1464-70.

Prevalences of Overweight and Obesity in Children and Adolescents: The Comparison of ADHD and Other Clinical Samples.

Jongpitakrat K, Limsuwan N.

OBJECTIVE: To investigate the prevalence of overweight and obesity in children and adolescents with ADHD and compare to other clinical samples.

METHOD: A retrospective chart reviewing of 165 ADHD and 305 other clinical participants aged 6 to 18 years.

RESULTS: There was no statistically significant difference in terms of the prevalences of overweight and obesity between ADHD and other clinical participants. In ADHD group, the prevalences of overweight, obesity, and combined overweight/obesity were 15.8%, 20.0%, and 35.8%, respectively. In addition, male gender was significantly associated with increasing the prevalences of overweight and obesity in children and adolescents with ADHD.
CONCLUSION: The prevalences of overweight and obesity between ADHD and other clinical samples were not different in a clinical setting. Male gender was significantly associated with increasing the prevalences of overweight and obesity in children and adolescents with ADHD

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J Atten Disord. 2022 Sep;26:1471-82.
WHICH MEASURES FROM A SUSTAINED ATTENTION TASK BEST PREDICT ADHD GROUP MEMBERSHIP?
Machida K, Barry E, Mulligan A, et al.
Difficulty with sustaining attention to a task is a hallmark of ADHD. It would be useful to know which measures of sustained attention best predict a diagnosis of ADHD. Participants were 129 children with a diagnosis of ADHD and 129 matched controls who completed the fixed Sustained Attention to Response Task (SART). The number of commission and omission errors, standard deviation of response time (SDRT), tau, fast and slow frequency variability, d-prime, and mu were able to successfully classify children with and without ADHD. The mean response time, criterion, and sigma were not able to classify participants. The best classifiers were d-prime (0.75 Area Under the Receiver Operated Characteristic), tau (.74), SDRT (0.74), omission errors (0.72), commission errors (0.71), and SFAUS (0.70). This list of the best classifier measures derived from the SART may prove useful for the planning of future studies

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J Atten Disord. 2022 Sep;26:1492-506.
IMMEDIATE AND SUSTAINED EFFECTS OF NEUROFEEDBACK AND WORKING MEMORY TRAINING ON COGNITIVE FUNCTIONS IN CHILDREN AND ADOLESCENTS WITH ADHD: A MULTI-ARM PRAGMATIC RANDOMIZED CONTROLLED TRIAL.
Hasslinger J, Jonsson U, et al.
OBJECTIVE: To evaluate the effects of neurocognitive training methods on targeted cognitive functions in children and adolescent with ADHD.
METHOD: A pragmatic four-arm randomized controlled trial compared two types of neurofeedback (Slow Cortical Potential and Live Z-score) and Working-memory training (WMT) with treatment as usual. N=202 participants with ADHD aged 9 to 17years were included. A battery of cognitive function tests was completed pretreatment, posttreatment, and after 6-months.
RESULTS: The effects of WMT on spatial and verbal working-memory were superior to neurofeedback and treatment as usual at posttreatment, but only partially sustained at follow-up. No other consistent effects were observed. We found no clear indications that effects were moderated by ADHD presentation, ongoing medication, age, or sex.
CONCLUSION: The sustained effects of neurocognitive training on cognitive functioning in children and adolescents with ADHD may be limited. Future research should focus on more personalized forms of neurocognitive training

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J Atten Disord. 2022 Sep;26:1422-36.

HERITABILITY AND CLINICAL CHARACTERISTICS OF NEUROPSYCHOLOGICAL PROFILES IN YOUTH WITH AND WITHOUT ELEVATED ADHD SYMPTOMS.

Arnett AB, McGrath LM, Flaherty BP, et al.

OBJECTIVE: In the last decade, there has been an increase in research that aims to parse heterogeneity in attention deficit hyperactivity disorder (ADHD). The current study tests heritability of latent class neuropsychological subtypes.

METHOD: Latent class analysis was used to derive subtypes in a sample of school-age twins (N = 2,564) enriched for elevated ADHD symptoms.

RESULTS: Five neuropsychological profiles replicated across twin 1 and twin 2 datasets. Latent class membership was heritable overall, but heritability varied by profile and was lower than heritability of ADHD status. Variability in neuropsychological performance across domains was the strongest predictor of elevated ADHD symptoms. Neuropsychological profiles showed distinct associations with age, psychiatric symptoms and reading ability.

CONCLUSION: Neuropsychological profiles are associated with unique neurocognitive presentations, but are not strong candidate endophenotypes for ADHD diagnosis

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J Child Psychol Psychiatry. 2022 Aug;63:881-89.

OBSESSIVE-COMPULSIVE DISORDER IN CHILDREN AND YOUTH: NEUROCOGNITIVE FUNCTION IN CLINIC AND COMMUNITY SAMPLES.

Schachar RJ, Dupuis A, Anagnostou E, et al.

BACKGROUND: Neurocognitive impairments are common in OCD, although not well studied in children and youth with the disorder.

METHOD: Using the stop-signal task (SST), we measured response inhibition (stop-signal reaction time-SSRT), sustained attention (reaction time variability-RTV), reaction time (RT), and performance monitoring (post-error slowing-PES) in OCD cases and controls from two samples of children and youth. A Clinic OCD group (n=171, aged 7-17years) was recruited from a specialty clinic after rigorous assessment. A typically developing (Clinic TD, n=157) group was enlisted through advertisement. A community OCD sample (Community OCD, n=147) and controls (Community TD n=13,832, aged 6-17 years) were recruited at a science museum. We also identified a community group with high OCD traits without an OCD diagnosis (Community High Trait; n=125).

RESULTS: Clinic OCD participants had longer SSRT and greater RTV than Clinic TD. These effects were greater in younger OCD participants and, for SSRT, in those on medication for OCD. The Community OCD group did not differ from Controls but was similar to the Clinic OCD group in ADHD and ASD comorbidity and medication usage. The Community High Trait group had longer SSRT and atypical PES suggesting that symptom severity predicts neurocognitive function. No group differences were found in RT.

CONCLUSIONS: In the largest study of neurocognitive performance in children with OCD to date, we found impaired response inhibition and sustained attention in OCD participants in comparison to typically developing peers. Performance was worse in younger OCD participants. In the community sample, participants with high OCD trait scores but no OCD diagnosis had impaired response inhibition and error processing, suggesting that OCD might be under-recognized

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J Child Psychol Psychiatry. 2022 Aug;63:929-38.

DEVELOPMENT OF A RISK CALCULATOR TO PREDICT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN VERY PRETERM/VERY LOW BIRTH WEIGHT NEWBORNS.

Franz AP, Caye A, Lacerda BC, et al.

BACKGROUND: Very preterm/very low birth weight (VP/VLBW) newborns can have lifelong morbidities, as attention-deficit/hyperactivity disorder (ADHD). Clinicians have no markers to discriminate which among

those individuals will develop later ADHD, based only on the clinical presentation at birth. Our aim was to develop an individualized risk calculator for ADHD in VP/VLBW newborns.
METHODS: This retrospective prognostic study included a consecutive sample of all VP/VLBW children (gestational age <32weeks and/or birth weight <1.5kg) born between 2010 and 2012 from a clinical cohort in a Brazilian tertiary care hospital. Children were clinically assessed at 6years of age for ADHD using the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS). The least absolute shrinkage and selection operator (LASSO) method was used for model-building.
RESULTS: Ninety-six VP/VLBW children were assessed at 6years of age (92% follow-up), of whom 32 (33%) were diagnosed with ADHD. The area under the ROC curve (AUC) for ADHD prediction based on seven parameters (late-onset sepsis confirmed by blood culture, necrotizing enterocolitis, neonatal seizures, periventricular leukomalacia, respiratory distress syndrome, length of hospital stay, and number of maternal ADHD symptoms) was .875 (CI, 0.800-0.942, p<.001; AUC corrected for optimism with bootstrapping: .806), a performance that is comparable to other medical risk calculators. Compared to approaches that would offer early intervention to all, or intervention to none, the risk calculator will be more useful in selecting VP/VLBW newborns, with statistically significant net benefits at cost:benefits of around 1:2 to around 10:6 (range of ADHD risk thresholds of 32%-62%, respectively). It also showed specificity for ADHD compared to other prevalent child psychopathologies.
CONCLUSIONS: The risk calculator showed good performance for early identification of VP/VLBW newborns at high risk of future ADHD diagnosis. External validity in population-based samples is needed to extend clinical usefulness

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J Child Psychol Psychiatry. 2022 Aug;63:948-56.
POLYGENIC RISKS FOR JOINT DEVELOPMENTAL TRAJECTORIES OF INTERNALIZING AND EXTERNALIZING PROBLEMS: FINDINGS FROM THE ALSPAC COHORT.
Speyer LG, Neaves S, Hall HA, et al.
BACKGROUND: Joint developmental trajectories of internalizing and externalizing problems show considerable heterogeneity; however, this can be parsed into a small number of meaningful subgroups. Doing so offered insights into risk factors that lead to different patterns of internalizing/externalizing trajectories. However, despite both domains of problems showing strong heritability, no study has yet considered genetic risks as predictors of joint internalizing/externalizing problem trajectories.
METHODS: Using parallel process latent class growth analysis, we estimated joint developmental trajectories of internalizing and externalizing difficulties assessed across ages 4 to 16 using the Strengths and Difficulties Questionnaire. Multinomial logistic regression was used to evaluate a range of demographic, perinatal, maternal mental health, and child and maternal polygenic predictors of group membership. Participants included 11,049 children taking part in the Avon Longitudinal Study of Parents and Children. Polygenic data were available for 7,127 children and 6,836 mothers.
RESULTS: A 5-class model was judged optimal: Unaffected, Moderate Externalizing Symptoms, High Externalizing Symptoms, Moderate Internalizing and Externalizing Symptoms and High Internalizing and Externalizing Symptoms. Male sex, lower maternal age, maternal mental health problems, maternal smoking during pregnancy, higher child polygenic risk scores for ADHD and lower polygenic scores for IQ distinguished affected classes from the unaffected class.
CONCLUSIONS: While affected classes could be relatively well separated from the unaffected class, phenotypic and polygenic predictors were limited in their ability to distinguish between different affected classes. Results thus add to existing evidence that internalizing and externalizing problems have mostly shared risk factors

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J Clin Ultrasound. 2022 Jul;50:805-09.
LONG-TERM OUTCOME OF CASES OF FETAL PLEURAL EFFUSION: A STUDY AT A SINGLE PERINATAL CENTER IN JAPAN.
Takita H, Matsuoka R, Goto M, et al.

PURPOSE: To analyze the long-term prognosis of primary and secondary fetal pleural effusion (FPE).
METHODS: We investigated all cases of FPE in a single University hospital (2005-2020). Cases were classified as primary (cases with only pleural effusion) and secondary (cases with other abnormalities such as chromosomal abnormalities or fetal cardiac failure). We retrospectively reviewed the medical records from the time of diagnosis, to assess medical procedures performed, chromosomal test results, and clinical outcomes.
RESULTS: Among 18 027 deliveries, 17 FPEs were identified (primary FPE: 8, secondary FPE: 9). Most primary FPEs were diagnosed in the second trimester of pregnancy, while all secondary FPEs were diagnosed in the third trimester. Secondary FPE was often associated with chromosomal abnormalities, including trisomy 21. The prognosis of pleural effusion caused by trisomy 21 was relatively good, except for cases with TAM. Cases of secondary FPE without trisomy 21 were of cardiac origin, and the neonatal prognosis was poor. The short-term prognosis was better in the primary FPE group, but long-term follow-up identified conditions such as acute encephalitis with refractory, repetitive partial seizures, developmental delay and attention deficit hyperactivity disorder.
CONCLUSION: Fetal pleural effusion without the presence of chromosomal abnormalities or morphologies has a good short-term prognosis, but the long-term prognosis is poor. Thus, long-term follow-up is necessary for all cases of fetal pleural effusion

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J Dev Behav Pediatr. 2022 Aug;43:e361-e369.
THE IMPACT OF PREINJURY AND SECONDARY ATTENTION-DEFICIT/HYPERACTIVITY DISORDER ON OUTCOMES AFTER PEDIATRIC TRAUMATIC BRAIN INJURY.
Narad ME, Kaizar EE, Zhang N, et al.
OBJECTIVE: The objective of this study was to examine the impact of preinjury attention-deficit/hyperactivity disorder (PADHD) and secondary ADHD (SADHD) on outcomes after pediatric traumatic brain injury (TBI).
METHODS: Two hundred eighty-four individuals aged 11 to 18 years hospitalized overnight for a moderate-to-severe TBI were included in this study. Parents completed measures of child behavior and functioning and their own functioning. Linear models examined the effect of ADHD status (PADHD vs SADHD vs no ADHD) on the child's executive functioning (EF), social competence, and functional impairment, and parental depression and distress.
RESULTS: ADHD status had a significant effect on EF [$F(2,269) = 9.19$, $p = 0.0001$), social competence ($F[2,263] = 32.28$, $p < 0.0001$), functional impairment ($F[2,269] = 16.82$, $p < 0.0001$), parental depression ($F[2,263] = 5.53$, $p = 0.005$), and parental distress ($F[2,259] = 3.57$, $p = 0.03$). PADHD and SADHD groups had greater EF deficits, poorer social competence, and greater functional impairment than the no ADHD group. The SADHD group had greater levels of parental depression than the no ADHD and PADHD groups, and the SADHD group had higher parental distress than the no ADHD group.
CONCLUSION: The results highlight the importance of early identification and management of ADHD symptoms after injury to mitigate downstream functional problems. Supporting parents managing new-onset ADHD symptoms may also be important

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J Dev Behav Pediatr. 2022 Aug;43:311-19.
PREDICTORS OF STIMULANT MEDICATION CONTINUITY IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Kamimura-Nishimura KI, Brinkman WB, Epstein JN, et al.
OBJECTIVE: The objective of this study was to examine the simultaneous impact of patient-related and parent-related factors, medication-related factors, and health care system-related factors on attention-deficit/hyperactivity disorder (ADHD) medication continuity.
METHOD: Stimulant-naïve children (N = 144, M age = 8 yrs, 71% male) with ADHD completed a methylphenidate (MPH) trial and were followed for 1 year after trial completion and return to community care. Multivariable analysis investigated predictors of (1) having at least 1 filled ADHD prescription after return to

community care versus none and (2) having more days covered with medicine after return to community care. Predictors included race; age; sex; income; baseline ADHD symptom severity; MPH trial experience; child and parent mental health conditions; and parent beliefs about ADHD, ADHD medications, and therapeutic alliance.
RESULTS: One hundred twenty-one children (84%) had at least 1 filled ADHD medication prescription (mean = 178 d covered by medication) in the year after return to community care. Multivariable models found that a weaker perceived clinician-family working alliance predicted not filling any ADHD prescriptions. Among those who filled 1 prescription, factors linked to fewer days of ADHD medication coverage included child sociodemographic factors (non-White race, older age, being female, and lower income), lower parent beliefs that the child's ADHD affects their lives, and higher parent beliefs that medication is harmful, while child oppositional defiant disorder and parental ADHD predicted having more days of medication coverage.
CONCLUSION: Child demographic factors, parent beliefs, and medication-related factors are associated with continuation of ADHD medication. These findings may facilitate the development of effective strategies to improve ADHD medication continuity for children from diverse groups

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J Interpers Violence. 2022 Aug;37:NP12768-NP12793.
EMERGENCY DEPARTMENT ADMISSIONS FOR PHYSICAL CHILD ABUSE: EVIDENCE FROM THE 2006-2017 NATIONWIDE EMERGENCY DEPARTMENT SAMPLE.
Carbone JT, Kremer KP, Holzer KJ, et al.
Physical child abuse continues to be a serious public health issue in the United States. This study expands on previous research by exploring trends in physical child abuse diagnoses among children admitted to emergency departments (EDs) across the United States. The analysis aimed to explicate the association between physical child abuse and both sociodemographic and behavioral health covariates to better inform and identify risk factors associated with ED admissions for abuse. The study also explicated differences between confirmed and suspected physical child abuse cases. The study utilized a nationally representative sample of hospital-owned EDs that included 319,676,625 ED admissions between 2006 and 2017 for children under 18-years-old. The analysis included a trend analysis, bivariate descriptive statistics, and multivariate logistic regression models were employed. Children with a physical child abuse diagnosis were less likely to be from higher income communities (aOR = 0.61, 95% CI [0.53, 0.71]), less likely to be female (aOR = 0.93, 95% CI [0.90, 0.96]), and more likely to be uninsured (aOR = 1.65, 95% CI [1.48, 1.84]). Children with attention-deficit hyperactivity disorder (aOR = 1.36, 95% CI [1.14, 1.62]) and a conduct disorder (aOR = 1.28, 95% CI [1.04, 1.58]) were more likely to have a physical abuse diagnosis. The sex-stratified analyses found that the higher rates of physical abuse among children with attention-deficit hyperactivity disorder were driven by the male subsample, while higher rates of abuse for those with conduct disorders were the result of the female subsample. A supplemental analysis of suspected versus confirmed physical child abuse for the fourth quarter of 2015 through 2017 also revealed sociodemographic and behavioral health differences. This study supports the need to consider sociodemographic and behavioral risk factors associated with physical child abuse to inform treatment and potential reoccurrence of abuse

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J Neural Eng. 2022 Jul;19.
TOWARDS HIGH-ACCURACY CLASSIFYING ATTENTION-DEFICIT/HYPERACTIVITY DISORDERS USING CNN-LSTM MODEL.
Wang C, Wang X, Jing X, et al.
Objective. The neurocognitive attention functions involve the cooperation of multiple brain regions, and the defects in the cooperation will lead to attention-deficit/hyperactivity disorder (ADHD), which is one of the most common neuropsychiatric disorders for children. The current ADHD diagnosis is mainly based on a subjective evaluation that is easily biased by the experience of the clinicians and lacks the support of objective indicators. The purpose of this study is to propose a method that can effectively identify children with ADHD.Approach. In this study, we proposed a CNN-LSTM model to solve the three-class problems of

classifying ADHD, attention deficit disorder (ADD) and healthy children, based on a public electroencephalogram (EEG) dataset that includes event-related potential (ERP) EEG signals of 144 children. The convolution visualization and saliency map methods were used to observe the features automatically extracted by the proposed model, which could intuitively explain how the model distinguished different groups.
Main results. The results showed that our CNN-LSTM model could achieve an accuracy as high as 98.23% in a five-fold cross-validation method, which was significantly better than the current state-of-the-art CNN models. The features extracted by the proposed model were mainly located in the frontal and central areas, with significant differences in the time period mappings among the three different groups. The P300 and contingent negative variation (CNV) in the frontal lobe had the largest decrease in the healthy control (HC) group, and the ADD group had the smallest decrease. In the central area, only the HC group had a significant negative oscillation of CNV waves.
Significance. The results of this study suggest that the CNN-LSTM model can effectively identify children with ADHD and its subtypes. The visualized features automatically extracted by this model could better explain the differences in the ERP response among different groups, which is more convincing than previous studies, and it could be used as more reliable neural biomarkers to help with more accurate diagnosis in the clinics

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J Neurodev Disord. 2022 Jul;14:42.
STEADY-STATE VISUAL EVOKED POTENTIALS IN CHILDREN WITH NEUROFIBROMATOSIS TYPE 1: ASSOCIATIONS WITH BEHAVIORAL RATING SCALES AND IMPACT OF PSYCHOSTIMULANT MEDICATION.
Lalancette E, Charlebois-Poirier AR, Agbogba K, et al.
BACKGROUND: Neurofibromatosis type 1 (NF1) is a genetic disorder often associated with cognitive dysfunctions, including a high occurrence of deficits in visuoperceptual skills. The neural underpinnings of these visuoperceptual deficits are not fully understood. We used steady-state visual evoked potentials (SSVEPs) to investigate possible alterations in the synchronization of neural activity in the occipital cortex of children with NF1.
METHODS: SSVEPs were measured using electroencephalography and compared between children with NF1 (n = 28) and neurotypical controls (n = 28) aged between 4 and 13 years old. SSVEPs were recorded during visual stimulation with coloured icons flickering at three different frequencies (6 Hz, 10 Hz, and 15 Hz) and analyzed in terms of signal-to-noise ratios. A mixed design ANCOVA was performed to compare SSVEP responses between groups at the three stimulation frequencies. Pearson's correlations with levels of intellectual functioning as well as with symptoms of ADHD, ASD and emotional/behavioral problems were performed. The impact of psychostimulant medication on the SSVEP responses was analyzed in a subset of the NF1 group (n = 8) with paired t-tests.
RESULTS: We observed reduced signal-to-noise ratios of the SSVEP responses in children with NF1. The SSVEP responses were negatively correlated with symptoms of inattention and with symptoms of emotional/behavioral problems in the NF1 group. The SSVEP response generated by the lowest stimulation frequency (i.e., 6 Hz) was rescued with the intake of psychostimulant medication.
CONCLUSIONS: Impaired processing of rhythmic visual stimulation was evidenced in children with NF1 through measures of SSVEP responses. Those responses seem to be more reduced in children with NF1 who exhibit more symptoms of inattention and emotional/behavioral problems in their daily life. SSVEPs are potentially sensitive electrophysiological markers that could be included in future studies investigating the impact of medication on brain activity and cognitive functioning in children with NF1

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J Pediatr Psychol. 2022 Jul;47:816-26.
PICKY EATING IN CHILDHOOD: ASSOCIATIONS WITH OBSESSIVE-COMPULSIVE SYMPTOMS .
Schwarzlose RF, Hennefield L, Hoyniak CP, et al .

OBJECTIVE: To test whether childhood picky eating (PE)-a behavior previously linked to many forms of psychopathology-is specifically associated with symptoms of obsessive-compulsive disorder (OCD).
METHODS: We investigated the relationship between PE and symptoms of several forms of psychopathology in two separate observational samples: a sample of 110 children (5 and 6years old) and a sample of 210 children (8 and 9years old) drawn from a longitudinal study. In each sample, regression models based on psychiatric symptoms or diagnoses were used to assess the specificity of PE associations while accounting for cooccurring symptoms or comorbidities.
RESULTS: Although bivariate associations emerged between PE and multiple forms of psychopathology, multivariate analyses revealed these associations were driven by a strong and specific association between PE and symptoms of OCD in both samples. Moreover, PE among 8- and 9-year-olds in the longitudinal study predicted emergence of additional later psychopathology, specifically attention-deficit/hyperactivity disorder (ADHD).
CONCLUSIONS: Findings suggest that PE, an easily identifiable clinical presentation, is also a specific marker for obsessive-compulsive symptomatology in school-age children and may impart risk for ADHD later in childhood

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J Psychiatr Res. 2022 Aug;152:31-37.
WITHDRAWING METHYLPHENIDATE IN RELATION TO SERUM LEVELS OF FERRITIN AND ZINC IN CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Rosenau PT, van den Hoofdakker BJ, Matthijssen AM, et al.
Iron and zinc have been associated with attention-deficit/hyperactivity disorder (ADHD), executive functioning, and response to methylphenidate, given their link with the dopaminergic system. This study aimed to investigate the effect of withdrawing methylphenidate after long-term treatment on serum levels of ferritin and zinc; and if baseline (pre-discontinuation) serum levels of these nutritional markers moderated the effects of withdrawing methylphenidate on ADHD and oppositional defiant disorder (ODD) symptoms, and working memory. Blood samples were collected from 63 children and adolescents who participated in a randomized, placebo-controlled methylphenidate discontinuation study. They were assigned to either seven weeks of continued treatment with methylphenidate or to gradual withdrawal to placebo. With mixed models for repeated measures we (i) compared changes in ferritin and zinc serum levels between both groups, and (ii) investigated moderating effects of ferritin and zinc on the effects of discontinuation on ADHD and ODD symptoms, and working memory. We additionally explored correlations of baseline and change serum levels with respective symptom scores. Withdrawing methylphenidate led to a decrease in ferritin levels. Higher baseline ferritin was associated with a larger increase (i.e., worsening) of teacher-rated hyperactivity-impulsivity and ODD symptoms after withdrawal; and higher baseline zinc with a larger increase in number of errors on the working memory task after withdrawal. Serum levels did not correlate with ADHD and ODD symptoms. Our preliminary results suggest that ferritin and zinc may be potential biomarkers for the effectiveness of long-term treatment with methylphenidate

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J Psychosoc Nurs Ment Health Serv. 2022 Jul;60:7-9.
VILOXAZINE ER (QELBREE(®)): A NEW NON-STIMULANT OPTION IN THE TREATMENT OF PEDIATRIC ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Kameg B.
The current article provides a brief overview for psychiatric-mental health nurse practitioners of viloxazine extended-release (Qelbree(Â®)) for the treatment of pediatric attention-deficit/hyperactivity disorder. [Journal of Psychosocial Nursing and Mental Health Services, 60(7), 7-9.]

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JAMA Netw Open. 2022 Jul;5:e2221608.

ASSOCIATIONS OF MATERNAL MILK FEEDING WITH NEURODEVELOPMENTAL OUTCOMES AT 7 YEARS OF AGE IN FORMER PRETERM INFANTS.

Belfort MB, Knight E, Chandarana S, et al.

IMPORTANCE: Maternal milk feeding may have unique long-term neurodevelopmental benefits in very preterm infants. OBJECTIVE: To examine the extent to which maternal milk feeding after very preterm birth is associated with cognitive, academic, and behavioral outcomes at school age.

DESIGN, SETTING, AND PARTICIPANTS: This prospective cohort study assessed 586 infants born at less than 33 weeks' gestation at 5 Australian perinatal centers and enrolled in the Docosahexaenoic Acid for Improvement of Neurodevelopmental Outcomes study (January 1, 2001, to December 31, 2005) who were evaluated at a corrected age of 7 years. The statistical analysis was completed on January 19, 2022.

EXPOSURES: Maternal milk intake, including mean volume (milliliters per kilogram per day) during neonatal hospitalization and total duration (in months).

MAIN OUTCOMES AND MEASURES: Neurodevelopmental outcomes at 7 years of age were (1) IQ (Wechsler Abbreviated Scale of Intelligence), (2) academic achievement (Wide Range Achievement Test, Fourth Edition), (3) symptoms of attention-deficit/hyperactivity disorder (ADHD) (Conners Third Edition ADHD Index, parent reported), (4) executive function (Behavior Rating Inventory of Executive Functioning, parent reported), and (5) behavior (Strengths and Difficulties Questionnaire, parent reported).

RESULTS: A total of 586 infants (mean [SD] gestational age at birth, 29.6 [2.3] weeks; 314 male [53.6%]) born to 486 mothers (mean [SD] age, 30.6 [5.5] years; 447 [92.0%] White) were included. Mean (SD) maternal milk intake in the neonatal intensive care unit was 99 (48) mL/kg daily, and mean (SD) maternal milk duration was 5.1 (5.4) months. Mean (SD) full-scale IQ was 98.5 (13.3) points. After covariate adjustment, higher maternal milk intake during the neonatal hospitalization was associated with higher performance IQ (0.67 points per additional 25 mL/kg daily; 95% CI, 0.10-1.23 points), reading scores (1.14 points per 25 mL/kg daily; 95% CI, 0.39-1.89 points), and math scores (0.76 points per 25 mL/kg daily; 95% CI, 0.14-1.37 points) and fewer ADHD symptoms (-1.08 points per 25 mL/kg daily; 95% CI, -1.96 to -0.20 points). Longer duration of maternal milk intake was associated with higher reading (0.33 points per additional month; 95% CI, 0.03-0.63 points), spelling (0.31 points per month; 95% CI, 0.01-0.62 points), and math (0.30 points per month; 95% CI, 0.03-0.58 points) scores. Maternal milk was not associated with improved full-scale IQ, verbal IQ, executive function, or behavior. Most associations were stronger among infants born at lower gestational ages, particularly less than 30 weeks (interaction P values <.01).

CONCLUSIONS AND RELEVANCE: In this cohort study of preterm infants, maternal milk feeding during the neonatal hospitalization and after discharge were associated with better school-age performance IQ and academic achievement and with a reduction in ADHD symptoms, particularly among infants born at less than 30 weeks' gestation

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JAMA Psychiatry. 2022.

ASSOCIATIONS BETWEEN PREGNANCY-RELATED PREDISPOSING FACTORS FOR OFFSPRING NEURODEVELOPMENTAL CONDITIONS AND PARENTAL GENETIC LIABILITY TO ATTENTION-DEFICIT/HYPERACTIVITY DISORDER, AUTISM, AND SCHIZOPHRENIA: THE NORWEGIAN MOTHER, FATHER AND CHILD COHORT STUDY (MOBA).

Havdahl A, Wootton RE, Leppert B, et al.

Importance: Several maternal exposures during pregnancy are considered predisposing factors for offspring neurodevelopmental conditions. However, many of these exposures may be noncausal and biased by maternal genetic liability.

Objective: To assess whether pregnancy-related predisposing factors for offspring neurodevelopmental conditions are associated with maternal genetic liability for attention-deficit/hyperactivity disorder (ADHD), autism, and schizophrenia and to compare associations for maternal genetic liability with those for paternal genetic liability, which could indicate that paternal exposures are not suitable negative controls for maternal exposures.

Design, Setting, and Participants: The Norwegian Mother, Father and Child Cohort Study (MoBa) is a population-based pregnancy cohort that recruited parents from June 1999 to December 2008. Polygenic

scores (PGS) for ADHD, autism, and schizophrenia were derived in mothers and fathers. The associations between maternal PGS and 37 pregnancy-related measures were estimated, and these results were compared with those from paternal PGS predicting paternal measures during the mother's pregnancy. Analysis took place between March 2021 and March 2022.
Exposures: PGS for ADHD, autism, and schizophrenia, calculated (using discovery effect size estimates and threshold of P <.05) from the largest available genome-wide association studies.
Main Outcomes and Measures: Self-reported pregnancy-related measures capturing lifestyle behaviors, metabolism, infectious and autoimmune diseases, other physical health conditions, and medication use.
Results: Data were available for up to 14539 mothers (mean [SD] age, 30.00 [4.45] years) and 14897 fathers (mean [SD] age, 32.46 [5.13] years) of European ancestry. Modest but robust associations were observed between specific pregnancy-related measures and maternal PGS, including ADHD PGS with asthma (odds ratio [OR], 1.15 [95% CI, 1.06-1.25]), smoking (OR, 1.26 [95% CI, 1.19-1.33]), prepregnancy body mass index (+¦, 0.25 [95% CI, 0.18-0.31]), pregnancy weight gain (+¦, 0.20 [95% CI, 0.10-0.30]), taking folate (OR, 0.92 [95% CI, 0.88-0.96]), and not taking supplements (OR, 1.09 [95% CI, 1.04-1.14]). Schizophrenia PGS was associated with coffee consumption (OR, 1.09 [95% CI, 1.05-1.12]), smoking (OR, 1.12 [95% CI, 1.06-1.19]), prepregnancy body mass index (+¦, -0.18 [95% CI, -0.25 to -0.11]), and pregnancy weight gain (+¦, 0.17 [95% CI, 0.07-0.27]). All 3 PGSs associated with symptoms of depression/anxiety (ADHD: OR, 1.15 [95% CI, 1.09-1.22]; autism: OR, 1.13 [95% CI, 1.06-1.19]; schizophrenia: OR, 1.13 [95% CI, 1.07-1.20]). Associations were largely consistent for maternal and paternal PGS, except ADHD PGS and smoking (fathers: OR, 1.13 [95% CI, 1.09-1.17]).
Conclusions and Relevance: In this study, genetic liability to neurodevelopmental conditions that is passed from mothers to children was associated with several pregnancy-related factors and may therefore confound associations between these pregnancy-related factors and offspring neurodevelopment that have previously been thought to be causal. It is crucial that future study designs account for genetic confounding to obtain valid causal inferences so that accurate advice can be given to pregnant individuals

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J Asthma. 2022.

ASSOCIATION OF CORTICOSTEROID USE AND ATTENTION DEFICIT/HYPERACTIVITY DISORDER IN ASTHMATIC CHILDREN VARIES BY AGE.

Xie L, Gelfand A, Mathew MS, et al.

Objective: We aim to examine the impact of corticosteroids use on ADHD among children with asthma by administration routes.
Methods: A population-based, cross-sectional analysis included pediatric patients ages 5-20 years old from the 2016 and 2019 Kids Inpatient Database (unweighted N = 111,702). ICD-10-CM codes were used to identify corticosteroids use, asthma, and ADHD cases. Survey logistic regression models with purposeful variable selection algorithms were built to examine the association between corticosteroids use, and ADHD by asthma severity and age. An inverse probability weighting (IPW) approach was used to help further control residual confounding,
Results: Among children aged 5-11 years old, the odds of ADHD were significantly higher in children with moderate to severe asthma who used inhaled corticosteroids than nonusers (moderate asthma: adjusted odds ratios [aOR] 1.46, 95% confidence interval [CI] 1.14-2.44; severe asthma: aOR 1.61, 95% CI 1.18ΓÇô2.21). Although oral corticosteroid use was not independently associated with ADHD in young children, combined use of inhaled and oral corticosteroid had almost 5 times higher odds of use among ADHD in children with severe asthma vs. nonusers (aOR 4.85, 95% CI 2.07 11.35). No associations were found between any corticosteroid use and ADHD among asthmatic children aged 12-20 years.
Conclusions: In this retrospective analysis, we found inhaled corticosteroids were positively associated with ADHD in younger children with moderate to severe asthma, but not in older children

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J Autism Dev Disord. 2022.

UNDERSTANDING AND SUPPORTING ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) IN THE PRIMARY SCHOOL CLASSROOM: PERSPECTIVES OF CHILDREN WITH ADHD AND THEIR TEACHERS.

McDougal E, Tai C, Stewart TM, et al.

Children with Attention Deficit Hyperactivity Disorder (ADHD) are more at risk for academic underachievement compared to their typically developing peers. Understanding their greatest strengths and challenges at school, and how these can be supported, is vital in order to develop focused classroom interventions. Ten primary school pupils with ADHD (aged 6-11years) and their teachers (N = 6) took part in semi-structured interviews that focused on (1) ADHD knowledge, (2) the child's strengths and challenges at school, and (3) strategies in place to support challenges. Thematic analysis was used to analyse the interview transcripts and three key themes were identified; classroom-general versus individual-specific strategies, heterogeneity of strategies, and the role of peers. Implications relating to educational practice and future research are discussed

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J Child Psychol Psychiatry. 2022 Jul;63:745-61.

ALPHA OSCILLATORY ACTIVITY DURING ATTENTIONAL CONTROL IN CHILDREN WITH AUTISM SPECTRUM DISORDER (ASD), ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD), AND ASD+ADHD.

Cañigueral R, Palmer J, Ashwood KL, et al.

Background: Autism Spectrum Disorder (ASD) and Attention-Deficit/Hyperactivity Disorder (ADHD) share impairments in top-down and bottom-up modulation of attention. However, it is not yet well understood if co-occurrence of ASD and ADHD reflects a distinct or additive profile of attention deficits. We aimed to characterise alpha oscillatory activity (stimulus-locked alpha desynchronisation and prestimulus alpha) as an index of integration of top-down and bottom-up attentional processes in ASD and ADHD.

Methods: Children with ASD, ADHD, comorbid ASD+ADHD, and typically-developing children completed a fixed-choice reaction-time task ('Fast task') while neurophysiological activity was recorded. Outcome measures were derived from source-decomposed neurophysiological data. Main measures of interest were prestimulus alpha power and alpha desynchronisation (difference between poststimulus and prestimulus alpha). Poststimulus activity linked to attention allocation (P1, P3), attentional control (N2), and cognitive control (theta synchronisation, 100–600 ms) was also examined. ANOVA was used to test differences across diagnostics groups on these measures. Spearman's correlations were used to investigate the relationship between attentional control processes (alpha oscillations), central executive functions (theta synchronisation), early visual processing (P1), and behavioural performance.

Results: Children with ADHD (ADHD and ASD+ADHD) showed attenuated alpha desynchronisation, indicating poor integration of top-down and bottom-up attentional processes. Children with ADHD showed reduced N2 and P3 amplitudes, while children with ASD (ASD and ASD+ADHD) showed greater N2 amplitude, indicating atypical attentional control and attention allocation across ASD and ADHD. In the ASD group, prestimulus alpha and theta synchronisation were negatively correlated, and alpha desynchronisation and theta synchronisation were positively correlated, suggesting an atypical association between attentional control processes and executive functions.

Conclusions: ASD and ADHD are associated with disorder-specific impairments, while children with ASD+ADHD overall presented an additive profile with attentional deficits of both disorders. Importantly, these findings may inform the improvement of transdiagnostic procedures and optimisation of personalised intervention approaches

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J Consult Clin Psychol. 2022 Jul;90:545-58.

MEDIATORS OF PSYCHOSOCIAL TREATMENT FOR ADOLESCENT ADHD.

Sibley MH, Coxe SJ, Zulauf-McCurdy C, et al.

Objective: Almost no studies identify mediators of psychosocial interventions for attention deficit/hyperactivity disorder (ADHD)—largely due to design limitations. Understanding mediators can

promote streamlined interventions in usual care (UC) settings. When individual studies are insufficient to pursue complex questions, integrative data analysis (IDA) allows researchers to pool raw data from multiple studies to produce cumulative scientific knowledge.
Method: We leveraged IDA to pool and harmonize data from four randomized controlled trials of ADHD psychosocial treatment (N = 854) with three time points. Linear growth curve analyses examined the impact of four psychosocial treatment conditions on ADHD symptom outcomes and five candidate mediators (compared to no treatment). To test mediation, we examined whether treatment condition predicted linear growth in the mediator at posttreatment, and if the mediator predicted linear growth in the outcome at follow-up.
Results: Compared to no treatment, engagement-focused parent–teen treatment (d = .43–.72; Supporting Teens' Autonomy Daily [STAND]) and community-based usual care (d = .54–.99) led to greatest reductions in parent-rated ADHD symptoms, followed by the Summer Treatment Program–Adolescent (d = .29–.30; STP-A) and standard behavioral parent training + organization skills training (d = .26–.31; BPT/OST). Improvements in organization, time management, and planning skills mediated outcome for all treatments. BPT/OST and STP-A prevented deterioration of social skills, in turn mitigating escalation of ADHD symptoms. Improvements in parent–teen communication skills mediated outcome for STAND, BPT/OST, and the STP-A. Parent contingency management and disruptive classroom behavior were not treatment mediators.
Conclusions: Psychosocial treatments for adolescent ADHD primarily improve ADHD symptoms through development of teen organization, time management (OTP), and parent–teen communication skills, as well as slowing deterioration of social skills.
What is the public health significance of this article?—Community-based treatments for adolescent ADHD should include evidence-based treatment components that target these outcomes

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J Epidemiol Community Health. 2019;73:A39.

GENETIC LIABILITY FOR ADHD AND PHYSICAL HEALTH OUTCOME – A TWO-SAMPLE MENDELIAN RANDOMIZATION STUDY.

Leppert B, Riglin L, Dardani C, et al.

Background Attention-deficit/hyperactivity disorder (ADHD) is associated with a broad range of physical health problems, including cardiometabolic, neurological and immunological conditions. Determining whether ADHD plays a causal role in these associations is of great importance not only for early treatment and prevention but also because comorbid health problems further increase the serious social and economic impacts of ADHD on individuals and the society.
Methods We used a two-sample Mendelian randomization (MR) approach to examine the causal relationships between genetic liability for ADHD and previously implicated physical health conditions. Genetic variants associated with ADHD were obtained from the latest summary statistics for European ancestry from the combined PGC + iPSYCH meta-analysis of ADHD. Consistent effects obtained from IVW, weighted median and MR Egger methods were taken forward for sensitivity analysis. The direction of effect was investigated in a bidirectional MR analysis. Multivariable MR was applied to assess effects of genetic liability for ADHD when adjusted for genetic liability for childhood obesity and lifetime smoking heaviness.
Results We found evidence of a causal effect of genetic liability for ADHD on childhood obesity (OR:1.29 (95% CI:1.02,1.63)) and coronary artery disease (CAD) (OR:1.11 (95% CI:1.03,1.19)) with consistent results across different MR approaches. There was further evidence for a bidirectional relationship between genetic liability for ADHD and childhood obesity. The effect of genetic liability for ADHD on CAD was independent of smoking heaviness in a multivariable MR setting (OR:1.14(95% CI:1.08,1.20) but was attenuated when simultaneously entering genetic liability for childhood obesity (OR:1.06 ((95% CI:0.95,1.17)). There was little evidence for a causal effect on other cardiometabolic, immunological, neurological disorders and lung cancer.
Conclusion Our findings strengthen the argument for early treatment and support for children with ADHD and their families and especially promoting physical activity and providing them with dietary advice to reduce the future risk for developing CAD

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J Epidemiol Community Health. 2019;73:A67-A68.

AREA – AND INDIVIDUAL-BASED MEASURES OF SOCIOECONOMIC CIRCUMSTANCES AND ADHD PRESCRIPTION UPTAKE AMONG CHILDREN IN SCOTLAND: A POPULATION-BASED REGISTER STUDY.

Henery PM, Katikireddi SV, Wood R, et al.

Background Attention-deficit hyperactivity disorder (ADHD) in childhood can have adverse effects on mental health, learning, and employment opportunities. There is evidence of a relationship between socioeconomic disadvantage and likelihood of ADHD in childhood; however, most studies use area-level measures which may underestimate inequality compared to individual/family-based measures. This study aimed assess whether area-level and individual-level measures of social disadvantage were predictive of child ADHD via dispensed prescriptions.

Methods We used birth data for all children born in Scotland 2010-2012 (n=195,419) linked to Prescription Information System up to March 2018. Two measures of socioeconomic circumstances (SECs) at the child's birth were used: Scottish Index of Multiple Deprivation (SIMD) (area-based), and four class measure of the NS-SEC of the mother (individual-based). Prescription use was defined as a record of any dispensed prescription for ADHD up until March 2018 (median age 6). We used binary logistic regression to estimate risk ratios (RRs) for prescription uptake by each SEC measure before and after adjusting for covariates/confounders (sex, age of child as of March 2018, number of births in pregnancy, mother's age at first live birth, mother's birth country, relationship status of parents).

Results Prescription use varied by area deprivation (0.58% of children born in the most deprived SIMD decile compared to 0.14% in the least deprived) and social class (0.62% for children born to mothers in the unemployed/other social class compared to 0.16% in the managerial/professional social class). The strength of association narrowed slightly after adjustment for confounders/covariates; the fully adjusted RR for prescription use was 2.14 (95% C.I.: 1.33-3.44) in the most compared to least deprived SIMD decile and 2.32 (95% C.I.: 1.78-3.04) for children born to mothers who were unemployed/ other compared to managerial/professional. After mutual adjustment for both SEC measures, the effect of SIMD was reduced whilst that of mother's social class remained consistent.

Conclusion Both area-level and family-level deprivation at birth are associated with increased prescription use among young children in Scotland, suggesting disadvantaged SEC are associated with higher prescription use. Inequalities in ADHD prescriptions across childhood may not be fully captured since prevalence increases with age (and our data only follow children up to the maximum age of 8). Prescription data may underestimate prevalence of ADHD as not all children with ADHD symptoms will be diagnosed and/or prescribed (and this may vary by SEC). Future analyses will explore this using data from child health checks

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J Isfahan Med Sch. 2020;38:655-63.

INTERVENTIONS FOR THE TREATMENT OF SELF-REGULATION DISORDERS IN CHILDREN WITH AUTISM: A NARRATIVE REVIEW.

Asadi S, Sourtiji H.

Background: Autism spectrum disorder is one of the most common developmental disorders among children that emerges in early childhood. These children have disturbances in self-regulation at various levels including physical, sensory, mental, emotional, and social levels. However, there is a clear link between self-regulation and language as well as learning and overall development. Therefore, before we can target a child's developmental skills, we need to know how the child is regulated. This article aimed to review the resources to study interventions for the treatment of self-regulated disorders in children with autism spectrum disorder.

Methods: This was a narrative review study. To find studies related to the purpose of the research, a search was performed on English databases of Ot seeker, Google Scholar, Pubmed, using the keywords autism, intervention, and self-regulation management, and Persian data base of Scientific Information Database (SID) using autism and self-regulation Persian keywords. Finally, 18 related studies were selected based on the inclusion criteria.

Findings: The literature review showed that interventions related to the treatment of self-regulation disorders in these children include drug therapy, interventions based on sensory processing and sensory integration,

behavioral and cognitive-behavioral therapies, types specialized in massages, horseback riding therapy, group interventions, and Chinese medicine.
Conclusion: It seems that the selection and application of a specific type of intervention for each child with autism spectrum disorder is dependent on his/her mental age, severity of autism, and the child's environment. Factors related to the individual, interaction, and environment affect the child's ability to self-regulation

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J Pediatr Gastroenterol Nutr. 2022;74:325.
PREVALENCE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER AND SLUGGISH COGNITIVE TEMPO SYMPTOMS IN CHILDREN PRESENTING WITH FOREIGN BODY INGESTION: A CASE-CONTROL STUDY.
Arslan M, et al.
Objectives and Study: Foreign body ingestion (FBI) is one of the common causes of emergency admissions in infancy and childhood. Although the large majority of children who present with the FBI have no psychiatric diagnosis, present studies demonstrate that attention deficit hyperactivity disorder (ADHD) and related psychiatric problems might be a risk factor for FBI.This study aimed to compare the demographic variables and attention deficit hyperactivity disorder levels and sluggish cognitive tempo symptoms (ADHD-SCT) in children who ingested foreign bodies with healthy children. Also we aimed to adress the relationship between ADHD-SCT symptoms and the age of FBI.
Methods: The FBI group comprised 44 children (age 2-8, median: 5, 68.2% boys) admitted to the emergency, pediatric surgery and pediatric gastroenterology department after FBI, and the healthy control group comprised 30 children (age3-8, median: 6, 56.7% boys). We administered the sociodemographic information form, SNAP-IV ADHD rating scale, and Barkley'schild SCT ratings scaleto both groups of parents.
Results: Our results demonstrated that maternal education level was significantly lower in the FBI group, although other demographic characteristics of the samples were similar (p=0.023). In addition, ADHD-hyperactivity/impulsivity scores were significantly higher in the FBI group (p=0.01). Still, there were no significant differences in ADHD-inattention, SCT-daydreaming, and SCTsluggishness scores (for all, p>0.05). We found positive-moderate relationships between SCTdaydreaming and sluggishness symptoms and FBI age (r=0.314, r= 0.348, respectively). This means that higher SCT scores are related to an older FBI age.
Conclusions: In conclusion, for the first time, we evaluated the ADHD and SCT symptoms in young children against FBI and found that ADHD-hyperactivity, but not ADHD-inattention symptoms were significantly higher in the FBI group, and SCT symptoms increase the risk of FBI at an older age. In addition, we found that a lower maternal education level could be an additional risk factor for FBI. High hyperactivity in the FBI group, but the low rate of child psychiatry evaluation should be considered when evaluating a child

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Journal of Pediatric Pharmacology and Therapeutics. 2022;27:409-14.
EXTENDED-RELEASE VILOXAZINE FOR CHILDREN AND ADOLESCENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.
Mather K, Condren M.
Non-stimulant medication therapy for children, adolescents, and young adults with attention-deficit/ hyperactivity disorder (ADHD) has included alpha 2-agonists (guanfacine and clonidine) as well as a norepinephrine reuptake inhibitor (atomoxetine) for multiple years. Although these may be effective options for some children, they are generally considered to be less effective than stimulant medications. In addition, there has been a suicidal ideation concern in early-late adolescence with atomoxetine, emphasizing the need for continued development of other treatment options. Extended-release viloxazine (SPN-812) has been shown in phase 2 and phase 3 trials to be an effective, well-tolerated alternative for some children with ADHD. The mechanism of action of viloxazine is unique, modulating activity of both serotonin and norepinephrine. Treatment-related adverse events most commonly seen included somnolence, decreased appetite, and headache. Although continued evaluation to confirm the reduced symptoms of ADHD in children along with the safety profile is needed, extended-release viloxazine may offer a once-a-day pharmaceutical treatment

option for patients in which stimulant medication is not effective or not a favorable option. It may also be beneficial for those children and adolescents with a comorbidity of depression. ABBREVIATIONS AAP, American Academy of Pediatrics; ADHD, attention-deficit/hyperactivity disorder; CNS, central nervous system; FDA, US Food and Drug Administration; LHH, likelihood to be helped or harmed; NET, norepinephrine transporter; NNH, number needed to harm; NNT, number needed to treat; NRI, norepinephrine reuptake inhibitor; SPN-812, extended-release viloxazine

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Journal of Perinatology. 2022.

PARENTAL ADHD AND ASD SYMPTOMS AND CONTRIBUTIONS OF PSYCHOSOCIAL RISK TO CHILDHOOD ADHD AND ASD SYMPTOMS IN CHILDREN BORN VERY PRETERM.

Liljenwall H, Lean RE, Smyser TA, et al.

Objectives: Examine maternal and paternal ADHD and ASD symptoms in relation to very preterm (VPT) and full-term (FT) children's ADHD and ASD symptoms.

Study design: In this longitudinal study, maternal- and teacher-report of child ADHD and ASD symptoms were obtained for 119 children (VPT = 79, FT = 40) at age 5-years using the Conner's Rating Scale-Revised (CRS-R) and Social Responsiveness Scale-2 (SRS-2). A biological parent completed self- and observer-report CRS-R and SRS-2, and measures of mood/affect, stress, and social support to assess psychosocial distress. Data were analyzed using mixed-effect models adjusted for covariates.

Results: Child ADHD symptoms were associated with VPT birth, maternal distress, and maternal ADHD symptoms (p Γëñ 0.02), and paternal ADHD symptoms (p < 0.001). Regarding ASD, VPT birth and parental ASD symptoms were associated with child ASD symptoms (p Γëñ 0.009). Parental symptoms and birth group had no interaction.

Conclusions: VPT birth and parental psychopathology represent independent risks for ADHD and ASD

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J Psychiatr Res. 2022;153:269-75.

BELOW AVERAGE MOTOR SKILLS PREDICT VICTIMIZATION FROM CHILDHOOD BULLIES: A STUDY OF ADULTS WITH ADHD.

Bejerot S, et al.

Children with ADHD are frequently clumsy and involved in bullying, both as victims and perpetrators. The relationship between motor skills and bully status is poorly understood. The aim of the current study was to evaluate the effect of motor skills in childhood on bully victimization/perpetration in those with ADHD. In this cross-sectional study, 403 adults diagnosed with ADHD filled out a questionnaire on their recall of bully victimization, bully perpetration, performance in physical education (PE) (defined as performance below average in i.e., ball dexterity, coordination or agility) as a proxy for motor skills, and academic skills at age 12, as compared to their peers. Of the current sample, 63% remembered being victimized and 31% noted they were perpetrators. Thirty-two percent recalled that they performed below average in PE. Being diagnosed with ADHD and having poor motor skills was strongly associated with bully victimization (OR = 2.63; 95% CI:1.62, 4.27, p < .001). Victimization was more common during all measured time periods, from nursery school until the age of 15, among those with poor performance in PE as compared to those without poor performance. No relationship was found between poor motor skills and bully perpetration. Conclusion: A crucial role of the cerebellum is coordination and the linking of sequenced motor actions through milli-second timing. Aberrations in this ability makes a person present as different, which was stated as the most common reason for social exclusion by other children. Therefore, subtle clumsiness (presumed by poor performance in PE class) is suggested to mirror deficits in social skills, which is intuitively observed by peers, leading to victimization

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J Psychopathol Behav Assess. 2022.

EMPIRICALLY BASED DIMENSIONS OF EXTERNALIZING SYMPTOMS IN CHILDREN AND ADOLESCENTS: A MULTITRAIT-MULTISOURCE APPROACH.

Thane AK, et al.

The present study sought to refine knowledge about the structure underlying externalizing dimensions. From a top-down ICD/DSM-based perspective, externalizing symptoms can be categorized into attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD). From a bottom-up developmental theory-based perspective, disruptive behaviors can be meaningfully described as aggressive (AGG) and rule-breaking (RB) behaviors. We analyzed five large data sets comprising externalizing symptom ratings obtained with a screening instrument using different sources (parents, teachers, self-ratings) from different samples. Using confirmatory factor analyses, we evaluated several factor models (unidimensional; correlated factors; bifactor (S-1) models) derived from an ICD/DSM- and theory-based perspective. Our optimally fitting models were assessed for measurement invariance across all sources, sample settings, and sex. Following several model-based criteria (model fit indices; factor loadings; omega statistics; model parsimony), we discarded our models stepwise and concluded that both the ICD/DSM-based model with three correlated factors (ADHD, ODD, CD) and the developmental theory-based model with three correlated factors (ADHD, AGG, RB) displayed a statistically sound factor structure and allowed for straightforward interpretability. Furthermore, these two models demonstrated metric invariance across all five samples and across sample settings (community, clinical), as well as scalar invariance across sources and sex. While the dimensions AGG and RB may depict a more empirically coherent view than the categorical perspective of ODD and CD, at this point we cannot clearly determine whether one perspective really outperforms the other. Implications for model selection according to our model-based criteria and clinical research are discussed

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J Am Acad Child Adolesc Psychiatry. 2022.

EDITORIAL: TREATING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN PRESCHOOL-AGE CHILDREN WITH STIMULANTS: MODEST EFFECTS IN YOUNG CHILDREN WITH BIG PROBLEMS.

Stein MA.

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J Neurol Sci. 2022;440.

DETERMINING NEURODEVELOPMENTAL MANIFESTATIONS IN DUCHENNE MUSCULAR DYSTROPHY USING A BATTERY OF BRIEF TESTS.

Saito Y, Takeshita E, Komaki H, et al.

Objective: We report neurodevelopmental manifestations in boys with Duchenne muscular dystrophy (DMD) and evaluate the correlations between mutation location and three neurodevelopmental abnormalities: intellectual disability, autism spectrum disorder, and attentional problems.

Methods: This cross-sectional study included 55 Japanese boys with genetically confirmed DMD who visited the outpatient department of the National Center for Psychiatry and Neurology of Japan from October 2017 to April 2018. Neurodevelopmental manifestations were evaluated using the Raven's Colored Progressive Matrices (RCPM), the Parent-Interview Autism Spectrum Disorder Rating Scale Text Revision (PARS TR), and the Attention-Deficit Hyperactivity Disorder Rating Scale.

Results: Among the 55 boys (mean [standard deviation, SD] age, 9.5 [1.6] years), 24 (43.6%) scored below 2.0 SD in RCPM, indicating intellectual disability. Further, 83% had DMD variants in exon 45 or downstream to it (P = 0.005). On the PARS TR, 30 (55%) and 21 boys (38%) scored higher than the clinical cutoff score in childhood and present scores, respectively. Stereotyped behavior and restricted interests scores were found to decrease with age (P = 0.003 and P = 0.01, respectively).

Discussion: The results show that boys with DMD who have intellectual disability commonly have DMD variants in exon 45 or downstream to it. Stereotyped behavior and restricted interests improved with age, while intellectual disability did not.

Conclusion: Understanding these characteristics of neurodevelopmental disability may reduce risky behaviors and improve the overall quality of life of patients with DMD

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Mol Biol Rep. 2022 Aug;49:7315-25.

SPECIFIC DOPAMINERGIC GENETIC VARIANTS INFLUENCE IMPULSIVITY, COGNITIVE DEFICIT, AND DISEASE SEVERITY OF INDIAN ADHD PROBANDS.

Maitra S, Chatterjee M, Roychowdhury A, et al.

BACKGROUND: Impulsivity (Imp), being one of the cardinal symptoms of Attention Deficit Hyperactivity Disorder (ADHD), often leads to inappropriate responses to stimuli. Since the dopaminergic system is the primary target for pharmaceutical intervention in ADHD, we investigated the association between ADHD-related Imp and functional gene variants of the dopamine transporter (SLC6A3) and catechol-O-methyltransferase involved in dopamine clearance.
METHODS AND RESULTS: Indo-Caucasoid families with ADHD probands (N=217) were recruited based on the Diagnostic and Statistical Manual of Mental Disorders (DSM). Imp of the probands was assessed using the Domain Specific Imp Scale for Children and DSM. Peripheral blood was collected after obtaining informed written consent for participation, genomic DNA was isolated, and target sites were genotyped by DNA sequencing. The association of genetic variants with Imp was examined by the Quantitative trait analysis (QTA) and Analysis of variance (ANOVA). Post-Hoc analysis following QTA and ANOVA showed significant associations of rs2254408, rs2981359, and rs2239393 with different domains of Imp ($P<0.05$). Various haplotypic combinations also showed statistically significant associations with Imp ($P<0.05$). Multifactor dimensionality reduction models revealed strong effects of the variants on Imp. ADHD probands harboring the risk alleles exhibited a deficit in performance during cognitive assessment. Longitudinal follow-up revealed a significant association of rs2254408 with trait persistence.
CONCLUSION: The present study indicates the influence of the studied genetic variants on ADHD-associated imp, executive deficit, and disease persistence. Thus, these variants may be helpful as predictors for the success of individual therapeutic sessions during cognitive training

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Mol Psychiatry. 2022.

ALTERED NEURAL FLEXIBILITY IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Yin W, Li T, Mucha PJ, et al.

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders of childhood, and is often characterized by altered executive functioning. Executive function has been found to be supported by flexibility in dynamic brain reconfiguration. Thus, we applied multilayer community detection to resting-state fMRI data in 180 children with ADHD and 180 typically developing children (TDC) to identify alterations in dynamic brain reconfiguration in children with ADHD. We specifically evaluated MR derived neural flexibility, which is thought to underlie cognitive flexibility, or the ability to selectively switch between mental processes. Significantly decreased neural flexibility was observed in the ADHD group at both the whole brain (raw $p = 0.0005$) and sub-network levels ($p < 0.05$, FDR corrected), particularly for the default mode network, attention-related networks, executive function-related networks, and primary networks. Furthermore, the subjects with ADHD who received medication exhibited significantly increased neural flexibility ($p = 0.025$, FDR corrected) when compared to subjects with ADHD who were medication na+»ve, and their neural flexibility was not statistically different from the TDC group ($p = 0.74$, FDR corrected). Finally, regional neural flexibility was capable of differentiating ADHD from TDC (Accuracy: 77% for tenfold cross-validation, 74.46% for independent test) and of predicting ADHD severity using clinical measures of symptom severity (R2: 0.2794 for tenfold cross-validation, 0.156 for independent test). In conclusion, the present study

found that neural flexibility is altered in children with ADHD and demonstrated the potential clinical utility of neural flexibility to identify children with ADHD, as well as to monitor treatment responses and disease severity

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Movement Disorders Clinical Practice. 2022.

TIC DISORDERS, ANTI-TIC MEDICATIONS, AND RISK OF ATOPY.

Hakimi M, Skinner S, Maurer CW.

Objective: To clarify patterns of comorbid atopic disorders in children with tic disorders compared to controls, and to evaluate whether medications commonly used for treatment of tics and attention deficit hyperactivity disorder (ADHD) are associated with differing risks of atopy.

Background: Inflammatory mechanisms are increasingly recognized as playing a role in a range of neuropsychiatric disorders. The association between tic disorders, ADHD, obsessiveΓÇôcompulsive disorder (OCD) and atopic disorders is uncertain.

Methods: We performed a retrospective cohort study using the global electronic health records database TriNetX. Using odds ratios, we compared the risk of atopy in children with tic disorder (n=4508), ADHD (n=83,569), and/or OCD (n=1555) to controls (n=758 290). To analyze the risk of developing atopy with use of different medications commonly prescribed to treat tics and ADHD, we performed a separate analysis including children with tic disorder, ADHD, and/or OCD who had initiated treatment with one of these medications. Binary logistic regression controlling for age and sex was used to calculate odds ratios.

Results: Children with tic disorder, ADHD, or OCD were more likely than controls to have comorbid atopy. Children who had taken clonidine, guanfacine, methylphenidate, or dexmethylphenidate were more likely to develop an atopic disorder than controls.

Conclusions: Our study suggests a link between atopic disorders and tic disorders, ADHD, and OCD. Although the underlying mechanism for this association remains unclear, medication use may play a role

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Neurology: Clinical Practice. 2021;11:398-405.

NEURODEVELOPMENTAL OUTCOMES OF HIGH-RISK PRETERM INFANTS: A PROSPECTIVE STUDY IN JAPAN.

Torio M, Iwayama M, Sawano T, et al.

ObjectivesTo determine the neurodevelopmental outcomes of very-low-birth-weight infants (VLBWIs, birth weight <1,500 g) after 9 years of follow-up.

Methods This study prospectively recruited 224 VLBWIs born from 2003 to 2009 in Kyushu University Hospital, Japan. Comorbidities of neurocognitive impairment, epilepsy, and autism spectrum disorder or attention-deficit hyperactivity disorder (ASD/ADHD) were assessed at age 3, 6, and 9 years.

Results Neurodevelopmental profiles were obtained from 185 (83%), 150 (67%), and 119 (53%) participants at age 3, 6, and 9 years, respectively. At age 9 years, 25 (21%) VLBWIs showed intelligence quotient (IQ) <70, 11 (9%) developed epilepsy, and 14 (12%) had a diagnosis of ASD/ADHD. The prevalence of epilepsy was higher in children with an IQ <70 at age 9 years than in those with an IQ 70 (44% vs 0%). In contrast, ASD/ADHD appeared at similar frequencies in children with an IQ <70 (16%) and 70 (11%). Perinatal complications and severe brain lesions on MRI were considered common perinatal risks for developmental delay and epilepsy but not for ASD/ADHD. Male sex was identified as a unique risk factor for ASD/ADHD.

Conclusion These data suggest that VLBWIs showed a higher prevalence of developmental delay, epilepsy, and ASD/ADHD at age 9 years than the general population. Distinct mechanisms might be involved in the pathogenic process of ASD/ADHD from those of developmental delay and epilepsy

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Neurosci Biobehav Rev. 2022 Aug;139:104723.

EFFICACY ON SLEEP PARAMETERS AND TOLERABILITY OF MELATONIN IN INDIVIDUALS WITH SLEEP OR MENTAL DISORDERS: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Salanitro M, Wrigley T, Ghabra H, et al.

We conducted the first systematic review and series of meta-analyses to assess the efficacy and tolerability of melatonin in children/adolescents or adults with sleep or mental health disorders, using the same set of criteria across disorders and ages. Based on a pre-registered protocol (PROPSPERO: CRD42021289827), we searched a broad range of electronic databases up to 02.02.2021 for randomized control trials (RCTs) of melatonin. We assessed study quality using the Risk of Bias tool, v2. We included a total of 34 RCTs (21 in children/adolescents: N=984; 13 in adults: N=1014). We found evidence that melatonin significantly improved sleep onset latency and total sleep time, but not sleep awaking, in children and adolescents with a variety of neurodevelopmental disorders, and sleep onset latency (measured by diary) as well as total sleep time (measured with polysomnography) in adults with delayed sleep phase disorder. No evidence of significant differences between melatonin and placebo was found in terms of tolerability. We discuss clinical and research implications of our findings

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Nord J Psychiatry. 2022 Aug;76:466-73.

PARENT-YOUTH AGREEMENT ON PSYCHIATRIC DIAGNOSES AND SYMPTOMS: RESULTS FROM AN ADOLESCENT OUTPATIENT CLINICAL SAMPLE.

Jansdattir H, et al.

OBJECTIVE: Previous research suggests that agreement, between youths and their parents, regarding assessment of youth psychiatric problems is limited. Due to this discrepancy, a multi-informant, multimethod approach is recommended when gathering psychopathological information. This study examines parent-youth agreement regarding youth psychiatric problems. It does so at a diagnostic level and at a symptom level, as well as studying the influence of age, gender, depressive disorder, anxiety disorder and attention-deficit/hyperactivity disorder (ADHD) as potential moderators of agreement.

METHODS: The participants in this study were 61 adolescents aged 12-18Â years and their parents. The K-SADS-PL DSM-5 was administered in two outpatient units, with adolescents and their parents interviewed separately. Participants also rated symptoms using a broad rating scale (Child Behavior Checklist and the Youth Self-Report) prior to being interviewed.

RESULTS: Parent-youth agreement at a diagnostic level ranged from fair to excellent. Agreement at a symptom level was lower than that at a diagnostic level, ranging from poor to fair. These results indicate that parent-youth agreement regarding diagnosis and symptoms is higher than in most previous studies. The results also suggest that some variables, such as age, gender, depressive disorders, and ADHD, potentially influence agreement on symptoms.

CONCLUSION: These findings support the importance of gathering information from both children and parents, and that clinicians should consider moderating factors when integrating data from multiple informants

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Nutrients. 2022 Jul;14.

PHYSICAL COMPLAINTS DECREASE AFTER FOLLOWING A FEW-FOODS DIET IN CHILDREN WITH ADHD.

Pelsser L, Stobernack T, Frankena K.

Attention-deficit hyperactivity disorder (ADHD) symptoms may significantly decrease after following a few-foods diet (FFD). The results of a small randomised controlled trial (RCT) showed that co-occurring physical complaints in children with ADHD decreased as well. To further investigate the effect of an FFD on physical complaints, we analysed unpublished data from previously published studies (i.e., 'Impact of Nutrition on Children with ADHD' [INCA], an RCT, and 'Biomarker Research in ADHD: the Impact of Nutrition' [BRAIN], an open-label trial). In both trials, the association between an FFD, ADHD, and 21 individual physical complaints was assessed. Children either followed a 5-week FFD (the INCA FFD group and BRAIN

participants) or received healthy food advice (the INCA control group). The ADHD rating scale and a physical complaint questionnaire were filled in at the start and end of the trials. The INCA results showed, for 10 of 21 complaints, a clinically relevant reduction in the FFD group compared to the control group. The open-label BRAIN results confirmed the outcomes of the FFD group. No association was detected between the decrease in physical complaints and the decrease in ADHD symptoms. The results point toward an association between the FFD and a decrease in thermoregulation problems, gastrointestinal complaints, eczema, and sleep problems

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Nutrients. 2022 Jul;14.

ASSOCIATIONS BETWEEN DIETARY INTAKE AND ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) SCORES BY REPEATED MEASUREMENTS IN SCHOOL-AGE CHILDREN.

Ryu SA, Choi YJ, An H, et al.

Attention deficit hyperactivity disorder (ADHD) is a common psychiatric disorder in school-age children and adolescents. However, the reported associations between ADHD and single nutrient intake are inconsistent. The aim of the study was to investigate the relationships between dietary intake changes and the prevalence of ADHD over time with repeat measurements using data from the Children Health and Environment Research (CHEER). To assess changes over time, we used data obtained in 2006 and 2008 (Phases (1) and (2)). In this study, there were 2899 children aged 8 years or older in Phase (1) and 2120 children aged 9 years or older in Phase (2) from Korea, and the ADHD scores and dietary intake of 1733 children in Phases (1) and (2) were used in the final analysis. The YN group refers to children whose disease had improved in Phase (2), and the NY group refers to children diagnosed with ADHD in Phase (2). A notable within-group result was the increase in vegetable protein ($p = 0.03$) in the YN group. A between-group comparison showed that significant changes in nutrient intake could be confirmed most in the NY group, and the YN group tended to have a lower nutrient intake than the NY group. In the correlation of changes in nutrient intake and three subtypes (combined, AD, and HD), the total fat ($p = 0.048$) and animal protein ($p = 0.099$) showed a positive correlation with the prevalence of AD. Vegetable iron ($p = 0.061$ and $p = 0.044$, respectively), zinc ($p = 0.022$ and $p = 0.007$, respectively), vegetable protein ($p = 0.074$), and calcium ($p = 0.057$) had inhibitory effects on ADHD and its subtype. In conclusion, management of dietary and nutritional status should be considered to ameliorate ADHD and its subtypes in school-age children, and these relationships require further exploration in other settings

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Paediatr Child Health. 2022.

WHAT'S NEW IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: UPDATES ON ASSESSMENT AND MANAGEMENT.

Sanwo O, Huzair H.

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental condition typically associated with hyperactivity, impulsivity and inattention. While the prevalence in the UK has been relatively stable over the last few years, groups such as those with other neurodevelopmental disorders or those known to the youth justice system, have a higher prevalence than the average population, while other groups, such as girls with the inattention-subtype, are recognized as being underrepresented. As an increasing proportion of children require an ADHD assessment, the time taken to reach a diagnosis has significantly increased, which in some cases can cause prolonged functional impairment. Via the introduction of the QbTest, a continuous performance test which incorporates motor activity measurement, symptoms of ADHD can be assessed objectively, alongside traditional tools of rating scales and clinical observation. The QbTest has also been shown to be useful in to be useful in monitoring treatment effects of stimulant and non-stimulant medication on ADHD symptoms. Alongside recommendations for assessment, the NICE guideline update in 2018 made a number of recommendations, focusing on increasing involvement and empowerment of the young person,

and promoting person-centred care. This short article offers an overview of the recent advances in assessment and management of ADHD for healthcare professionals working with children and young people who may be affected

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Pakistan Journal of Medical and Health Sciences. 2022;16:528-31.

EFFECTIVENESS OF AN INSTRUCTIONAL PROGRAM ON BEHAVIORS OF PARENTS TOWARD CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN AUTISM CENTERS AT BAGHDAD CITY.

Arrar SR, Khudhair SH.

Objective: To find out the effectiveness of instructional program on behaviors of parents toward children with Attention Deficit Hyperactivity Disorder.

Methodology: A quasi-experimental study was conducted that included (120) deliberate samples of parents selected from eight autism centers according to the study criteria (60) parents in the centers (Al-Safa, Al-Marwa, Basmat Amal, Al-Tahadi), and (60) parents in the centers (Al-Rami, Al-Rahman, Al-Takhassusi, Al-Saeeda Family. The samples were divided into two groups (60) parents (study group) who participated in the instructional program and (60) parents (control group) who did not participate in the program. The groups are almost identical in their properties. The instructional program was implemented in four steps, the first step (pre-test) is to assess parents' behaviors towards children with ADHD before implementing the program, and the second step is to implement the program and then two tests and the time period between the first and second test is two weeks. The validity and reliability of the questionnaire were determined by a group of experts and through a pilot study of ten parents. Descriptive and inferential statistics were used to analyze the data.

Results: The results of the study indicated that the general evaluation of the parents behaviors about ADHD for the study sample before implementing the program was a lack of basic behaviors about ADHD, but after implementing the program the result was: The study indicated a high effectiveness in the behaviors of the parents Matters between the study group as indicated by the high significance associated with the Greenhouse-Geisser correction at p-value = 0.001. A significant difference was found for the study group on the first and second pretest and posttest over time, compared with the control group

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Percept Mot Skills. 2022 Aug;129:1014-35.

ENHANCING EXECUTIVE FUNCTIONS AND HANDWRITING WITH A CONCENTRATIVE COORDINATION EXERCISE IN CHILDREN WITH ADHD: A RANDOMIZED CLINICAL TRIAL.

Chang SH, Shie JJ, Yu NY.

Handwriting difficulties are common in children with Attention-Deficit/Hyperactivity Disorder (ADHD), and they have been associated with lower academic achievement and self-esteem. Our aim in this study was to determine if training coordination of the head, eyes, and arm and engaging in the necessary visual concentration associated with table tennis would improve executive functions and school-based handwriting among children with ADHD. We designed a randomized controlled trial to explore the therapeutic efficacy of this table tennis training and recruited 48 children with ADHD that we randomly assigned to one of three equal-sized training groups: (a) actual table tennis, (b) simulated table tennis (exergame), or (c) a control group receiving no additional training. The training intervention lasted 12-weeks in which the two different table tennis trainings (i.e., actual or simulated) were scheduled for three one-hour sessions per week. Outcome measures included a computerized handwriting evaluation, the Stroop test, and the Wisconsin Card Sorting Test (WCST). Participants in each table tennis training group showed significant improvements in handwriting performance, response time, and required time to achieve automation. Both intervention groups also showed significant improvements on the Stroop Color-Word test, but only the actual table tennis training group showed a significant improvement on the WCST. This study provided evidence of at least short-term improvements in executive functions and handwriting problems in children with ADHD through their participation in table tennis motor coordination activities

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Prim Care Companion CNS Disord. 2022 Jul;24.
HOMICIDAL IDEATION IN YOUTH WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Chen Y, Caesar AD.

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Psicologia Clinica. 2016;28:123-38.
ADHD BETWEEN THE GLOBAL AND THE SINGULAR: INCURSIONS FROM THE DISJUNCTION OF THE CHILD'S BODY.
Silva DR, Albertini MRB.
The clinical picture of Attention Deficit Hyperactivity Disorder (ADHD) is present in the current context both in the professional and parents discourse. The child seen from the disorder gets lost among different proposals for evaluation and treatment. The literature that fundaments these proposals is exclusively divided between the biological and the subjective/inter-relational field. Given these different assumptions about the body and the child, it aimed to question the clinical picture of ADHD given the disjunction of the childΓÇÖs body nowadays. Thus, it discusses the body as a unit allocated by the subject to express itself in the environment. The moves were seen as entered in intent, so the subject moves toward an object/objective and intended to avoid anguish, taking advantage of both the psychic and cognitive resources, this joint being implemented by language. This model, in addition to the current context, presents impasses that relate to the symptoms of inattention and hyperactivity. In conclusion, it was found the importance of the unique aspects that are expressed; the need to discuss disjunctive paradigms and psychologist positioning

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Psicothema. 2022 Aug;34:471-78.
THE EXTERNAL VALIDITY OF SLUGGISH COGNITIVE TEMPO VERSUS INATTENTION IN BEHAVIORAL, SOCIAL INTERACTION, AND ACADEMIC PERFORMANCE MEASURES.
Moreno-Garcia I, Servera M, Morales-Ortiz M, et al.
BACKGROUND: The main objective was to replicate data on the external validity of the Sluggish Cognitive Tempo (SCT) dimension, versus ADHD Inattention (IN), with the Spanish version of the Child and Adolescent Behavior Inventory (CABI) SCT subscale [Cuestionario sobre el Comportamiento de Niaos] (Burns et al., 2015).
METHOD: 273 mothers and 255 fathers evaluated their 9 to13 year old children on SCT, IN and other CABI internalizing externalizing, academic impairment and social interaction measures.
RESULTS: As hypothesized, the relationship between SCT and externalizing measures, in contrast to IN, was practically nonexistent, whereas both measures were related to internalizing and social interaction measures. Thus, the unique predictive capacity of SCT and IN was significant and similar on internalizing measures, except in the case of shyness, where SCT was better, while IN was better on externalizing measures.
CONCLUSIONS: The data largely replicated previous results: SCT, despite its relationship with IN, is capable of predicting a significant proportion of anxiety, depression, and excessive shyness problems and, unlike IN, functions as a protective measure for externalizing problems

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Psychiatrie (CZE). 2021;25:61-67.
CONCEPTUALIZATION OF ASSESSMENT OF PERSONALITY DISORDERS IN ADOLESCENTS.
Takacova A, Riegel KD, Preiss M.
The child pathology, especially personality disorders in adolescence, is still under-studied, making it difficult for professionals to work in diagnostics and intervention. Although the prevailing categorical system of diagnosis of personality disorders does not recommend the diagnosis in individuals under the age of 17, current research shows that the severity of personality pathology can be reliably assessed already in childhood, resp. adolescence. This evidence is primarily based on modern theories of object relations and egopsychology, especially Kernberg's concept of personality organization. Dimensional evaluation of identity

pathology penetrates into new diagnostic systems, especially the Diagnostic and statistical manual of mental disorders (DSM-5) Alternative model for personality disorders, which allows the assessment of personality pathology from the age of 11 onwards. For a clearer mapping of the personality of the adolescent, a tool called Interview of personality organization processes for adolescents (IPOP-A) has also been created to assess personality dynamics, image the strengths and weaknesses of the individual, and determine the level of personality functioning according to the severity of the pathology. This specific diagnostic tool can also be used for differential diagnosis between borderline personality disorder and ADHD whose symptomatic manifestations overlap each other. The article presents a systematic view on the issue of the assessment of PDs in adolescents with an emphasis on relevant research studies in the field of theory and diagnostic practice

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Psychiatry and Clinical Psychopharmacology. 2017;27:181-215.

EFFECTS OF PRESENCE OF MATERNAL PSYCHIATRIC DISORDERS ON ATTACHMENT TO PARENTS AND PEERS IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Dogan H, Oztop D, Eker OO, et al.

Objective: Attention-Deficit/Hyperactivity Disorder (ADHD) is characterized by inattention, hyperactivity, and impulsivity, which is observed in 3ΓÇô7% of the children at school age. It is associated with significant disruption in developmental, cognitive, and academic domains. In recent years, intensive research has been conducted on the topic of Woman's Mental Health. Psychiatric disorders significantly affect individual and interpersonal relationships at all stages of individual's life.

Methods: 50 patients aged 11-17 years who were diagnosed as ADHD were enrolled to the study. Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL) interview and Wechsler Intelligence Scale for ChildrenRevised (WISC-R), Relationship Scale Questionnaire (RSQ), and Inventory of Parent and Peer Attachment (IPPA) were administered to all cases included.

Results: Mean age was 12.78-¦1.67 in patient group. Frequency of psychiatric disorder was 14% among mothers of the patients with ADHD. It was found that mean score for attachment to mother was 69, whereas mean score for attachment to father was 66. In peer attachment, highest mean score was found for disinterested attachment by 4.41-¦1.19. When attachment was assessed by maternal psychiatric disorder status, no significant differences were found in parent attachment, while a significant difference was found in favor of obsessive attachment to peer ($p<0.05$).

Conclusions: In our study, mean scores for obsessive attachment was found to be significantly higher in children in whom maternal psychiatric disorder was present. It was found that mothers of children with ADHD promoted less interaction with their children; that they were less responsive to positive and neutral interactions promoted by children; and that they used more negative, more reactive, more authoritative and more controlling but less positive parenting strategies. Previous studies reported that mothers of children with ADHD experienced more burn-out and have higher exhaustion levels when compared controls

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Psychiatry Res. 2022;315.

RELATIONSHIP BETWEEN COGNITIVE ABILITY AND PREDICTORS FOR AGE AT THE TIME OF AUTISM SPECTRUM DISORDER DIAGNOSIS.

Saban-Bezalel R, Zachor DA, Ben-Itzchak E.

The rising prevalence of autism spectrum disorder (ASD) has increased awareness of the need for early diagnosis and intervention; however, not all children are diagnosed at preschool age. In the literature, findings regarding factors that may play a role in later diagnosis are inconsistent. Presence or absence of intellectual disability is a possible factor. This study aimed to identify factors associated with later diagnosis of ASD among children grouped according to low and high cognitive levels. Data of children who were previously diagnosed with ASD between 2002 and 2016 at a national autism center were analyzed. Better cognitive ability, having more siblings, and previous diagnosis of attention-deficit/hyperactivity disorder were predictors

of later diagnosis among the entire cohort. Children exhibiting lower cognitive levels (LC-ASD; DQ/IQ < 70; n = 209) were diagnosed much earlier. Among this group, later ASD diagnosis was predicted by poorer adaptive behavior, more severe restricted and repetitive behaviors, and previous diagnosis of epilepsy. In the higher cognitive level group (HC-ASD; DQ/IQ ГëÑ 70; n = 321), familial variables and more severe social impairments were predictors of later ASD diagnosis. Clinicians should be aware of variables that may affect ASD diagnostic age among children with varying cognitive abilities

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Res Child Adolesc Psychopathol. 2022 Jul;50:853-66.

UNDERSTANDING CO-OCCURRING ADHD AND ANXIETY SYMPTOMS WITHIN A DEVELOPMENTAL FRAMEWORK: RISK AND PROTECTIVE FACTORS OF EARLY TEMPERAMENT AND PEER RELATIONS.

Havewala M, Lorenzo NE, Seddio K, et al.

Symptoms of ADHD and anxiety often co-occur, yet we are limited in our understanding of which children with ADHD symptoms are more likely to develop anxiety symptoms in adolescence. This longitudinal study examined the role of behavioral inhibition (BI) and peer relationships (i.e., peer support and peer victimization) in relation to childhood ADHD and adolescent anxiety symptoms in a community sample, which was oversampled for reactivity. Data were drawn from a larger longitudinal study (Nâ€‰=â€‰291) examining trajectories of BI. For the current analyses, we used behavioral observations of BI at ages 2 and 3, parent report of their child's ADHD symptoms at age 7, child report of peer support and peer victimization at age 12, and adolescent report of anxiety symptoms at age 15. Using structural equation modeling, results indicated that BI and peer support moderated the relation between ADHD and anxiety symptoms, such that ADHD symptoms predicted later anxiety symptoms only for youth who displayed low BI in toddlerhood and reported experiencing lower levels of peer support in early adolescence. Findings highlight the role of early temperament and peer relationships on the relation between childhood ADHD and adolescent anxiety symptoms, and underscore the importance of evaluating multiple risk factors when examining the development of psychopathology

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Res Dev Disabil. 2022;129.

THE STRUCTURE, PROFILE, AND DIAGNOSTIC SIGNIFICANCE OF INTELLIGENCE IN CHILDREN WITH ADHD ARE IMPRESSIVELY SIMILAR TO THOSE OF CHILDREN WITH A SPECIFIC LEARNING DISORDER.

Toffalini E, Buono S, Cornoldi C.

This study examines the structure, profile, and diagnostic significance of intelligence in a group of 948 children diagnosed with attention deficit/hyperactivity disorder (ADHD) assessed with the WISC-IV and compared with children with specific learning disorders (SLDs) and with typically developing children. Based on four indexes, the WISC-IV configuration found in TD resulted applicable to ADHD, but with generally lower loadings on g. The Perceptual Reasoning and Verbal Comprehension indexes not only had higher loadings compared to the other two indexes but also represented the relative strengths of children with ADHD, as previously observed for children with SLD. In fact, the WISC pattern could be successfully used for discriminating between ADHD and TD, but not between ADHD and SLD. The latter result was not due to a co-occurrence of a learning disorder because the presence or absence of an associated diagnosis of SLD negligibly affected the pattern observed in ADHD. We concluded that the characteristics of intelligence in children with ADHD can be relevant for assessing this disorder, and that ADHD and SLDs share largely similar underlying cognitive features

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Research on Child and Adolescent Psychopathology. 2022 Jul;50:867-80.

EFFECTIVENESS OF SPECIFIC TECHNIQUES IN BEHAVIORAL TEACHER TRAINING FOR CHILDHOOD ADHD BEHAVIORS: SECONDARY ANALYSES OF A RANDOMIZED CONTROLLED MICROTRIAL.

Staff AI, van der Oord S, Oosterlaan J, et al.

Behavioral teacher training is an effective intervention for children with attention-deficit/hyperactivity disorder (ADHD). Intervention effectiveness may be enhanced by including intervention components that carry the strongest evidence for their effectiveness. A previous article of this group showed that both antecedent- (i.e., stimulus-control) and consequent-based (i.e., contingency management) techniques were highly effective in reducing daily teacher-rated, individually selected problem behaviors in a specific situation of the child. Effects were observed up to three months post intervention. Here, we tested whether effects were also present in teacher-rated and masked DSM-based assessments that comprise the full range of ADHD and oppositional defiant disorder (ODD) symptoms, as well as on teacher-rated impairment. Teachers of 90 children with (subthreshold) ADHD (6–12 years) were randomly assigned to one of three conditions: a short (two sessions), individualized intervention consisting of either a) antecedent-based techniques or b) consequent-based techniques; or c) waitlist. Multilevel analyses showed that both sets of techniques were effective in reducing teacher-rated ADHD symptoms and impairment immediately after the intervention and up to three months later, as compared to waitlist. Masked observations of ADHD behavior were in line with teacher ratings, with effects being most pronounced for inattention. No effects on teacher-rated or masked ODD behavior were found. This study showed that antecedent- and consequent-based techniques were effective in improving classroom ADHD symptoms and impairment. Long-term changes in teacher-rated ADHD are promising. These results extend previous findings and show the potential of short individually tailored interventions in classroom settings as treatment of ADHD symptoms

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Research on Child and Adolescent Psychopathology. 2022 Jul;50:881-94.

MULTISOURCE NETWORK AND LATENT VARIABLE MODELS OF SLUGGISH COGNITIVE TEMPO, ADHD-INATTENTIVE, AND DEPRESSIVE SYMPTOMS WITH SPANISH CHILDREN: EQUIVALENT FINDINGS AND RECOMMENDATIONS.

Burns GL, Preszler J, Ahnach A, et al.

Multisource network and latent variable models were used to examine the construct validity of sluggish cognitive tempo (SCT) symptoms relative to attention-deficit/hyperactivity disorder-inattentive (ADHD-IN) and depressive symptoms. The five objectives were to determine the (1) distinctiveness of SCT, ADHD-IN, and depressive symptom communities, (2) similarity of the three symptom communities across mother, father, and teacher ratings, (3) individual symptoms with the strongest influence on other symptoms, (4) individual symptoms with the strongest relations to academic and social impairment, and (5) similarity between network and latent variable model results. Mothers, fathers, and teachers rated SCT, ADHD-IN, and depressive symptoms for 2,142 Spanish children (49.49% girls, ages 8–13 years, third to sixth grade). Walktrap community analysis resulted in SCT, ADHD-IN, and depressive symptom communities with three SCT symptom communities within the overall SCT symptom community (daydreams, mental confusion, and hypoactive communities). The symptom networks were also similar across mothers, fathers, and teachers, especially mothers and fathers. Finally, for all three sources, the same two SCT and two ADHD-IN symptoms showed unique relations with academic impairment and the same depressive symptom showed unique relations with social impairment. A latent variable model yielded equivalent results. Both models thus supported the validity of SCT symptoms relative to ADHD-IN and depressive symptoms. Complexities are noted in the selection of network and latent variable models to study child and adolescent psychopathology with recommendations for their selection

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Scand J Med Sci Sports. 2022 Aug;32:1297-312.

THE IMPACTS OF A COMBINED EXERCISE ON EXECUTIVE FUNCTION IN CHILDREN WITH ADHD: A RANDOMIZED CONTROLLED TRIAL.

Liang X, Qiu H, Wang P, et al.

Purpose: The purpose of this study was to examine the effects of aerobic and neurocognitive exercise with moderate-to-vigorous physical activity levels on executive functions (EFs) and sleep quality in children with attention-deficit/hyperactivity disorder (ADHD).

Methods: In a parallel two-group randomized controlled trial (RCT) design, 80 children with ADHD aged 6-12 years (Mage = 8.46 ± 1.50) were assigned to either a 12-week combined aerobic-and neurocognitive-exercise experimental group (EG; three sessions per week for 60-min) or a wait-list control group (CG). Forty children with typical development aged 6-12 years (Mage = 8.49 ± 1.51) were recruited as healthy controls (HC). A Polar heart rate (HR) monitor was used to track the exercise intensity (60%-80% predicted HRmax) throughout the intervention. Three core EFs (inhibitory control [IC], working memory [WM], and cognitive flexibility [CF]) were assessed by computer-based neurocognitive tasks, and sleep quality and physical activity (PA) levels were assessed by self-report questionnaires.

Results: The results showed that the exercise intervention was beneficial for improving three core EFs, shortening sleep latency and decreasing sleep disturbances. The intervention effects on EFs and sleep quality appeared to be sustained for at least 12 weeks in EG. In addition, children with ADHD after intervention showed non-significant differences in IC, CF and multiple sleep quality outcomes compared with HC. Furthermore, a significant PA-EFs-sleep correlation was found in children with ADHD after the intervention.

Conclusion: The findings suggest that a 12-week combined aerobic and neurocognitive exercise intervention appears to be an effective treatment program for EFs and sleep quality in children with ADHD

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Sch Psychol. 2022 Jul;37:298-308.

EDUCATIONAL DIAGNOSTIC LABEL AND TEACHER SELF-EFFICACY: IMPACT ON CLASSROOM INTERVENTION CHOICE.

Chunta AM, Dupaul GJ.

Children with attention-deficit/hyperactivity disorder (ADHD) and specific learning disabilities (SLD) face similar academic and behavioral challenges. Although combined behavioral and academic interventions (AIs) are among the most effective for each disability, a child's diagnostic label and teacher self-efficacy may influence teacher intervention choice. This study examined the relationship between diagnostic label and teacher self-efficacy on intervention choice using a sample of 206 general education elementary school teachers (female = 69.9%; White = 60.7%). Results showed that teachers were significantly more likely to endorse AIs for children with SLD as compared to ADHD (ds = 0.29-0.35), even when children had identical academic needs. Furthermore, self-efficacy did not moderate this relationship but was an individual predictor of intervention endorsement. Findings indicate the need to increase teacher awareness of academic impairments related to ADHD and to further identify teacher factors that could impact choice of intervention and decrease intervention selection biases. (PsycInfo Database Record (c) 2022 APA, all rights reserved)

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Sleep Med. 2022;100:S34-S35.

MINIMALLY INVASIVE NASAL AIRWAY SURGERY CAN REVERSE ADHD IN CHILDREN.

Catalano P, Walker J, El Mardeeni D, et al.

Introduction: Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) are increasingly diagnosed in children, and estimated to occur in nearly 10% of children in the US. While their etiology can be varied and complex, ADD and ADHD are known to occur in up to 50% of children who exhibit sleep disordeeed breathing (SDB). The mechanism of hyperactivity in these children is directly related to 2 phenomena of SDB: (a) the secretion of adrenaline during sleep to assist children to breath through their airway obstruction, and (b) the build up of toxins in the brain during the day that are not appropriately cleared during interrupted sleep. Sleep patterns in children with SBD are characterized by intermittent airway

obstruction resulting in episodic hypoxia, sleep fragmentation due to repeated arousal, mouth breathing, and sleep deprivation. In the past decade, medical and behavioral treatment of ADHD has been extensively studied, however no one has yet evaluated the effect on ADD/ADHD behavior after correcting SDB in these children. In our study, we compare the changes ADHD behavior before and after targeted upper airway surgical treatment for SDB in children.
Materials and Methods: A prospective pilot study designed to evaluate the effect of targeted nasal surgery on improving ADHD symptoms in children with SDB. 72 children with ADHD symptoms who demonstrated SDB as determined by history, physical exam, and sinus CT-scan were included. The validated Barkley Deficits in Executive Functioning Scale was obtained at baseline and 6 months after surgery. Data from this ADHD evaluation tool was analyzed and compared for each patient using the reliable change index scale (RCI). Parents completed the assessment tool during the child's clinic visits.
Results: 72 patients aged 6-17 years (M 91%; F 9%) completed the study. For ages 6-11 years, 44% of children showed highly significant improvement in their RCI, and another 20% improved between 75-99% of the highly significant threshold. For children ages 12-17 years, these numbers were 17% and 67%, respectively. 5% of children in both age groups showed slightly worse RCI scores after surgery. Combined, 37.7% of children exceded the RCI threshold for highly significant change, and another 26% improved to between 75-99% of the highly significant threshold. There were no surgical complications in this study cohort.
Conclusions: Targeted minimally invasive upper airway surgery in children with SDB and ADHD symptoms can significantly improve their executive functioning. This pilot study shows the importance of restoring upper airway breathing and normal sleep as part of ADHD management in a majority of children with SDB and ADHD. Acknowledgements: The patients and their families who trusted in us along the way

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Sleep Med. 2022;100:S191-S192.

ACTIVE INVOLVEMENT OF CHILDREN IN ADHD RANDOMIZED CONTROL TRIALS ASSESSING SLEEP.

Hill O, McWilliams S, Zhou T, et al.

Introduction: Sleep disturbances are an intrinsic characteristic of ADHD, and interventions to treat ADHD can alleviate or aggravate intrinsic sleep problems. The treated subjectsΓÇÖ voice, here the pediatric patient, may or may not be captured during their treatment. The goals of this secondary analysis are to 1) determine if children were involved in research investigating interventions for ADHD and sleep, 2) and to what degree their reporting was acknowledged.
Materials and Methods: We performed a secondary analysis of a dataset from a previous scoping literature review (DOI 10.17605/OSF.IO/VWRPT) which screened 2265 studies to identify 71 interventional ADHD RCTs that measured sleep as a primary or secondary outcome. In this analysis we reviewed the 52/71 RCTs carried out in pediatric populations. The research questions were: 1) how was the child involved in the consenting process, and 2) was the child directly involved in the tools used to measure ADHD, sleep, miscellaneous outcomes, and reporting of adverse events.
Results: A total of 6488 subjects aged 2-17 (mean= 9.5) were enrolled between the years 1995-2020. 32,11,9 studies targeted ADHD, sleep, and ADHD and sleep, respectively. 3/52 RCTS did not mention consent or assent (age range: 6-12, mean=9.5) and 5 did not specify the participant (5-14, m=9.8). The children and parents gave consent in 6 RCTS (5-15, m=10.2), 30 RCTs had the children give assent with parental consent (5-17, m=9.6), only the parents gave consent in 8 RCTS (2-12, m=8.5), respectively. The children were not included in the reporting of ADHD, sleep, or miscellaneous outcomes in 30/52 RCTs (3-15, m=9.4). When participating, children were more frequently involved in the reporting of nighttime outcomes (n=12; 2-17, m=10.0) compared to daytime outcomes (n=5; 5-13, m=8.6) and 1 RCT had children reporting both (13-17, m=14.5). Children were involved in the reporting of adverse events in 15/52 RCTs (2-17, m=12.4).
Conclusions: We conclude that tools used to measure outcomes in ADHD RCTs sparsely involved the input of children. These findings suggest not only the need for a consensus approach to obtaining consent/assent in pediatric ADHD RCTs, but also the involvement of children can be improved through incorporating more child friendly tools in order to comply with the United Nations Convention on the Rights of the Child. Acknowledgements: BC Children's Hospital Foundation and Research Institute

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Sleep Med. 2022;100:S199-S200.

LONGITUDINAL ASSESSMENT OF SLEEP STRUCTURE AND EXECUTIVE FUNCTIONS IN TYPICALLY DEVELOPING CHILDREN AND DRUG-NAÏVE CHILDREN DIAGNOSED WITH ADHD.

Sakhelashvili I, Campbell IG, Basishvili T, et al.

Introduction: Sleep problems, sleep-wake instability and impaired cognitive functioning are common in children diagnosed with attention deficit hyperactivity disorder (ADHD). Research findings, primarily from cross-sectional studies, are inconclusive regarding ADHD-related differences in sleep macrostructure. The age-related changes in sleep organization in children with ADHD, as well as longitudinal association of sleep and executive functioning, have not yet been investigated. Here we present data from the longitudinal study of the maturational trajectories of sleep architecture and cognitive functions in drug-naïve children diagnosed with ADHD and typically developing children followed from about 12 to 14 years, age range of most rapid developmental electroencephalogram changes.

Materials and Methods: Nine ADHD children (combined presentation, DSM-V criteria, mean age 12.39-¦0.61 years at the first measurement) without any additional comorbid condition or sleep-disordered breathing problem, and nine typically developing controls (12.07-¦0.35 years) were recruited. There were no major differences in overall cognitive performance between the two groups. All subjects underwent an adaptation night and all night polysomnography (PSG) twice yearly at the Laboratory. Actigraphy devices/sleep diaries documented sleep-wake schedules. Executive functioning was assessed by the Comprehensive Executive Function Inventory (CEFI, parent form). Data from 4 recording time-points were analysed with mixed effects analysis for the PSG data and with repeated measures ANOVA for the executive functioning data.

Results: Comparison of the PSG between the ADHD and control groups showed that the ADHD group had significantly ($p<0.01$ for all) lower time in bed (mean ADHD vs. control, 518.2 vs. 552.3 min), total sleep time (TST, 481.1 vs. 523.0 min), and stage N2 duration (242.2 vs. 277.0 min). Expressed as percent of TST, stage N2 duration was lower and stage N3 duration was higher in the ADHD group ($p<0.05$ for both). Latency to REM sleep was shorter in the ADHD group (68.8 vs. 78.8 min, $p<0.05$). Sleep efficiency, wake after sleep onset, N1 duration, N3 duration, REM sleep duration, and the number of awakenings did not differ between groups ($p>0.1$ for all). N3 duration and N3 as a percent of TST decreased with age ($p<0.001$ for both) and N2 as a percent of TST increased with age ($p<0.001$). There were no group differences in the age-related changes in any sleep structure measure (age by group interaction $p>0.2$ for all). Children with ADHD had poorer executive functions. CEFI full scale and all subscales were significantly lower in the ADHD group, without significant recording by group interaction for any scale. The correlation between CEFI full scale and sleep structure variables were not significant for any recording session.

Conclusions: Sleep duration is shorter in drug-naïve children with ADHD due to the shorter stage N2 duration. Other than sleep duration and REM latency, sleep macrostructure is basically similar between groups and age-related changes do not differ between groups. Children with ADHD exhibit similar developmental trajectories but constantly poorer executive functioning compared to the typically developing children, suggesting a developmental lag.

Acknowledgements: The study was supported by Shota Rustaveli National Science Foundation Research Grant - FR17_94

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Sleep Med. 2022;100:S27-S28.

AN EXPLORATION OF EARLY SLEEP DEVELOPMENT IN PRESCHOOL CHILDREN WITH AND WITHOUT A FAMILIAL HISTORY OF ADHD.

Keating J, Hasshim N, Bramham J, et al.

Introduction: Children with poor sleep are reported to show more problems with attention and do less well in school. Poor sleep is widely reported for children and adults with attention deficit hyperactivity disorder (ADHD), however the link between how this relation develops is relatively unknown. In our study, we investigated sleep and attention in infants and young children with and without a familial history of ADHD. By exploring the early development of sleep and attention we hope to gain a better understanding of how early sleep can impact brain and behaviour development.

Materials and Methods: We used both questionnaire and lab based methods to address our study aims. In Study 1, questionnaires on temperament markers of attention control and sleep quality and quantity were

completed by parents of children under 6 years with (n=72) and without (n=139) a familial history of ADHD. In Study 2, actigraphs were worn by a subgroup of infants aged 10-20 months with and without a familial history of ADHD, to measure sleep-wake activity, and eye-tracking measures were utilised to record early markers of visual attention and inhibitory control.
Results: In Study 1, parents of the high-risk infant/toddler group report 2.48 night time awakenings in comparison to 1.38 for the low-risk group (p=.004) and reported that their children spent.56 hours awake in comparison to.24 hours in the low-risk group (p=.046). No group differences for sleep were observed for preschool-aged children, except for more reports of bedtime anxiety (3 to 6 years). Poorer sleep quality predicted higher temperament levels of negative affectivity across the whole group (.376, p<.001), and poorer family function predicted lower temperamental levels of effortful control (-.290, p=.002). Results in Study 2 suggest that more daytime sleep and a lower proportion of light sleep at night can predict better visual attention in infants, with the former being a more robust marker. Family functioning scores and familial history of ADHD were not related to visual attention on the eye-tracking task, however the familial ADHD group had slower response times.
Conclusions: Study 1 highlights for researchers the importance of future research focus on early sleep and family function factors in the context of ADHD risk. Study 2 explores potential relations between infants sleep behaviour, family factors (family function and familial ADHD), and early attention development and is the first to utilise objective measures of sleep and attention to investigate the link between sleep and concurrent attention in infants. This project is an early step towards learning more about how attention develops in young children. As ADHD is a heterogenous disorder, gaining a better understanding of how different genetic and environmental factors influence the development of ADHD symptoms is imperative to guide the development of future treatments and interventions.
Acknowledgements: This study was funded by The Waterloo Foundation under Grant 1854-3027. Thank you to all the families who participated in this research and to ADHD Ireland for their support

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Sleep Med. 2022;100:S216.

MELATONIN PRODUCTION AND RELEASE IN CHILDREN AND ADOLESCENTS WITH ADHD AND CHRONIC SLEEP PROBLEMS - GENETIC VARIATION ? A NEW STUDY IS PRESENTED.

Bindesboll I, Hvolby A.

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is a common neuropsychiatric disorder, affecting an estimated 5.3% of children and adolescents worldwide and persisting into adulthood in approx. 2/3 of patients. Although the diagnosis is based on observations while the patient is awake, there is a prevalence of sleep disturbances of 25-55% in persons with ADHD There is a growing evidence that a number of sleep traits in humans are heritable, such as timing of sleep and sleep requirement. The timing of sleep is determined by the circardian clock and is generated by transcriptional-translational feed-back loops. There is a growing list of core clock genes that have been discovered participating in this feedback loop. This complex mechanism of circardian regulation and its downstream regulatory processes were hypothisized to play an important role as etiological factors for, among other psychiatric disorders, ADHD. Several genetic mutation including Casein kinase 1 delta (CK1d), T44A and H46R, Period (PER2), period3 (PER3) P415A7H417R and cytochrome2 (CRY2) A260T is found in families suffering from familial advance sleep phase.
Materials and Methods: Genotype analysis: A single saliva swap sample from each participant will be collected for genomic DNA extraction. After DNA purification, real-time qPCR analysis for SNP rs1801260 will be performed. This SNP is located in the 3-¦;UTR part of the CLOCKgene harbouring a T or C in position 3111.Saliva samples will be analysed immediately after sampling, and then destroyed.
Results: In this study we will look into the complex mechanisms underlying circadian regulation as e.g., the timing of sleep, are cell autonomous transcription-translation feedback loops where the transcription factors CLOCK and BMAL1 drive the expression of Period (Per1/2) and Cryptochrome (Cry1/2), whose protein products in turn feed-back to inhibit CLOCK and BMAL1. Correlation between ADHD, circadian rhythmicity and sleep disturbances have been demonstrated for ADHD patients, and circadian regulation and its downstream regulatory processes have been suggested to play an important role as etiological factor for, among other psychiatric disorders, ADHD.

Conclusions: CLOCK is considered as the master gene the circardian rhytm, and understanding the relationship between ADHD and CLOCK may provide additional information to understand the correlation between ADHD and sleep problems. This has only been explored in few studies. As can be seen, it is important to gain more knowledge about the normal release of melatonin, and the release of melatonin in a group of children and adolescents with a variety of psychiatric diagnoses. It is essential to investigate whether there are any differences in the release of melatonin in children and adolescents with chronic sleep onset problem and children and adolescents who do not have sleep problems. Also, if there is a genetic component or explanation in the different DLMO and whether there is a further relation to ADHD. Acknowledgements:

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Sleep Med. 2022;100:S221.

SLEEP-RELATED TREATMENT-EMERGENT ADVERSE EVENTS (TEAES) IN ADHD RANDOMIZED CONTROLLED TRIALS (RCTS) INVESTIGATING AMPHETAMINE-BASED STIMULANTS: A SCOPING REVIEW.

Zhou T, McWilliams S, Elbe D, et al.

Introduction: ADHD and sleep are highly interconnected, illuminated by the high prevalence of individuals with ADHD exhibiting sleep disorders. The clinical implications of disturbed sleep include worsening ADHD symptoms. Given this intrinsic relationship, interventions aimed at ameliorating ADHD symptoms should consider effects on sleep. Of specific interest are amphetamine-based stimulants, which are commonly prescribed despite their known adverse effects on sleep. To further investigate the associations between ADHD and sleep-related TEAEs, this literature review was conducted. The goals of this review are: 1) identify the incidence of sleep-related TEAEs in treatment and placebo/control groups, and 2) evaluate medication timing and administration schedules.

Methods: A previous scoping review screened 2265 studies to identify 71 interventional ADHD RCTs that measured sleep as a primary or secondary outcome measure (DOI 10.17605/OSF.IO/VWRPT). The current review investigates the excluded studies of the aforementioned scoping review, employing the same search strategy and databases. Inclusion criteria for this review are: 1) Diagnosis of ADHD according to e.g. DSM, 2) Intervention was an amphetamine-based stimulant(s), 3) Reported sleep-related TEAEs but did not include sleep as an outcome, 4) Study design was an RCT.

Results: After screening 2194 excluded studies, 33 RCTs investigating amphetamine-based interventions that reported sleep-related TEAEs were identified. 11/33 were performed in adults (n=2029 participants), and 22/33 were performed in children and adolescents (n=3917 participants). Two major categories of sleep-related TEAEs were identified: insomnia/initial insomnia (Adult n=11, Pediatric n=22) and fatigue/somnolence (Adult n=5, Pediatric n=5). In adult studies, incidence rates of insomnia/initial insomnia TEAEs ranged from 5%-37% vs. 1%-13% in the treatment vs. placebo groups respectively, and ranges for fatigue/somnolence TEAEs were 1%-7.60% vs. 3.70%-12% respectively. For pediatric studies, 15 studies contained placebo groups, 2 contained active control groups, and 3 contained both. The incidence rates of insomnia/initial insomnia TEAEs ranged from 2.10%-25.90% vs. 0%-19% in the treatment vs. placebo groups respectively, and ranges for fatigue/somnolence TEAEs were 0%-9.40% vs. 2.60%-3.70% respectively. Additionally, information regarding medication timing, dosage, administration schedule, and titration strategy were extracted and analyzed.

Conclusion: In amphetamine-based stimulant ADHD RCTs, the incidence of sleep-related TEAEs are higher in treatment groups. The paucity of sleep-related side effect assessment tools and criteria when reporting sleep-related TEAEs highlights the need for standardization. Furthermore, the total number of participants in studies reporting sleep-related TEAEs was nearly threefold greater than in studies reporting sleep as a primary/secondary outcome identified in our previous scoping review (McWilliams et al., SMRV, under revision). This disparity in participants underlines again the need for standardization of sleep-related outcome measures and more studies to include sleep as a primary/secondary outcome to further assess the effects of amphetamines on sleep.

Acknowledgments: BC Children's Hospital Research Institute

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The Clinical Neuropsychologist. 2022 Jul;36:1069-93.

CO-OCCURRING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND ANXIETY DISORDERS DIFFERENTIALLY AFFECT MALES AND FEMALES WITH AUTISM.

Wodka EL, Parish-Morris J, Annett RD, et al.

Objective: To examine overlap and divergence of symptomatology in Autism Spectrum Disorder (ASD) with and without co-occurring Attention/Deficit Hyperactivity Disorder (ADHD) and/or Anxiety Disorder by age and sex.

Method: Participants included 25,078 individuals registered in the SPARK cohort, age 6-18 years. SPARK participation includes online consent and registration, as well as parent-reported ASD, ADHD, and Anxiety Disorder diagnoses, developmental, medical, and intervention history, and standardized rating scales. Individuals with ASD, ASD + ADHD, ASD + Anxiety, or ASD + ADHD + Anxiety were compared on measures assessing social communication, restricted and repetitive behaviors (RRBs), and motor functioning, and differences between male and female profiles were examined.

Results: Significant differences in symptom presentation between females/males, school-age/adolescent individuals, and by co-occurring conditions (ASD/ADHD/Anxiety) are apparent, and the impact of co-occurring conditions differed by age and sex. Most notably, school-age females with ASD without co-occurring conditions present with significantly fewer concerns about social communication skills and have better motor skills, but have more prominent RRBs as compared to same-aged males with ASD alone; co-occurring conditions were associated with increased social communication problems and motor concerns, most consistently for school-age females.

Conclusions: School-age females with ASD are at highest risk for underestimation of autism-related symptoms, including underestimation of symptoms beyond core ASD features (motor skills). Further, across ages, particular consideration should be given when probing for social communication symptoms, RRBs, and motor skills in females with ASD alone, as well as with co-occurring ADHD and/or Anxiety. For females with co-occurring symptoms and conditions, use of symptom-specific measures in lieu of omnibus measures should be considered

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U S Pharm. 2022;47:14.

ADD/ADHD PREVALENCE ANDTREATMENT IN CHILDREN.

Pal S.

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Value Health. 2022;25:S538.

LEARNINGS FROM DTC LAUNCH OF A DIGITAL THERAPEUTIC FOR ADHD IN RESPONSE TO THE COVID-19 FDA POLICY FOR DIGITAL HEALTH DEVICES FOR THE TREATMENT OF PSYCHIATRIC DISORDERS.

Palko L.

Objective: To describe real-world learnings from the launch of direct-to-consumer digital therapeutic in response to the FDA policy for digital health devices during COVID-19 prior to product's FDA-cleared status. Methods: From April to August 2020, Endeavor-« 3-month access was provided to children who were 8-12 years old; with a parent-reported ADHD-diagnosis; in the US with access to an iPad-«/iPhone-« device. Parents agreed to contact their childΓÇÖs health care provider before using Endeavor. Recommended product use was 5 days/week, Γê+25 minutes (5 missions) a day, for at least 4 weeks. Surveys were sent online at treatment start (Day 1) and after 1 month (Day 30).

Surveys included: Child cognitive functioning: Patient Reported Outcomes Measurement Information System (PROMIS) parent-proxy 8 selected items. Surveys for ADHD-related impairment: Impairment Rating Scale (IRS) parent-report. Results: During this direct-to-consumer launch, Endeavor was activated 446 times, 419 children started the treatment and 357 children played at least one full Endeavor mission. Parents saw significant improvement in 6 of the 8 selected PROMIS cognitive functioning items. There was also improvement seen in the ADHD-related overall impairment severity.

Conclusions: This demonstration confirmed that Endeavor access under FDA emergency guidance via direct-to consumers was feasible, with approximately 20% of patients requesting reactivation. Compliance rates varied from those reported in the structured setting of previous clinical trials. Caregivers observed improvement in their child's cognitive functioning and impairment severity. Future studies should provide real-world insights on compliance and efficacy as a prescription product

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Value Health. 2022.

COST-EFFECTIVENESS OF CARE COORDINATION FOR CHILDREN WITH CHRONIC NONCOMPLEX MEDICAL CONDITIONS: RESULTS FROM A MULTICENTER RANDOMIZED CLINICAL TRIAL.

Carter HE, Waugh J, Chang AB, et al.

Objectives: To assess the cost-effectiveness of care coordination, compared with standard care, for children with chronic noncomplex medical conditions.

Methods: A total of 81 children aged between 2 and 15 years newly diagnosed with a noncomplex chronic condition were randomized to either care coordination or standard care as part of a multicenter randomized controlled trial. Families receiving care coordination were provided access to an Allied Health Liaison Officer, who facilitated family-centered healthcare access across hospital, education, primary care, and community sectors. Costs were estimated over a 12-month period from the perspective of the Australian health system. Health outcomes were valued as quality-adjusted life-years (QALYs). Caregiver productivity costs were included in an alternative base-case analysis, and key assumptions were tested in a series of one-way sensitivity analyses. A probabilistic sensitivity analysis was conducted to investigate the overall impact of uncertainty in the data.

Results: Children in the intervention arm incurred an average of $17 in additional health system costs (95% confidence interval 3861 to 1558) and gained an additional 0.031 QALYs (95% confidence interval ΓêÆ0.29 to 0.092) over 12 months, producing an incremental cost-effectiveness ratio of $548 per QALY. When uncertainty was considered, there was a 73% likelihood that care coordination was cost-effective from a health system perspective, assuming a willingness to pay of $50 000 per QALY. This increased to 78% when caregiver productivity costs were included.

Conclusions: Care coordination is likely to be a cost-effective intervention for children with chronic noncomplex medical conditions in the Australian healthcare setting

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Value Health. 2022;25:S299.

REASONS FOR TREATMENT CHANGES IN CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD): A CHART REVIEW STUDY.

Schein J, Cloutier M, Gauthier-Loiselle M, et al.

Objective: To examine the reasons underlying treatment changes among pediatric patients with ADHD. Methods: Data were obtained through online medical chart abstraction (AugustΓÇôSeptember, 2021). Eligible patients with ADHD had initiated a treatment regimen at ages 6-17 and within 1-5 years of chart abstraction. Reasons contributing to treatment discontinuation were analyzed for a randomly selected treatment episode. ADHD/treatment-related complication rate was also described. PhysiciansΓÇÖ perspective on adherence to ADHD treatment was assessed through an online survey. Results were reported overall and among children (ages 6-12) and adolescents (ages 13ΓÇô17), separately.

Results: A total of 156 physicians abstracted 434 patient charts (235 children; 199 adolescents). Mean patient age was 11.3 years and 68.7% were male. Treatment regimens analyzed included stimulants (83.2%), nonstimulants (11.3%), and combination therapy (5.1%); average treatment duration was 23.3 months. Among patients who discontinued treatment (N=83), inadequate/suboptimal symptom management (60.2%) was the most common reason for discontinuing treatment, while 25.3% reported a treatment discontinuation due to ADHD/treatment-related complications. The most common ADHD/treatment-related complications leading to treatment discontinuation were anxiety (19.0%), insomnia/sleep disturbances (19.0%), and emotional impulsivity (19.0%). Overall, 42.4% of patients had 1 documented ADHD/treatment-

related complication, and this proportion reached 54.5% among patients receiving combination therapy. Insomnia/sleep disturbance was the most common ADHD/treatment-related complication and occurred in 9.7% of patients. Notably, 75.5% of patients reported the experience or fear of complications had a negative impact on their adherence to ADHD treatment. Physicians reported taking actions toward patients non-adherence by further educating patients (81.0%), closer monitoring (59.9%), and changing the prescribed ADHD medication (38.1%). Results were similar among children and adolescents.
Conclusion: Lack of effectiveness and ADHD/treatment-related complications are important reasons for treatment changes among children and adolescents with ADHD, highlighting the need for more effective and tolerable treatments to mitigate the burden of ADHD

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Verhaltenstherapie. 2022.
STRUCTURE OF CHILD EXTERNALIZING BEHAVIOR AND ASSOCIATED PARENTAL STRESS IN FAMILY SITUATIONS.
Lauth M, Panagl M, Lauth G.
All three cardinal symptoms of attention deficit hyperactivity disorder (ADHD) describe impaired stimulus control over behavior. Children with ADHD require more frequent and explicit behavioral cues from others and thereby increase parental stress. Both self-control deficits and parental stress manifest depending on the situation and possess intra-individual variability. Common measures of externalizing behavior and parental stress rarely address this and target generalized impressions instead. Intra-individual differences in externalizing and stressful child behavior can be assessed with a family situations inventory including two rating scales. It supplements the underlying HSQ by a parental stress scale and constitutes an otherwise closely aligned German adaption of the original.
Method: Parents of children with (male = 204, female = 33; mean = 8.6 years) and without confirmed ADHD (male = 206, female= 155; mean = 7.6 years) took part. They were asked to rate 16 family situations concerning the extent of child externalizing behavior and their own associated stress. Three established scales (CBCL, PSI, BAP) were employed in the clinical sample to determine the external validity of the German HSQ adaption.
Results: Both HSQscales share the same two-factorial structure with satisfying explained variance (56.02 60.38%) and acceptable external and discriminant validity. "Domestic accomplishments"(factor 2) discriminates better than "social appearance"(factor 1) between children with and without ADHD.
Discussion: "Domestic accomplishment"refers to behavior in regularly recurring situations and demands rule following. Parental stress associated with child externalizing behaviors in family situations appears to represent regulation load rather than mental load

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ORIGINAL RESEARCH

Centrality and interhemispheric coordination are related to different clinical/behavioral factors in attention deficit/hyperactivity disorder: a resting-state fMRI study

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Abstract

Eigenvector-Centrality (EC) has shown promising results in the field of Psychiatry, with early results also pertaining to ADHD. Parallel efforts have focused on the description of aberrant interhemispheric coordination in ADHD, as measured by Voxel-Mirrored-Homotopic-Connectivity (VMHC), with early evidence of altered Resting-State fMRI. A sample was collected from the ADHD200-NYU initiative: 86 neurotypicals and 89 participants with ADHD between 7 and 18 years old were included after quality control for motion. After preprocessing, voxel-wise EC and VMHC values between diagnostic groups were compared, and network-level values from 15 functional networks extracted. Age, ADHD severity (Connor's Parent Rating-Scale), IQ (Wechsler-Abbreviated-Scale), and right-hand dominance were correlated with EC/VMHC values in the whole sample and within groups, both at the voxel-wise and network-level. Motion was controlled by censoring time-points with Framewise-Displacement > 0.5 mm, as well as controlling for group differences in mean Framewise-Displacement values. EC was significantly higher in ADHD compared to neurotypicals in the left inferior Frontal lobe, Lingual gyri, Peri-Calcarine cortex, superior and middle Occipital lobes, right inferior Occipital lobe, right middle Temporal gyrus, Fusiform gyri, bilateral Cuneus, right Precuneus, and Cerebellum (FDR-corrected-$p = 0.05$). No differences were observed between groups in voxel-wise VMHC. EC was positively correlated with ADHD severity scores at the network level (at p-value < 0.01, Inattentive: Cerebellum rho = 0.273; Hyper/Impulsive: High-Visual Network rho = 0.242, Cerebellum rho = 0.273; Global Index Severity: High-Visual Network rho = 0.241, Cerebellum rho = 0.293). No differences were observed between groups for motion ($p = 0.443$). While EC was more related to ADHD psychopathology, VMHC was consistently and negatively correlated with age across all networks.

Keywords Attention Deficit/Hyperactivity Disorder (ADHD) · Resting-state fMRI · Eigenvector Centrality (EC) · Voxel-Mirrored Homotopic Connectivity (VMHC) · Brain development

Abbreviations

ADHD	Attention deficit / hyperactivity disorder
AUC	Area under the curve
BOLD	Blood oxygen level dependent signal
DMN	Default mode network
EC	Eigenvector centrality
LECN	Left executive control network
FC	Functional connectivity
fMRI	Functional magnetic resonance imaging
MNI	Montreal neurological institute
MRI	Magnetic resonance imaging
RECN	Right executive control network
TYP	Neurotypicals
VMHC	Voxel-mirrored homotopic connectivity

Livio Tarchi and Stefano Damiani contributed equally to this work.

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Introduction

Attention Deficit/Hyperactivity disorder (ADHD) is characterized by symptoms presenting in a heterogeneous manner across individuals, including attention deficits, impulsivity, and hyper-activity (American Psychiatric Association, 2013). Functional Magnetic Resonance Imaging (fMRI) proved to be a powerful tool for exploring the neurobiological correlates of ADHD symptoms and behaviors (Damiani et al., 2020; Iravani et al., 2021; Qian et al., 2018; Rosch et al., 2018; Silva et al., 2021; Tarchi et al., 2021). Specifically, fMRI highlighted the importance of how each region is functionally connected to the rest of the brain. Two independent measures of these connections are centrality and interhemispheric coordination, the present study aims to elucidate their role in ADHD.

Centrality measures

An important proxy used in fMRI analyses is centrality, a group of graph-theory based parameters which measure the degree of connection between a specific brain region and all others. fMRI and centrality measurements have allowed researchers to identify functional centers in moderating ADHD presentations and symptomatology (Damiani et al., 2020; Iravani et al., 2021; Rosch et al., 2018). The concept of functional centers considers brain regions as "nodes", and each relationship between pairs of regions as "edges". As centrality measurements quantify the number and strength of relationships between edges and nodes, functional centers are nodes with a high number of meaningful connections, that is, a high number of connections above a certain threshold. This conceptualization provides an efficient and simple instrument to better explore the complex functional organization of the brain, also known as the functional connectome (Iturria-Medina et al., 2008; Sporns, 2006; Sporns et al., 2005, 2007). Centrality measurements proved to have the ability to capture intrinsic features of the human functional connectome in both neurotypicals (Achard et al., 2006; He et al., 2009; Sporns et al., 2007; Tarchi et al., 2021; Zuo et al., 2012), and individuals with neuropsychiatric disorders (Reinelt et al., 2019; Seidel et al., 2020), including ADHD (M. Zhou et al., 2019). However, the available evidence showed both increased and decreased centrality scores in ADHD compared to neurotypical controls, in particular for the superior Temporal lobes and the middle/inferior Occipital lobes (Di Martino et al., 2013; Hong et al., 2017; Tarchi et al., 2021; Zhou et al., 2019). Analyses of the age contribution to centrality measurements in ADHD indicated a role for development in moderating the Resting-State fMRI activity in the middle Temporal cortex (Hong et al., 2017), with additional reports of transient alterations during development among patients with ADHD (Damiani et al., 2020; Hong et al., 2017). However, recent literature in the field of Computational Psychiatry and fMRI has focused the attention on subcortical structures (Castellanos et al., 2008; Damiani et al., 2020; Giraldo-Chica & Woodward, 2017; Lottman et al., 2019; Zhou et al., 2017), and preliminary evidence highlighted their key role in ADHD (Bruchhage et al., 2018; Damiani et al., 2020). For these reasons, a centrality measurement sensitive to the contribution of subcortical structures was preferred in the current study. When compared to other centrality measurements (e.g. Degree of Centrality), Eigenvector Centrality (EC) proved to be more sensitive subcortical regions (Zuo et al., 2012), and was thus selected as the centrality measurement of choice, also considering its recursive nature (Lohmann et al., 2010).

Interhemispheric coordination

Parallel efforts in the study of the intrinsic characteristics of the human brain, as assessed by fMRI, have focused on the degree of functional integration between hemispheres, i.e. their interhemispheric coordination (Halpern et al., 2005). Interhemispheric coordination has been defined as the degree of left–right symmetry in the brain activity. Lower interhemispheric coordination has concerned a number of functions and associated brain areas, at the molecular, cellular, and functional level (with relevance of asymmetry both during Resting-State, Toga & Thompson, 2003; and task conditions, Riès et al., 2016). The clinical relevance of increased or decreased hemispheric specialization in individuals has not yet been fully elucidated, while multiple theories rely on atypical lateralization as a mechanism for the onset of neuropsychiatric disorders (Angrilli et al., 2009; Berretz et al., 2020; Vingerhoets, 2019).

For these reasons, Voxel-Mirrored Homotopic Connectivity (VMHC) was developed in order to assess the degree of homotopy in fMRI (that is, the degree of similarity between symmetric brain regions, Wei et al., 2018). VMHC has been shown to yield valuable insight on psychiatric conditions in Resting-State fMRI scans. In particular, a lower interhemispheric coordination has been reported in depression (Guo et al., 2013; L. Wang et al., 2013; Zhang et al., 2020); obsessive–compulsive disorder (Deng et al., 2019), schizophrenia (D. Wang et al., 2019), and bipolar disorder (L. Zhao et al., 2017). Although more commonly reported at the voxel-wise, whole-brain level, the characterization of brain networks by degree of interhemispheric coordination as assessed by VMHC has been proposed as a reliable marker of neurodegenerative processes (Cheung et al., 2021). The use of VMHC also seems supported by evidence of high

test–retest stability (intraclass correlation coefficient ≥ 0.8, Dai et al., 2020), in contrast to other similar measurements of interhemispheric coordination (Hagemann et al., 2002).

For what concerns ADHD, current reports highlighted specific VMHC alterations in this population (Jiang et al., 2014, 2019; Zhou et al., 2018). In particular, lower VMHC was found in children with ADHD in comparison to neurotypicals in the Occipital lobes. VMHC also negatively correlated with anxiety scores at the Conners' Parent Rating Scale and positively correlated with set-shifting abilities in children with ADHD (J. Zhou et al., 2018). Contrasting evidence was offered by Jiang et al. (2019), who showed higher VMHC scores in children with ADHD in comparison to neurotypicals in the Occipital cortex. Our group recently suggested that age can partially explain these contrasting findings in ADHD fMRI, since cortical-subcortical connectivity can show transient alterations that are observable in specific time points between childhood and adulthood (Damiani et al., 2020).

The current study

Neuroplasticity is known to shape brain development during late childhood, adolescence and early adulthood (Aoki et al., 2017; Guyer et al., 2018; Kadis et al., 2011; Petanjek et al., 2011; Selemon, 2013), and age-related changes have been observed in interhemispheric coordination or brain centrality during the same period of life in both clinical conditions and the general population (Anderson et al., 2011; Di Martino et al., 2013; Everts et al., 2009; Kadis et al., 2011; Lo et al., 2011; Nagel et al., 2013; Oades, 1998; Sato et al., 2015; Schneider et al., 2011; M. Zhou et al., 2019). A divergence of neurodevelopment has been postulated for ADHD (American Psychiatric Association, 2013), as, among other factors, individuals with ADHD report delays in language or social development more frequently than their peers (American Psychiatric Association, 2013; Bruce et al., 2006; Staikova et al., 2013). Therefore, a description of the patterns of neurodevelopment in individuals with ADHD and neurotypical controls is warranted for the interval between 7 and 18 years of age, a salient time span characterized by the onset of both ADHD (American Psychiatric Association, 2013; Chandra et al., 2021; Kieling et al., 2010; Rohde et al., 2000) and a relevant portion of all psychiatric disorders (Kessler et al., 2007a, b; Solmi et al., 2021).

Aims

These premises call for using multiple whole brain, voxel-wise parameters which could explore brain connectivity in ADHD. Centrality and interhemispheric coordination may thus provide two different perspectives on ADHD brain connectivity: the former is more related to the global weight of a voxel, the second to the degree of symmetry reached between two homotopic voxels.

The primary aim of this study was to evaluate the potential differences in centrality (EC) and interhemispheric coordination of the brain (VMHC) in participants with ADHD, compared to neurotypicals, using a sample of adolescents between the age of 7 and 18 years old at the voxel-wise level.

Although previous studies focused on voxel-wise differences between ADHD and neurotypicals, the current work also adopted a network-based approach to provide novel insights on EC/VMHC. This approach allows to clearly visualize the relationship between neuroimaging and clinical findings (Tarchi et al., 2021), and to improve their replicability (Nickerson, 2018). The secondary aims of this study were i) to evaluate potential differences between neurotypicals and patients with ADHD in EC and VMHC at the network level. ii) to characterize the correlation of EC and VMHC with age, symptom severity, and cognitive/behavioral scores (Intelligence Quotient—verbal, performance, and full score; handedness—right hand dominance).

Methods

Sample

The current study sample was obtained from the New York University dataset of the ADHD200 repository, specifically from the International Neuroimaging Data-Sharing Initiative. All participants were between 7 and 18 years of age. A quality check for each subject was present in the phenotypic key provided with the dataset, and those subjects that did not pass were discarded preventively. The psychiatric diagnosis was based on the Schedule of Affective Disorders and Schizophrenia for Children—Present and Lifetime Version (Kaufman et al., 1997), administered to parents and children. ADHD specific psychopathology was evaluated through the Conners' Parent Rating Scale-Revised, Long version (Gurley, 2011). Intelligence was evaluated with the Wechsler Abbreviated Scale of Intelligence (Canivez et al., 2009). Inclusion in the ADHD group required a diagnosis of ADHD based on parent and child responses to the Schedule of Affective Disorders and Schizophrenia for Children: Present and Lifetime Version, as well as on a T-score greater than or equal to 65 on at least one ADHD related index of the Conners' Parent Rating Scale-Revised, Long version. Psychostimulant drugs were withheld at least 24 h before scanning. Inclusion criteria for the control group of neurotypicals required absence of any Axis-I psychiatric diagnoses per parent and child as per the interview by the Schedule of Affective Disorders and Schizophrenia for Children: Present and Lifetime Version, as well as T-scores below 60 for all the Conners' Parent Rating Scale- Revised, Long version

ADHD summary scales. Estimates of a Full Intelligence Quotient above 80, right-handedness and absence of other chronic medical conditions were required for all children (*ADHD200,* n.d.—NYU sample). Handedness was reported in a dimensional manner, and all included participants were right-handed. A handedness score ranging from 0 to + 1 was used to quantify the degree of right-hand dominance. Further details about the sample can be found in the parent study (Castellanos et al., 2008). MRI data was acquired in a single site (New York University, Child Study Center), and on one of two 3 T Siemens Trio scanners. Functional MRI scans were collected using a T2*-weighted echo-planar imaging (EPI) sequence with the following parameters: slice thickness 4 mm, repetition time 2 s, echo time 20 ms, flip angle 90°, voxel size 3.0 × 3.0x4.0 mm. An anatomical scan was acquired for each participant and defaced in order to preserve anonymity, the voxel size was 1.3 × 1.0x1.3 mm. The Resting-State fMRI scan lasted 304 s. Participants were asked to remain still and keep their eyes closed; they were not presented with stimuli or asked to respond during the scan.

Preprocessing

fMRI data preprocessing steps were implemented in AFNI (Cox, 1996; Cox & Hyde, 1997; Taylor & Saad, 2013). Firstly, the structural and functional reference images were co-registered (Saad et al., 2013). The first 4 frames of each fMRI run were removed in order to discard the transient effects in amplitude observed until magnetization achieves steady state (Caballero-Gaudes & Reynolds, 2017). Slice timing correction (Konstantareas & Hewitt, 2001) and despike methods (Satterthwaite et al., 2013) were applied. Rigid-body alignment of the structural and functional image was performed. The anatomical image was then warped using the Montreal Neurological Institute (MNI) standard space template provided with the AFNI binaries. A symmetrical template was chosen in order to better compare results of inter-hemispheric connectivity. The "2009c" symmetric template of the MNI152 initiative was chosen as the template of choice. Volume registration was then used to align the functional data to the base volume, warping it to the stereotactic space of choice. Bandpass (0.01–0.1 Hz) was performed (Shirer et al., 2015). Each of the voxel time series was then scaled to have a mean of 100. To control for non-neural noise, regression based on the 6 rigid body motion parameters and their 6 derivatives was applied, as well as mean time series from cerebro-spinal fluid masks (Fox et al., 2005; Vovk et al., 2011) eroded by one voxel (Chai et al., 2012). Regression of white matter artifacts was performed through the fast ANATICOR technique as included in AFNI (Jo et al., 2010). To further improve motion correction, censoring of voxels with a Framewise Displacement (FD) above 0.5 mm was applied to the timeseries (Power et al., 2014).

A visual quality assessment of each scan was performed at the end of preprocessing. Alignment between the anatomical and Resting-State scan, alignment between Resting-State scan and the reference volume, motion control (censored timepoints < 10% and absolute movement in each of the 6 motion parameters < 2 mm translation and < 2° rotation) were inspected, and subjects excluded if at least one was altered.

Primary aims, voxel-wise analysis

EC measures the importance of a node based on its connections to other important nodes (Bonacich, 1972, 2007). In fMRI, EC is based on both the number and the strength of connections between areas of the brain, with the most commonly used computational methods relying on correlation coefficients between voxels (Wink et al., 2012). Importance is assigned to voxels based on two factors: the raw number of meaningful connections (above a certain correlation coefficient threshold), and the degree of connection to highly connected hubs. Whole brain, voxel-wise EC values of Resting-State scans were measured using FASTCAT functionalities implemented in AFNI (Taylor & Saad, 2013). EC was measured by first calculating Pearson's correlation coefficients for each pair of voxels in the brain. As no sparsity or threshold correction coefficient is currently established in the literature, Fast Eigenvector Centrality was used as the method of choice to determine the correlation matrix (Wink et al., 2012). Subsequently, eigenvectors were calculated determining the largest eigenvalue in the correlation matrix according to the formula:

$$Rv = \lambda v$$

where

R represents the correlation matrix,

v represents the eigenvector of the matrix, and the scalar λ its corresponding eigenvalue.

VMHC, on the other hand, is a measure of interhemispheric coordination between corresponding areas in fMRI (Wei et al., 2018). In other words, VMHC measures the level of symmetry, or correlation, between left/right pairs of voxels or brain areas. VMHC values were computed by calculating the Pearson's correlation coefficients between each voxel and its interhemispheric counterpart in the mirrored symmetrical brain space. Thereafter, the correlation values were *z transformed* to improve normality: whole brain, voxel-wise

VMHC maps were computed for each participant, then normalized using Fisher z-transformation (Zuo et al., 2010). The adopted formula for computing Z-transformed VMHC values was the following:

$$\frac{1}{2} ln \frac{(1+v)}{(1-v)}$$

where

v represented voxel-wise VMHC values.

Secondary aims, network-level analysis

To calculate age-related variations, each participant's voxel-wise connectivity results was averaged within 15 networks. Masks for networks were obtained from the Functional Imaging in Neuropsychiatric Disorder Lab website – University of Stanford (Greicius & Eger, n.d.; Shirer et al., 2012). As the cerebellum plays an important role in ADHD (Bruchhage et al., 2018; Curtin et al., 2018; Ding & Pang, 2021; Miquel et al., 2019; Zhao et al., 2021), but was not included in the set of functional networks, a cerebellar map was retrieved from previous studies on cerebellar segmentation in the MNI stereotactic space (Diedrichsen et al., 2009). In total, 15 networks were included in secondary analyses. These 15 masks include: Anterior Salience, Auditory, Basal Ganglia, dorsal Default Mode Network (DMN), high Visual, Language, Left Executive Control, posterior Salience, Precuneus, Primary Visual, Right Executive Control, Sensorimotor, ventral DMN, and Visuospatial networks, as well as a Cerebellar mask. A graphical representation of network maps is offered by the original publication from which the functional networks were derived (Shirer et al., 2012). In order to compare means between neurotypicals and patients with a diagnosis of ADHD, Student's t-tests were calculated for mean EC/VMCH value per network, Hedges' g estimate of effect size reported. Correlation coefficients were estimated between the mean EC/VMHC value in each network and age/symptoms scores. Correlation coefficients were also estimated between the mean EC/VMHC value per network and IQ scores or handedness.

Control analyses

To control for the role of motion, group differences in mean FD values per run were explored through a student t-test, the estimated effect size was reported by Hedges' g. A violin plot was used to graphically inspect group distributions in mean FD values, with a jitter element to represent individual observations. Quartile values per group were rendered in the distribution curve (25, 50, 75 percentiles).

Statistical analyses

For both EC and VMHC, t-tests were used to measure whole brain, voxel-wise differences between neurotypicals and patients with a diagnosis of ADHD (3dttest + +, by AFNI, Cox, 1996), with a False Discovery Rate corrected threshold (FDR-corrected-p) of 0.05. Significant voxels after thresholding were reported after clustering in order to remove potential, isolated, artifacts. A minimum cluster of 30 voxels with 3 Nearest Neighbors (NN) was selected in accordance with previous literature (Damiani et al., 2020). Age, sex, IQ (verbal, performance, full scores) and handedness were introduced as covariates when estimating group differences, using the 3dttest + AFNI command and the "-covariates" option. Results were also clustered according to standard practice, with minimum size of 30 voxels, calculated by the 3 nearest neighbors. Secondary analyses were conducted with R, version 4.1.2 (R Core Team, 2020) and its library *tidyverse* (Wickham et al., 2019). Correlation coefficients were estimated using Spearman's rho, p-values reported via correlation matrices. Analyses on the full sample were repeated considering neurotypicals and ADHD groups separately. To account for multiple comparisons, a p-value of 0.01 was adopted as a significance threshold, while thresholds between 0.01 and 0.05 were referred to as trends in reporting the results.

Results

Descriptive Statistics

In the sample, 37 participants were excluded for excessive motions or quality control (9 TYP, 28 ADHD). 10 participants were excluded as at least one network had an EC value of 0, as it was not possible to calculate the respective value for computational or technical impossibility (4 TYP, 6 ADHD). In fact, current EC estimation methods are memory intensive and might not resolve the matrix operations (Taylor & Saad, 2013; Wink et al., 2012). A final count of 86 neurotypicals and 89 participants with ADHD were included in the study. Sample descriptives for both groups and overall can be found in Table 1.

Primary results

Analysis of EC resulted in wide and diffuse differences between neurotypicals and ADHD participants, with results observed at a minimal FDR-corrected-p of 0.0005. A visual representation of non-thresholded results was reported in Fig. 1a, while a threshold of FDR-corrected-p 0.05 and a minimum of 30 voxel clusters (NN = 3) was used to represent results as Fig. 1b.

Table 1 Descriptive statistics

	Neurotypicals	ADHD	Difference	Overall
N	86	89	/	175
Age	12.23 (±3.10)	11.22 (±2.76)	W 4522 * p 0.026	11.71 (±2.97)
Handedness	0.62 (±0.24)	0.66 (±0.26)	W 3350 p 0.236	0.64 (±0.25)
Gender	40 ♂ 46 ♀	66 ♂ 23 ♀	W 2651 * $p < 0.001$	106 ♂ 69 ♀
ADHD Global Index Severity	45.50 (±6.34)	71.20 (±8.53)	W 103 * $p < 0.001$	58.66 (±14.92)
Inattentive score	45.55 (±6.14)	70.44 (±8.81)	W 122 * $p < 0.001$	58.29 (±14.61)
Hyper/Impulsive score	46.40 (±5.42)	67.43 (±12.20)	W 386 * $p < 0.001$	57.16 (±14.18)
Full IQ	110.57 (±14.38)	107.41 (±14.26)	W 3840 p 0.149	108.92 (±14.36)
Verbal IQ	110.98 (±13.56)	108.06 (±14.79)	W 3789 p 0.202	109.46 (±14.38)
Performance IQ	107.74 (±14.89)	104.70 (±13.82)	W 3833 p 0.155	106.15 (±14.38)

Differences evaluated by Mann–Whitney U-test as normality was not assumed. Values reported ± 1 Standard Deviation

W = Wilcoxon-Mann–Whitney two-sample rank-sum

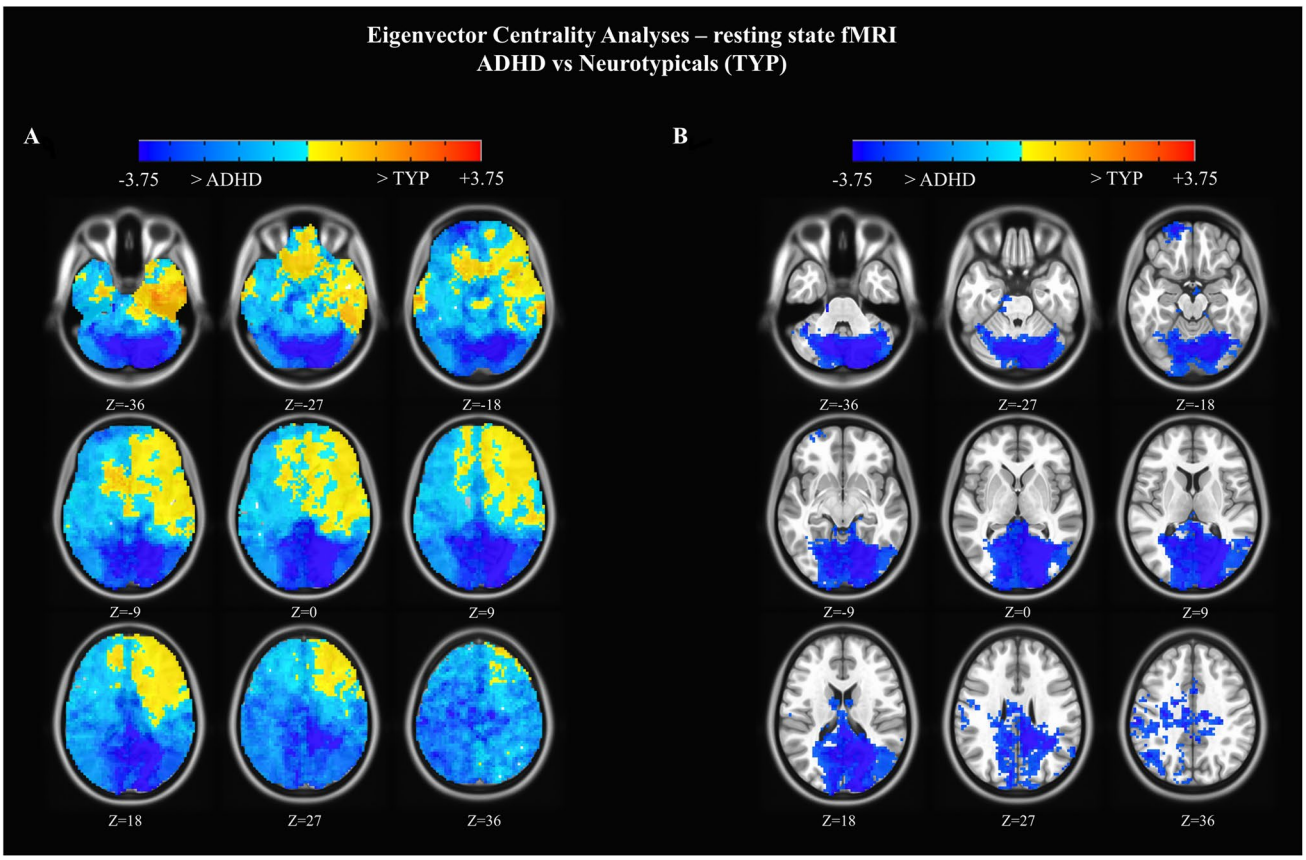

Fig. 1 Voxel-wise results of Eigenvector Centrality analyses, no thresholding. Color-bar by Z-scores, from -3.75 to + 3.75, Blue higher in ADHD, Red higher in TYP. A. no thresholding, B. FDR-corrected-p 0.05 and minimum cluster size 30 voxels (NN 3)

Significantly higher EC in ADHD compared to neurotypicals was found in the left inferior Frontal lobe, Lingual gyri, Peri-Calcarine cortex, superior and middle Occipital lobes, right inferior Occipital lobe, right middle Temporal gyrus, Fusiform gyri, bilateral Cuneus, right Precuneus, and Cerebellum. A detailed account of the thresholded clusters can be found in the Supplementary Materials as Table S1.

For what concerns individual factors, age, sex, clinical severity, and IQ scores did not appear to significantly influence between groups voxel-wise differences. Between groups, no covariate-map had surviving voxels at FDR-corrected-p 0.05.

Analysis of VMHC at the voxel-wise level resulted in no significant difference between neurotypicals and participants with ADHD, with no surviving voxel at FDR-corrected-p 0.05. Again, age, sex, clinical severity, and IQ scores did not appear to significantly influence between groups voxel-wise differences (no surviving voxels at FDR-corrected-p 0.05).

Network-based analyses

Network-based analyses showed a significant difference in EC between neurotypicals (TYP) and ADHD patients in the Higher Visual, Primary Visual, Language and Posterior Salience Networks, as well as in the Cerebellum (higher EC among individuals with ADHD in all significant networks). VMHC did not show any significant difference in network-based analyses. Mean FD, as a measure of motion, was not significantly different between groups. Results were reported in Table 2.

Network-based analyses showed a significant correlation between EC and age in 11 networks out of 15, when including all participants. Out of 15 networks, 7 showed a negative correlation between EC and age (Anterior Salience rho = -0.309; Auditory rho = -0.390; Basal Ganglia rho = -0.428; dorsal DMN rho = -0.406; Language rho = -0.369; Right Executive Control rho = -0.202; Cerebellum rho = -0.242), while 4 had a positive correlation (Left Executive Control rho = 0.383; Precuneus rho = 0.258; ventral DMN rho = 0.345; Visuospatial rho = 0.402). One network showed a positive trend between EC and age, namely the Sensorimotor network (rho = 0.167). Results for network-based analyses, including correlation coefficients and level of significance, were illustrated as Fig. 2. To be noted, EC values in the High Visual Network were positively correlated with age only for the ADHD group (ADHD rho = 0.264, p-value < 0.01; TYP rho = -0.131, p-value > 0.05; Overall rho = 0.022, p-value > 0.05).

Participants with ADHD showed a significant and negative trend between ADHD Global Index Severity and EC values in the Sensorimotor Network (rho = -0.232). For the overall sample, EC values also followed a positive trend with the Inattentive score of ADHD in the High Visual network (rho = 0.204) and a positive correlation with the Cerebellum (rho = 0.273). Additionally, a positive correlation was observed in the overall sample for the Hyper/Impulsive score in the High Visual (rho = 0.242), Right Executive Networks (rho = 0.204) and Cerebellum (rho = 0.276). Conversely, a negative trend was observed in the overall sample between EC values in the Sensorimotor Network and Hyper/Impulsivity severity scores (rho = -0.167). No significant correlation was found for EC and handedness or IQ, either as full or sub-domain scores. As previously reported, results for network-based analyses of EC correlation were illustrated as Fig. 2.

Table 2 Network-based analyses, group differences between neurotypicals and ADHD

Network	t-statistic	p-value	Hedges' g
anterior_Salience_EC	1.162	0.247	0.178
Auditory_EC	0.115	0.909	0.020
Basal_Ganglia_EC	0.182	0.856	0.031
dorsal_DMN_EC	-1.266	0.207	-0.192
high_Visual_EC	**-3.704**	**< 0.001**	**-0.616**
Language_EC	**-2.082**	**0.039**	**-0.315**
LECN_EC	-0.228	0.820	-0.035
post_Salience_EC	**-3.113**	**0.002**	**-0.470**
Precuneus_EC	-1.055	0.293	-0.162
prim_Visual_EC	**-3.160**	**0.002**	**-0.539**
RECN_EC	-1.277	0.203	-0.196
Sensorimotor_EC	-1.309	0.192	-0.198
ventral_DMN_EC	-1.458	0.147	-0.223
Visuospatial_EC	-1.294	0.197	-0.195
Cerebellum_EC	**-4.229**	**< 0.001**	**-0.692**
anterior_Salience_VMHC	-1.065	0.288	-0.161
Auditory_VMHC	-0.468	0.641	-0.071
Basal_Ganglia_VMHC	-0.886	0.377	-0.134
dorsal_DMN_VMHC	-1.164	0.246	-0.176
high_Visual_VMHC	0.246	0.806	0.037
Language_VMHC	-1.130	0.260	-0.171
LECN_VMHC	0.638	0.524	0.096
post_Salience_VMHC	-0.231	0.817	-0.035
Precuneus_VMHC	-0.218	0.827	-0.033
prim_Visual_VMHC	-0.268	0.789	-0.041
RECN_VMHC	-0.346	0.730	-0.052
Sensorimotor_VMHC	-1.142	0.255	-0.172
ventral_DMN_VMHC	-0.405	0.686	-0.061
Visuospatial_VMHC	0.680	0.498	0.103
Cerebellum_VMHC	-1.192	0.235	-0.180
Mean FD	-0.769	0.443	-0.116

In bold, statistically significant results

LECN Left executive control network

RECN Right executive control network

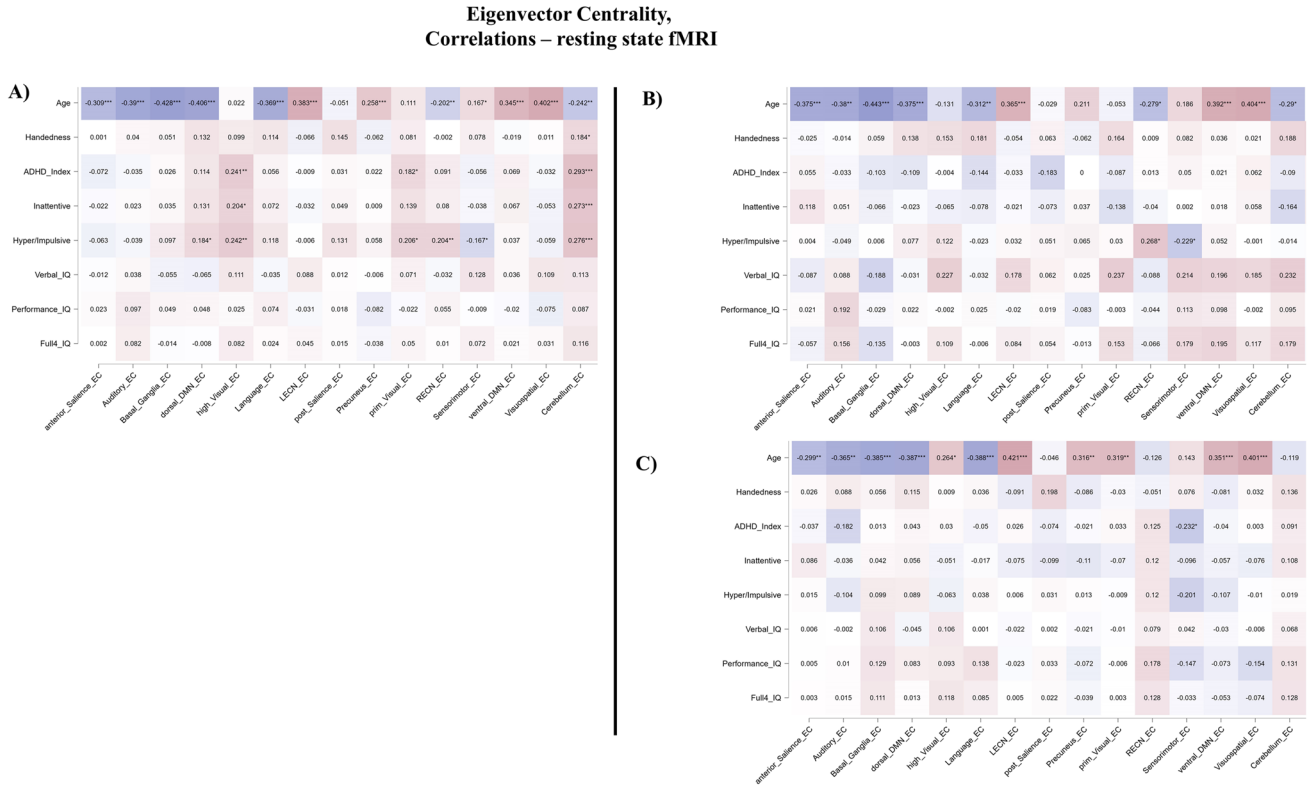

Fig. 2 Heatmaps of Eigenvector Centrality correlations with age, handedness, IQ scores and severity scales. Colors from blue to red. DMN: Default Mode Network, LECN: Left Executive Control Network, RECN: Right Executive Control Network, Blue higher negative correlation coefficient, Red higher positive correlation coefficients. A: Heatmap of the overall sample, B: Heatmap for neurotypicals, TYP, C: Heatmap for patients with a diagnosis of ADHD, * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

Network-based analyses showed a significant, negative correlation between VMHC and age in 11 out of 15 networks, when including all participants (Anterior Salience rho = -0.315; Auditory rho = -0.218; Basal Ganglia rho = -0.268; dorsal DMN rho = -0.354; Language rho = -0.381; Precuneus rho = -0.197; Right Executive Control rho = -0.212; Sensorimotor rho = -0.324; ventral DMN rho = -0.299; Visuospatial rho = -0.251; Cerebellum rho = -0.281). Results of the network-based analyses, including correlation coefficients and level of significance, were illustrated as Fig. 3.

Verbal IQ was negatively correlated with VMHC values in the Left and Right Executive Networks in neurotypicals (rho = -0.327 and rho = -0.323 respectively) but not among participants with ADHD. Performance IQ showed a negative trend only for the Right Executive Network in neurotypicals (rho = -0.237) and only with the Visuospatial Network in the group of patients with ADHD (rho = -0.229). Full IQ scores showed a negative trend with VMHC only in the Left and Right Executive Networks for neurotypicals (rho = -0.271 and rho = -0.280 respectively), while in the Visuospatial Network in the group of patients with ADHD (rho = -0.240). Handedness was negatively correlated with VMHC only in the Language Network for neurotypicals (rho = -0.280), while in Basal Ganglia and ventral DMN and for participants with ADHD (rho = -0.335 and rho = -0.336 respectively). Results for network-based analyses of VMHC correlations were illustrated in Fig. 3.

Control analysis

No significant differences were observed for motion (mean FD value) between neurotypicals and participants with ADHD ($p = 0.443$, see Table 2). Violin plot distribution of mean FD value, with reported quartiles per group, showed high similarity and was illustrated in the Supplementary Materials as Supplementary Figure S2.

Discussion

The present study confirms the importance of centrality measurements in the evaluation of psychiatric disorders. The observed increases of EC in ADHD in comparison to neurotypicals were in a wide area in the posterior half of the Cerebrum, including: the left inferior Frontal lobe, Lingual

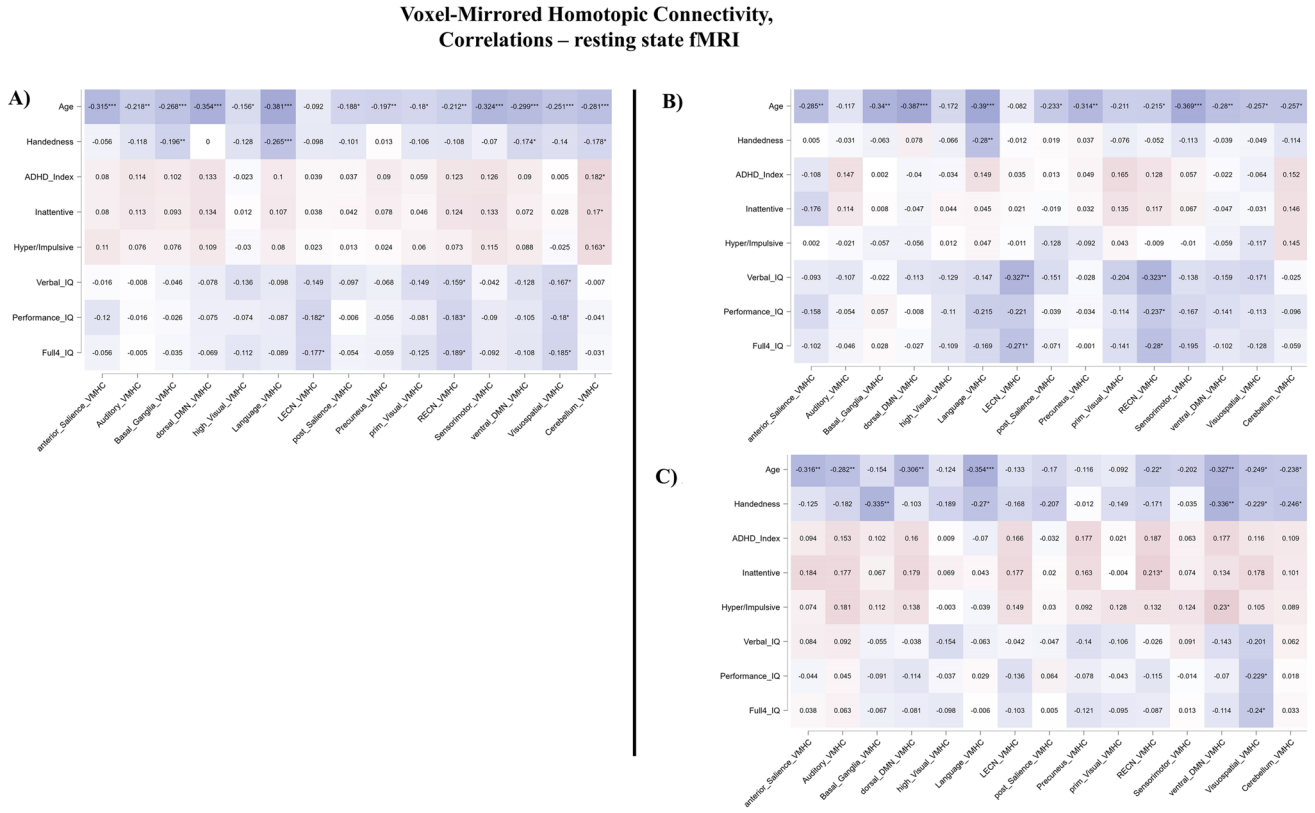

Fig. 3 Heatmap of Voxel-wise Homotopic Connectivity correlations with age, handedness, IQ scores and severity scales. Colors from blue to red. DMN: Default Mode Network, LECN: Left Executive Control Network, RECN: Right Executive Control Network, Blue higher negative correlation coefficient, Red higher positive correlation coefficients. A: Heatmap of the overall sample, B: Heatmap for neurotypicals, TYP, C: Heatmap for patients with a diagnosis of ADHD, * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

gyri, Peri-Calcarine cortex, superior and middle Occipital lobes, right inferior Occipital lobe, right middle Temporal gyrus, Fusiform gyri, bilateral Cuneus, right Precuneus, and Cerebellum. Although the current literature has focused on an aberrant interhemispheric coordination in ADHD, the current study did not find statistically significant differences between participants with ADHD and neurotypicals, as assessed by VMHC in a sample of participants aged from 7 to 18 years.

EC was particularly correlated with age at the network-level, pointing to a significant effect of neurodevelopment in the longitudinal trajectory of EC. Therefore, the present study offers a possible interpretation of the contrasting findings offered by previous literature. In fact, reports of increased centrality scores (Jiang et al., 2014) and decreased centrality scores (J. Zhou et al., 2018) in ADHD could be the result of specific alterations at different neurodevelopmental timepoints (Damiani et al., 2020; Hong et al., 2017). While early reports described increased centrality scores in ADHD for the superior Occipital lobes (M. Zhou et al., 2019), the current study observed a similar trend only for the inferior and medial Occipital lobes (Hong et al., 2017). Previous reports of increased centrality scores in ADHD for the Striatum, Pallidum, and Basal Ganglia (Di Martino et al., 2013) were not replicated. Furthermore, the current study supported decreased centrality scores in ADHD for the middle Temporal gyrus (Hong et al., 2017; Zhou et al., 2019).

Although age showed a homogeneous effect on VMHC (negative correlations in the overall sample and in each diagnostic group, across all networks), a heterogeneous correlation between EC and age was observed in the network-based analyses. Networks differentiated into three association patterns (positive, negative, or null), which remained similar when comparing analysis of single groups and across the entire sample. These trends can be interpreted in light of recent literature, which described different patterns of association between age and the structural/functional topography of the brain (Bellantuono et al., 2021; Long et al., 2017; Lopez-Larson et al., 2011; Zuo et al., 2012). For what concerns VMHC, only global patterns of interhemispheric coordination and development have been reported (Zuo et al., 2010). These patterns described a non-linear trend of decreasing global interhemispheric coordination before adulthood, and a later

progressive increase after senility (Zuo et al., 2010). In previous literature, the right hemisphere exhibited higher values of EC as a function of age in comparison to its left homologue, as evaluated in a sample of healthy children aged 2 to 6 years old (Long et al., 2017). Associative areas, such as the right superior Frontal lobe and both superior/medial Temporal lobes, were observed to significantly increase in centrality scores as a function of age in the same sample (Long et al., 2017). Conversely, sensory areas such as the Occipital lobes and bilateral inferior Temporal lobes showed significantly decreased centrality scores with increasing age (Long et al., 2017). In the current study, the same areas (Occipital lobes—bilateral superior and middle gyri, right inferior gyrus; right middle Temporal gyrus) showed significantly higher EC in participants with ADHD aged between 7 to 18. In other words, the same areas which undergo a specific remodulation of EC as a function of age during early childhood (2–6 years old), also show significantly higher values in 7 to 18 years old individuals with ADHD. Together with these findings, it can thus be speculated that altered age-related trajectories in EC may represent the presence of a delayed or missed neurodevelopmental milestone in these individuals (Dark et al., 2018; Hannigan et al., 2021).

The Left and Right Executive Control networks exhibited significant but opposite correlations between EC and age, shifting from a marked left dominance in centrality towards an interhemispheric balance. Interestingly, this remodeling was not reflected by interhemispheric coordination, demonstrating how neurodevelopment drives different trajectories between inter- and intra-network connectivity patterns. The divergent development of the Left and Right Executive Control networks seems to be supported by evidence of white matter asymmetry, differences in functional interhemispheric connectivity, and reports of lateralized neural correlates for executive tasks (Asanowicz et al., 2012; Vallesi, 2012, 2021; Yin et al., 2013).

The dorsal and ventral DMN also showed significant but opposite correlations between EC values and age (positive for the ventral DMN, negative for the dorsal DMN). These findings might be interpreted in light of recent research on the separate role of these two components of the DMN (Chen et al., 2017; Lee et al., 2021; Sethi et al., 2018), and of the overlap between these regions and previously described ventral and dorsal streams of language processing (Hickok & Poeppel, 2007; Klein et al., 2015; Middlebrooks et al., 2017; Saur et al., 2008; Tomasi & Volkow, 2020; Wylie & Regner, 2014). As recent research highlighted the role of non-linear, non-monotonic trajectories in the neurodevelopment of the functional connectome in the human brain (Gracia-Tabuenca et al., 2021), especially for attention-related networks (Damiani et al., 2020; Gracia-Tabuenca et al., 2021), the authors warrant further research on the topic.

For what concerns ADHD severity, EC was correlated with the ADHD Global Index Severity score, and with the Inattentive/Hyper-impulsive subdomain scores. These correlations were evaluated at the network level, and were statistically significant primarily in the High Visual network and the Cerebellum. The correlation between symptomatic scores and EC values in the High Visual network can be better interpreted when considering previous neuroimaging studies, which highlighted consistent alterations in cortical thickness and functional activity in the medial Occipital cortex of patients with ADHD (Castellanos & Proal, 2012; Dickstein et al., 2006; Proal et al., 2011). Current voxel-wise results also showed important differences in EC values, which extended to most of the posterior brain.

Similarly, the correlation between symptomatic scores and Cerebellar EC values is in full agreement with the prefrontal-striatal-cerebellar model of ADHD (Curtin et al., 2018; Goetz et al., 2014; Krain & Castellanos, 2006; Lantieri et al., 2010). The prefrontal-striatal-cerebellar model posits a cerebellar involvement underpinning executive functioning, when integrated with the frontoparietal network (Cortese et al., 2012; Miquel et al., 2019; Mulder et al., 2008), and a cerebellar contribution to motor control, when integrated with somatosensory areas (Cortese et al., 2012; Picazio & Koch, 2015). The effect of EC at the network level was transdiagnostic, and neurotypicals showed a significant correlation between EC values and hyper-impulsivity in the Sensorimotor cortex and Executive Control networks. EC may therefore be posited as a marker of dimensional psychopathology rather than a diagnostic classification tool. As both clinical accounts and current results showed a protective role for age, to the present day it is not possible to exclude a potential compensatory plasticity during adolescence and young adulthood. Furthermore, EC correlated with age similarly in the two groups, with no significant difference between groups in the age effect for voxel-wise analyses. However, the correlations EC showed with age in dorsal DMN, right Executive Control, Sensorimotor network, and Cerebellum were opposite to the ones between EC and ADHD symptoms. Moreover, EC was not significantly correlated with handedness or IQ at the network level, which might be interpreted as a specificity of this measurement for the clinical correlates of ADHD psychopathology.

Although all included participants were right-handed, a dimensional approach to hand dominance allowed for novel interpretations about the role of hand dominance in the interhemispheric coordination and functional lateralization of the brain. In particular, interhemispheric coordination—as measured by VMHC—was significantly correlated with right-hand dominance in the Language Network in the neurotypical sample. By contrast, the groups of patients with ADHD showed a higher correlation between VMHC and handedness across several networks (Basal Ganglia,

Language, ventral DMN, Visuospatial Networks). These findings show similar patterns to the high inter-participant and task-specific variability of lateralization in language processing areas (Cotosck et al., 2021; Gurunandan et al., 2020; Olulade et al., 2020; Vigneau et al., 2011), where marked functional lateralization is not clearly correlated to better performance. In turn, ventral DMN is central not only for sustained-attention (Sormaz et al., 2018) or goal-oriented behavior (Murphy et al., 2018; Spreng, 2012), but also for semantic fluency, entailing both cognition and memory (Martin et al., 2021). Consequently, in comparison to EC, VMHC rather seemed involved as a transdiagnostic marker of functioning in cognitive, verbal, or semantic tasks. In fact, VMHC correlated with IQ scores, but in a diverging manner between neurotypicals and ADHD. While neurotypicals showed negative correlations between VMHC and IQ in the Executive Networks, the group of participants with ADHD showed negative correlations in the Visuospatial Network only. Of special interest, previous studies described an interaction between auditory and visual processing, with reports suggesting the existence of a dual interplay between these processes, and the emergence of both interaction and segregation in brain areas related to these functions during late neurodevelopment (Berto et al., 2021). Moreover, studies have shown altered sensory processing in ADHD for what visual and auditory processing are concerned (Dunn & Bennett, 2002; Ghanizadeh, 2011; Schulze et al., 2021). Current results could then partially explain these findings in light of a divergent neurodevelopment between neurotypicals and individuals with ADHD. In fact, although VMHC was consistently and negatively correlated with age in both healthy controls and participants with ADHD, behavioral and cognitive functioning seemed to correlate with different brain networks in the two groups.

Limitations

Although the included sample size was significantly high, further studies are needed in order to increase generalizability of results. Included participants ranged between 7 and 18 years old, thus warranting caution in interpreting results in light of an adult population. Although a dimensional approach to handedness allowed for a novel interpretation of results, further studies including both left and right-handed individuals are needed before definitive conclusions about the potential role of VMHC in determining interhemispheric coordination as a function of performance. Due to the explorative nature of the network-level analysis, several trends with uncorrected p between 0.05 and 0.01 were also reported, avoiding to perform more stringent corrections in order to reduce the risk of false negatives. The role of motion was controlled for with extensive preprocessing measures and controlled for both in quality evaluations of individual scans and group differences at the group level, however the authors warrant caution in drawing conclusions from a single study.

Conclusions

EC was significantly higher in ADHD in respect to neurotypicals in the left inferior Frontal lobe, Lingual gyri, Peri-Calcarine cortex, superior and middle Occipital lobes, right inferior Occipital lobe, right middle Temporal gyrus, Fusiform gyri, bilateral Cuneus, right Precuneus, and Cerebellum. The current study suggested the specificity of EC as a correlate of ADHD psychopathology as assessed through the Conners' Parent Rating Scale. VMHC was not found to be significantly different between participants with ADHD and neurotypicals, but a specific correlation was found between VMHC and handedness or IQ at the network level, suggesting a role of interhemispheric coordination in verbal or semantic associated areas and overall performance. Although all VMHC measures were negatively correlated with age in both healthy controls and participants with ADHD, behavioral and cognitive functioning correlated with different brain networks in the two groups. The authors interpreted this finding as further evidence of neurodivergence in ADHD. Finally, the authors discussed the complex relationship between EC, ADHD symptoms and age. Age significantly correlated (either positively or negatively) with the centrality of several brain networks. Brain networks where EC significantly correlated with clinical severity scores also exhibited opposite correlation coefficients between EC and age.

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Author contributions L.T. conceived and designed the study, with the supervision of S.D.; T.P.; G.C.; P.P. and V.R.

T.F. and L.T. performed the screening process. L.T. performed the statistical analysis. The first draft was written by L.T. under the supervision of S.D.; T.P.; G.C.; P.P. and V.R. S.D.; G.C; T.P. and P.P provided critical technical and theoretical input in the interpretation of the studies and writing the article. All authors contributed to the interpretation of the studies and to the synthesis of results. The final manuscript was approved by all the authors.

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Data availability The datasets generated during the current study are available from the corresponding author on reasonable request.

Declarations

This study used a shared neuroimaging dataset from the UCLA Consortium for Neuropsychiatric Phenomics, all analyses conformed with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. All participants consented to participate in the study and for future results to be published.

Conflict of interest The authors declare no potential conflict of interest.

References

Achard, S., Salvador, R., Whitcher, B., Suckling, J., & Bullmore, E. (2006). A resilient, low-frequency, small-world human brain functional network with highly connected association cortical hubs. *Journal of Neuroscience, 26*(1), 63–72. https://doi.org/10.1523/JNEUROSCI.3874-05.2006

ADHD200. (n.d.). Retrieved October 14, 2021, from https://fcon_1000.projects.nitrc.org/indi/adhd200/.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Anderson, J. S., Druzgal, T. J., Froehlich, A., DuBray, M. B., Lange, N., Alexander, A. L., Abildskov, T., Nielsen, J. A., Cariello, A. N., Cooperrider, J. R., Bigler, E. D., & Lainhart, J. E. (2011). Decreased interhemispheric functional connectivity in autism. *Cerebral Cortex (New York, N.Y.: 1991), 21*(5), 1134–1146. https://doi.org/10.1093/cercor/bhq190

Angrilli, A., Spironelli, C., Elbert, T., Crow, T. J., Marano, G., & Stegagno, L. (2009). Schizophrenia as failure of left hemispheric dominance for the phonological component of language. *PLoS One, 4*(2), e4507. https://doi.org/10.1371/journal.pone.0004507

Aoki, C., Romeo, R. D., & Smith, S. S. (2017). Adolescence as a critical period for developmental plasticity. *Brain Research, 1654*(Part B), 85–86. https://doi.org/10.1016/j.brainres.2016.11.026

Asanowicz, D., Marzecová, A., Jaśkowski, P., & Wolski, P. (2012). Hemispheric asymmetry in the efficiency of attentional networks. *Brain and Cognition, 79*(2), 117–128. https://doi.org/10.1016/j.bandc.2012.02.014

Bellantuono, L., Marzano, L., La Rocca, M., Duncan, D., Lombardi, A., Maggipinto, T., Monaco, A., Tangaro, S., Amoroso, N., & Bellotti, R. (2021). Predicting brain age with complex networks: From adolescence to adulthood. *NeuroImage, 225*, 117458. https://doi.org/10.1016/j.neuroimage.2020.117458

Berretz, G., Wolf, O. T., Güntürkün, O., & Ocklenburg, S. (2020). Atypical lateralization in neurodevelopmental and psychiatric disorders: What is the role of stress? *Cortex, 125*, 215–232. https://doi.org/10.1016/j.cortex.2019.12.019

Berto, M., Ricciardi, E., Pietrini, P., & Bottari, D. (2021). Interactions between auditory statistics processing and visual experience emerge only in late development. *Iscience, 24*(11), 103383. https://doi.org/10.1016/j.isci.2021.103383

Bonacich, P. (1972). Factoring and weighting approaches to status scores and clique identification. *The Journal of Mathematical Sociology, 2*(1), 113–120. https://doi.org/10.1080/0022250X.1972.9989806

Bonacich, P. (2007). Some unique properties of eigenvector centrality. *Social Networks, 29*(4), 555–564. https://doi.org/10.1016/j.socnet.2007.04.002

Bruce, B., Thernlund, G., & Nettelbladt, U. (2006). ADHD and language impairment. *European Child & Adolescent Psychiatry, 15*(1), 52–60. https://doi.org/10.1007/s00787-006-0508-9

Bruchhage, M. M. K., Bucci, M.-P., & Becker, E. B. E. (2018). Chapter 4—Cerebellar involvement in autism and ADHD. In M. Manto, & T. A. G. M. Huisman (Eds.), *Handbook of Clinical Neurology* (vol. 155, pp. 61–72). Elsevier. https://doi.org/10.1016/B978-0-444-64189-2.00004-4

Caballero-Gaudes, C., & Reynolds, R. C. (2017). Methods for cleaning the BOLD fMRI signal. *NeuroImage, 154*, 128–149. https://doi.org/10.1016/j.neuroimage.2016.12.018

Canivez, G. L., Konold, T. R., Collins, J. M., & Wilson, G. (2009). Construct validity of the Wechsler Abbreviated Scale of Intelligence and Wide Range Intelligence Test: Convergent and structural validity. *School Psychology Quarterly, 24*(4), 252–265. https://doi.org/10.1037/a0018030

Castellanos, F. X., Margulies, D. S., Kelly, C., Uddin, L. Q., Ghaffari, M., Kirsch, A., Shaw, D., Shehzad, Z., Di Martino, A., Biswal, B., Sonuga-Barke, E. J. S., Rotrosen, J., Adler, L. A., & Milham, M. P. (2008). Cingulate-precuneus interactions: A new locus of dysfunction in adult attention-deficit/hyperactivity disorder. *Biological Psychiatry, 63*(3), 332–337. https://doi.org/10.1016/j.biopsych.2007.06.025

Castellanos, F. X., & Proal, E. (2012). Large-scale brain systems in ADHD: Beyond the prefrontal–striatal model. *Trends in Cognitive Sciences, 16*(1), 17–26. https://doi.org/10.1016/j.tics.2011.11.007

Chai, X. J., Castañón, A. N., Ongür, D., & Whitfield-Gabrieli, S. (2012). Anticorrelations in resting state networks without global signal regression. *NeuroImage, 59*(2), 1420–1428. https://doi.org/10.1016/j.neuroimage.2011.08.048

Chandra, S., Biederman, J., & Faraone, S. V. (2021). Assessing the validity of the age at onset criterion for diagnosing ADHD in DSM-5. *Journal of Attention Disorders, 25*(2), 143–153. https://doi.org/10.1177/1087054716629717

Chen, J. E., Glover, G. H., Greicius, M. D., & Chang, C. (2017). Dissociated patterns of anti-correlations with dorsal and ventral default-mode networks at rest. *Human Brain Mapping, 38*(5), 2454–2465. https://doi.org/10.1002/hbm.23532

Cheung, E. Y. W., Shea, Y. F., Chiu, P. K. C., Kwan, J. S. K., & Mak, H. K. F. (2021). Diagnostic efficacy of voxel-mirrored homotopic connectivity in vascular dementia as compared to alzheimer's related neurodegenerative diseases—a resting state fMRI study. *Life, 11*(10), 1108. https://doi.org/10.3390/life11101108

Cortese, S., Kelly, C., Chabernaud, C., Proal, E., Di Martino, A., Milham, M. P., & Castellanos, F. X. (2012). Toward systems neuroscience of ADHD: A meta-analysis of 55 fMRI studies. *American Journal of Psychiatry, 169*(10), 1038–1055. https://doi.org/10.1176/appi.ajp.2012.11101521

Cotosck, K. R., Meltzer, J. A., Nucci, M. P., Lukasova, K., Mansur, L. L., & Amaro, E. (2021). Engagement of language and domain general networks during word monitoring in a native and unknown language. *Brain Sciences, 11*(8), 1063. https://doi.org/10.3390/brainsci11081063

Cox, R. W. (1996). AFNI: Software for analysis and visualization of functional magnetic resonance neuroimages. *Computers and Biomedical Research, an International Journal, 29*(3), 162–173. https://doi.org/10.1006/cbmr.1996.0014

Cox, R. W., & Hyde, J. S. (1997). Software tools for analysis and visualization of fMRI data. *NMR in Biomedicine, 10*(4–5), 171–178. https://doi.org/10.1002/(sici)1099-1492(199706/08)10:4/5%3c171::aid-nbm453%3e3.0.co;2-l

Curtin, K., Fleckenstein, A. E., Keeshin, B. R., Yurgelun-Todd, D. A., Renshaw, P. F., Smith, K. R., & Hanson, G. R. (2018). Increased risk of diseases of the basal ganglia and cerebellum in patients with a history of attention-deficit/hyperactivity disorder. *Neuropsychopharmacology, 43*(13), 2548–2555. https://doi.org/10.1038/s41386-018-0207-5

Dai, X.-J., Liu, B.-X., Ai, S., Nie, X., Xu, Q., Hu, J., Zhang, Q., Xu, Y., Zhang, Z., & Lu, G. (2020). Altered inter-hemispheric communication of default-mode and visual networks underlie etiology of primary insomnia. *Brain Imaging and Behavior, 14*(5), 1430–1444. https://doi.org/10.1007/s11682-019-00064-0

Damiani, S., Tarchi, L., Scalabrini, A., Marini, S., Provenzani, U., Rocchetti, M., Oliva, F., & Politi, P. (2020). Beneath the surface: Hyper-connectivity between caudate and salience regions in ADHD fMRI at rest. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-020-01545-0

Dark, C., Homman-Ludiye, J., & Bryson-Richardson, R. J. (2018). The role of ADHD associated genes in neurodevelopment. *Developmental Biology, 438*(2), 69–83. https://doi.org/10.1016/j.ydbio.2018.03.023

Deng, K., Qi, T., Xu, J., Jiang, L., Zhang, F., Dai, N., Cheng, Y., & Xu, X. (2019). Reduced interhemispheric functional connectivity in obsessive-compulsive disorder patients. *Frontiers in Psychiatry, 10*, 418. https://doi.org/10.3389/fpsyt.2019.00418

Di Martino, A., Zuo, X.-N., Kelly, C., Grzadzinski, R., Mennes, M., Schvarcz, A., Rodman, J., Lord, C., Castellanos, F. X., & Milham, M. P. (2013). Shared and distinct intrinsic functional network centrality in autism and attention-deficit/hyperactivity disorder. *Biological Psychiatry, 74*(8), 623–632. https://doi.org/10.1016/j.biopsych.2013.02.011

Dickstein, S. G., Bannon, K., Xavier Castellanos, F., & Milham, M. P. (2006). The neural correlates of attention deficit hyperactivity disorder: An ALE meta-analysis. *Journal of Child Psychology and Psychiatry, 47*(10), 1051–1062. https://doi.org/10.1111/j.1469-7610.2006.01671.x

Diedrichsen, J., Balsters, J. H., Flavell, J., Cussans, E., & Ramnani, N. (2009). A probabilistic MR atlas of the human cerebellum. *NeuroImage, 46*(1), 39–46. https://doi.org/10.1016/j.neuroimage.2009.01.045

Ding, L., & Pang, G. (2021). Identification of brain regions with enhanced functional connectivity with the cerebellum region in children with attention deficit hyperactivity disorder: A resting-state fMRI study. *International Journal of General Medicine, 14*, 2109–2115. https://doi.org/10.2147/IJGM.S303339

Dunn, W., & Bennett, D. (2002). Patterns of Sensory Processing in Children with Attention Deficit Hyperactivity Disorder. *OTJR: Occupation, Participation and Health, 22*(1), 4–15. https://doi.org/10.1177/153944920202200102

Everts, R., Lidzba, K., Wilke, M., Kiefer, C., Mordasini, M., Schroth, G., Perrig, W., & Steinlin, M. (2009). Strengthening of laterality of verbal and visuospatial functions during childhood and adolescence. *Human Brain Mapping, 30*(2), 473–483. https://doi.org/10.1002/hbm.20523

Fox, M. D., Snyder, A. Z., Vincent, J. L., Corbetta, M., Essen, D. C. V., & Raichle, M. E. (2005). The human brain is intrinsically organized into dynamic, anticorrelated functional networks. *Proceedings of the National Academy of Sciences, 102*(27), 9673–9678. https://doi.org/10.1073/pnas.0504136102

Ghanizadeh, A. (2011). Sensory processing problems in children with ADHD, a systematic review. *Psychiatry Investigation, 8*(2), 89–94. https://doi.org/10.4306/pi.2011.8.2.89

Giraldo-Chica, M., & Woodward, N. D. (2017). Review of thalamocortical resting-state fMRI studies in schizophrenia. *Schizophrenia Research, 180*, 58–63. https://doi.org/10.1016/j.schres.2016.08.005

Goetz, M., Veseka, M., & Ptacek, R. (2014). Notes on the Role of the Cerebellum in ADHD. *Austin Journal of Psychiatry and Behavioral Sciences*, *1*(3), 1013.

Gracia-Tabuenca, Z., Moreno, M. B., Barrios, F. A., & Alcauter, S. (2021). Development of the brain functional connectome follows puberty-dependent nonlinear trajectories. *NeuroImage, 229*, 117769. https://doi.org/10.1016/j.neuroimage.2021.117769

Greicius, M., & Eger, S. (n.d.). *FIND Lab at Stanford University*. Functional Imaging in Neuropsychiatric Disorders (FIND) Lab at Stanford University. Retrieved March 23, 2021, from https://findlab.stanford.edu/functional_ROIs.html.

Guo, W., Liu, F., Xue, Z., Gao, K., Liu, Z., Xiao, C., Chen, H., & Zhao, J. (2013). Decreased interhemispheric coordination in treatment-resistant depression: A resting-state fMRI study. *PLoS One, 8*(8), e71368. https://doi.org/10.1371/journal.pone.0071368

Gurley, J. R. (2011). Conners' Parent Rating Scales – Revised. In S. Goldstein, & J. A. Naglieri (Eds.), *Encyclopedia of Child Behavior and Development* (pp. 404–405). Springer US. https://doi.org/10.1007/978-0-387-79061-9_670

Gurunandan, K., Arnaez-Telleria, J., Carreiras, M., & Paz-Alonso, P. M. (2020). Converging evidence for differential specialization and plasticity of language systems. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience, 40*(50), 9715–9724. https://doi.org/10.1523/JNEUROSCI.0851-20.2020

Guyer, A. E., Pérez-Edgar, K., & Crone, E. A. (2018). Opportunities for neurodevelopmental plasticity from infancy through early adulthood. *Child Development, 89*(3), 687–697. https://doi.org/10.1111/cdev.13073

Hagemann, D., Naumann, E., Thayer, J. F., & Bartussek, D. (2002). Does resting electroencephalograph asymmetry reflect a trait? An application of latent state-trait theory. *Journal of Personality and Social Psychology, 82*(4), 619–641.

Halpern, M. E., Güntürkün, O., Hopkins, W. D., & Rogers, L. J. (2005). Lateralization of the vertebrate brain: Taking the side of model systems. *Journal of Neuroscience, 25*(45), 10351–10357. https://doi.org/10.1523/JNEUROSCI.3439-05.2005

Hannigan, L. J., Askeland, R. B., Ask, H., Tesli, M., Corfield, E., Ayorech, Z., Magnus, P., Njølstad, P. R., Øyen, A.-S., Stoltenberg, C., Andreassen, O. A., Ronald, A., Smith, G. D., Reichborn-Kjennerud, T., & Havdahl, A. (2021). Developmental milestones in early childhood and genetic liability to neurodevelopmental disorders. *Psychological Medicine, 1–9*,. https://doi.org/10.1017/S0033291721003330

He, Y., Wang, J., Wang, L., Chen, Z. J., Yan, C., Yang, H., Tang, H., Zhu, C., Gong, Q., Zang, Y., & Evans, A. C. (2009). Uncovering Intrinsic modular organization of spontaneous brain activity in humans. *PLoS One, 4*(4), e5226. https://doi.org/10.1371/journal.pone.0005226

Hickok, G., & Poeppel, D. (2007). The cortical organization of speech processing. *Nature Reviews Neuroscience, 8*(5), 393–402. https://doi.org/10.1038/nrn2113

Hong, J., Park, B.-Y., Cho, H.-H., & Park, H. (2017). Age-related connectivity differences between attention deficit and hyperactivity disorder patients and typically developing subjects: A resting-state functional MRI study. *Neural Regeneration Research, 12*(10), 1640–1647. https://doi.org/10.4103/1673-5374.217339

Iravani, B., Arshamian, A., Fransson, P., & Kaboodvand, N. (2021). Whole-brain modelling of resting state fMRI differentiates ADHD subtypes and facilitates stratified neuro-stimulation therapy. *NeuroImage, 231*, 117844. https://doi.org/10.1016/j.neuroimage.2021.117844

Iturria-Medina, Y., Sotero, R. C., Canales-Rodríguez, E. J., Alemán-Gómez, Y., & Melie-García, L. (2008). Studying the human brain anatomical network via diffusion-weighted MRI and Graph Theory. *NeuroImage, 40*(3), 1064–1076. https://doi.org/10.1016/j.neuroimage.2007.10.060

Jiang, K., Dong, X., Gao, M., Li, H., Zhang, Q., Yi, Y., Shen, H., Chen, L., Ding, L., & Zheng, A. (2014). Intensity of functional connection between bilateral hemispheres of children with attention-deficit hyperactivity disorder by functional magnetic resonance imaging. *Zhonghua Yi Xue Za Zhi, 94*(46), 3649–3651.

Jiang, K., Yi, Y., Li, L., Li, H., Shen, H., Zhao, F., Xu, Y., & Zheng, A. (2019). Functional network connectivity changes in children with attention-deficit hyperactivity disorder: A resting-state fMRI study. *International Journal of Developmental Neuroscience: The Official Journal of the International Society for Developmental Neuroscience, 78*, 1–6. https://doi.org/10.1016/j.ijdevneu.2019.07.003

Jo, H. J., Saad, Z. S., Simmons, W. K., Milbury, L. A., & Cox, R. W. (2010). Mapping sources of correlation in resting state FMRI, with artifact detection and removal. *NeuroImage, 52*(2), 571–582. https://doi.org/10.1016/j.neuroimage.2010.04.246

Kadis, D. S., Pang, E. W., Mills, T., Taylor, M. J., McAndrews, M. P., & Smith, M. L. (2011). Characterizing the normal developmental trajectory of expressive language lateralization using magnetoencephalography. *Journal of the International Neuropsychological Society, 17*(5), 896–904. https://doi.org/10.1017/S1355617711000932

Kaufman, J., Birmaher, B., Brent, D., Rao, U., Flynn, C., Moreci, P., Williamson, D., & Ryan, N. (1997). Schedule for affective disorders and schizophrenia for school-age children-present and lifetime version (K-SADS-PL): Initial reliability and validity data. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(7), 980–988. https://doi.org/10.1097/00004583-199707000-00021

Kessler, R. C., Angermeyer, M., Anthony, J. C., De Graaf, R., Demyttenaere, K., Gasquet, I., DE Girolamo, G., Gluzman, S., Gureje, O., Haro, J. M., Kawakami, N., Karam, A., Levinson, D., Medina Mora, M. E., Oakley Browne, M. A., Posada-Villa, J., Stein, D. J., Adley Tsang, C. H., Aguilar-Gaxiola, S., …, & Ustün, T. B. (2007b). Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, *6*(3), 168–176.

Kessler, R. C., Amminger, G. P., Aguilar-Gaxiola, S., Alonso, J., Lee, S., & Ustun, T. B. (2007a). Age of onset of mental disorders: A review of recent literature. *Current Opinion in Psychiatry, 20*(4), 359–364. https://doi.org/10.1097/YCO.0b013e32816ebc8c

Kieling, C., Kieling, R. R., Rohde, L. A., Frick, P. J., Moffitt, T., Nigg, J. T., Tannock, R., & Castellanos, F. X. (2010). The age at onset of attention deficit hyperactivity disorder. *The American Journal of Psychiatry, 167*(1), 14–16. https://doi.org/10.1176/appi.ajp.2009.09060796

Klein, A. P., Sabsevitz, D. S., Ulmer, J. L., & Mark, L. P. (2015). Imaging of cortical and white matter language processing. *Seminars in Ultrasound, CT and MRI, 36*(3), 249–259. https://doi.org/10.1053/j.sult.2015.05.011

Konstantareas, M. M., & Hewitt, T. (2001). Autistic disorder and schizophrenia: Diagnostic overlaps. *Journal of Autism and Developmental Disorders, 31*(1), 19–28. https://doi.org/10.1023/A:1005605528309

Krain, A. L., & Castellanos, F. X. (2006). Brain development and ADHD. *Clinical Psychology Review, 26*(4), 433–444. https://doi.org/10.1016/j.cpr.2006.01.005

Lantieri, F., Glessner, J. T., Hakonarson, H., Elia, J., & Devoto, M. (2010). Analysis of GWAS top hits in ADHD suggests association to two polymorphisms located in genes expressed in the cerebellum. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics, 153B*(6), 1127–1133. https://doi.org/10.1002/ajmg.b.31110

Lee, S., Parthasarathi, T., & Kable, J. W. (2021). The ventral and dorsal default mode networks are dissociably modulated by the vividness and valence of imagined events. *Journal of Neuroscience, 41*(24), 5243–5250. https://doi.org/10.1523/JNEUROSCI.1273-20.2021

Lo, Y.-C., Soong, W.-T., Gau, S.S.-F., Wu, Y.-Y., Lai, M.-C., Yeh, F.-C., Chiang, W.-Y., Kuo, L.-W., Jaw, F.-S., & Tseng, W.-Y.I. (2011). The loss of asymmetry and reduced interhemispheric connectivity in adolescents with autism: A study using diffusion spectrum imaging tractography. *Psychiatry Research: Neuroimaging, 192*(1), 60–66. https://doi.org/10.1016/j.pscychresns.2010.09.008

Lohmann, G., Margulies, D. S., Horstmann, A., Pleger, B., Lepsien, J., Goldhahn, D., Schloegl, H., Stumvoll, M., Villringer, A., & Turner, R. (2010). Eigenvector Centrality Mapping for Analyzing Connectivity Patterns in fMRI Data of the Human Brain. *PLoS One, 5*(4), e10232. https://doi.org/10.1371/journal.pone.0010232

Long, X., Benischek, A., Dewey, D., & Lebel, C. (2017). Age-related functional brain changes in young children. *NeuroImage, 155*, 322–330. https://doi.org/10.1016/j.neuroimage.2017.04.059

Lopez-Larson, M. P., Anderson, J. S., Ferguson, M. A., & Yurgelun-Todd, D. (2011). Local brain connectivity and associations with gender and age. *Developmental Cognitive Neuroscience, 1*(2), 187–197. https://doi.org/10.1016/j.dcn.2010.10.001

Lottman, K. K., Gawne, T. J., Kraguljac, N. V., Killen, J. F., Reid, M. A., & Lahti, A. C. (2019). Examining resting-state functional connectivity in first-episode schizophrenia with 7T fMRI and MEG. *NeuroImage. Clinical, 24*, 101959. https://doi.org/10.1016/j.nicl.2019.101959

Martin, S., Saur, D., & Hartwigsen, G. (2021). Age-dependent contribution of domain-general networks to semantic cognition. *Cerebral Cortex (New York, N.Y.: 1991)*, bhab252. https://doi.org/10.1093/cercor/bhab252

Middlebrooks, E. H., Yagmurlu, K., Szaflarski, J. P., Rahman, M., & Bozkurt, B. (2017). A contemporary framework of language processing in the human brain in the context of preoperative and intraoperative language mapping. *Neuroradiology, 59*(1), 69–87. https://doi.org/10.1007/s00234-016-1772-0

Miquel, M., Nicola, S. M., Gil-Miravet, I., Guarque-Chabrera, J., & Sanchez-Hernandez, A. (2019). A working hypothesis for the role of the cerebellum in impulsivity and compulsivity. *Frontiers in Behavioral Neuroscience*, *13, 99*. https://doi.org/10.3389/fnbeh.2019.00099

Mulder, M. J., Baeyens, D., Davidson, M. C., Casey, B. J., Den ban, E. V., Van engeland, H., & Durston, S. (2008). Familial vulnerability to ADHD affects activity in the cerebellum in addition to the prefrontal systems. *Journal of the American Academy of Child & Adolescent Psychiatry, 47*(1), 68–75. https://doi.org/10.1097/chi.0b013e31815a56dc

Murphy, C., Jefferies, E., Rueschemeyer, S.-A., Sormaz, M., Wang, H., Margulies, D. S., & Smallwood, J. (2018). Distant from input: Evidence of regions within the default mode network supporting perceptually-decoupled and conceptually-guided cognition. *NeuroImage, 171*, 393–401. https://doi.org/10.1016/j.neuroimage.2018.01.017

Nagel, B. J., Herting, M. M., Maxwell, E. C., Bruno, R., & Fair, D. (2013). Hemispheric lateralization of verbal and spatial working

memory during adolescence. *Brain and Cognition, 82*(1), 58–68. https://doi.org/10.1016/j.bandc.2013.02.007

Nickerson, L. D. (2018). Replication of resting state-task network correspondence and novel findings on brain network activation during task fmri in the human connectome project study. *Scientific Reports, 8*(1), 17543. https://doi.org/10.1038/s41598-018-35209-6

Oades, R. D. (1998). Frontal, temporal and lateralized brain function in children with attention-deficit hyperactivity disorder: A psychophysiological and neuropsychological viewpoint on development. *Behavioural Brain Research, 94*(1), 83–95. https://doi.org/10.1016/S0166-4328(97)00172-1

Olulade, O. A., Seydell-Greenwald, A., Chambers, C. E., Turkeltaub, P. E., Dromerick, A. W., Berl, M. M., Gaillard, W. D., & Newport, E. L. (2020). The neural basis of language development: Changes in lateralization over age. *Proceedings of the National Academy of Sciences of the United States of America, 117*(38), 23477–23483. https://doi.org/10.1073/pnas.1905590117

Petanjek, Z., Judaš, M., Šimic, G., Rasin, M. R., Uylings, H. B. M., Rakic, P., & Kostovic, I. (2011). Extraordinary neoteny of synaptic spines in the human prefrontal cortex. *Proceedings of the National Academy of Sciences of the United States of America, 108*(32), 13281–13286. https://doi.org/10.1073/pnas.1105108108

Picazio, S., & Koch, G. (2015). Is motor inhibition mediated by cerebello-cortical interactions? *Cerebellum (london, England), 14*(1), 47–49. https://doi.org/10.1007/s12311-014-0609-9

Power, J. D., Mitra, A., Laumann, T. O., Snyder, A. Z., Schlaggar, B. L., & Petersen, S. E. (2014). Methods to detect, characterize, and remove motion artifact in resting state fMRI. *NeuroImage, 84*, 320–341. https://doi.org/10.1016/j.neuroimage.2013.08.048

Proal, E., Reiss, P. T., Klein, R. G., Mannuzza, S., Gotimer, K., Ramos-Olazagasti, M. A., Lerch, J. P., He, Y., Zijdenbos, A., Kelly, C., Milham, M. P., & Castellanos, F. X. (2011). Brain gray matter deficits at 33-year follow-up in adults with attention-deficit/hyperactivity disorder established in childhood. *Archives of General Psychiatry, 68*(11), 1122–1134. https://doi.org/10.1001/archgenpsychiatry.2011.117

Qian, A., Wang, X., Liu, H., Tao, J., Zhou, J., Ye, Q., Li, J., Yang, C., Cheng, J., Zhao, K., & Wang, M. (2018). Dopamine D4 receptor gene associated with the frontal-striatal-cerebellar loop in children with ADHD: A resting-state fMRI study. *Neuroscience Bulletin, 34*(3), 497–506. https://doi.org/10.1007/s12264-018-0217-7

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna. https://www.R-project.org/

Reinelt, J., Uhlig, M., Müller, K., Lauckner, M. E., Kumral, D., Schaare, H. L., Baczkowski, B. M., Babayan, A., Erbey, M., Roebbig, J., Reiter, A., Bae, Y.-J., Kratzsch, J., Thiery, J., Hendler, T., Villringer, A., & Gaebler, M. (2019). Acute psychosocial stress alters thalamic network centrality. *NeuroImage, 199*, 680–690. https://doi.org/10.1016/j.neuroimage.2019.06.005

Riès, S. K., Dronkers, N. F., & Knight, R. T. (2016). Choosing words: Left hemisphere, right hemisphere, or both? Perspective on the lateralization of word retrieval. *Annals of the New York Academy of Sciences, 1369*(1), 111–131. https://doi.org/10.1111/nyas.12993

Rohde, L. A., Biederman, J., Zimmermann, H., Schmitz, M., Martins, S., & Tramontina, S. (2000). Exploring ADHD age-of-onset criterion in Brazilian adolescents. *European Child & Adolescent Psychiatry, 9*(3), 212–218. https://doi.org/10.1007/s007870070045

Rosch, K. S., Mostofsky, S. H., & Nebel, M. B. (2018). ADHD-related sex differences in fronto-subcortical intrinsic functional connectivity and associations with delay discounting. *Journal of Neurodevelopmental Disorders, 10*(1), 34. https://doi.org/10.1186/s11689-018-9254-9

Saad, Z. S., Reynolds, R. C., Jo, H. J., Gotts, S. J., Chen, G., Martin, A., & Cox, R. W. (2013). Correcting brain-wide correlation differences in resting-state FMRI. *Brain Connectivity, 3*(4), 339–352. https://doi.org/10.1089/brain.2013.0156

Sato, J. R., Salum, G. A., Gadelha, A., Vieira, G., Zugman, A., Picon, F. A., Pan, P. M., Hoexter, M. Q., Anés, M., Moura, L. M., Del'Aquilla, M. A. G., Crossley, N., Amaro, E., Mcguire, P., Lacerda, A. L. T., Rohde, L. A., Miguel, E. C., Jackowski, A. P., & Bressan, R. A. (2015). Decreased centrality of subcortical regions during the transition to adolescence: A functional connectivity study. *NeuroImage, 104*, 44–51. https://doi.org/10.1016/j.neuroimage.2014.09.063

Satterthwaite, T. D., Elliott, M. A., Gerraty, R. T., Ruparel, K., Loughead, J., Calkins, M. E., Eickhoff, S. B., Hakonarson, H., Gur, R. C., Gur, R. E., & Wolf, D. H. (2013). An improved framework for confound regression and filtering for control of motion artifact in the preprocessing of resting-state functional connectivity data. *NeuroImage, 64*, 240–256. https://doi.org/10.1016/j.neuroimage.2012.08.052

Saur, D., Kreher, B. W., Schnell, S., Kümmerer, D., Kellmeyer, P., Vry, M.-S., Umarova, R., Musso, M., Glauche, V., Abel, S., Huber, W., Rijntjes, M., Hennig, J., & Weiller, C. (2008). Ventral and dorsal pathways for language. *Proceedings of the National Academy of Sciences, 105*(46), 18035–18040. https://doi.org/10.1073/pnas.0805234105

Schneider, S., Peters, J., Bromberg, U., Brassen, S., Menz, M. M., Miedl, S. F., Loth, E., Banaschewski, T., Barbot, A., Barker, G., Conrod, P. J., Dalley, J. W., Flor, H., Gallinat, J., Garavan, H., Heinz, A., Itterman, B., Mallik, C., Mann, K., …, & Büchel, C. (2011). Boys do it the right way: Sex-dependent amygdala lateralization during face processing in adolescents. *NeuroImage, 56*(3), 1847–1853. https://doi.org/10.1016/j.neuroimage.2011.02.019

Schulze, M., Aslan, B., Stöcker, T., Stirnberg, R., Lux, S., & Philipsen, A. (2021). Disentangling early versus late audiovisual integration in adult ADHD: A combined behavioural and resting-state connectivity study. *Journal of Psychiatry & Neuroscience: JPN, 46*(5), E528–E537. https://doi.org/10.1503/jpn.210017

Seidel, M., Geisler, D., Borchardt, V., King, J. A., Bernardoni, F., Jaite, C., Roessner, V., Calhoun, V., Walter, M., & Ehrlich, S. (2020). Evaluation of spontaneous regional brain activity in weight-recovered anorexia nervosa. *Translational Psychiatry, 10*(1), 395. https://doi.org/10.1038/s41398-020-01081-0

Selemon, L. D. (2013). A role for synaptic plasticity in the adolescent development of executive function. *Translational Psychiatry, 3*(3), e238–e238. https://doi.org/10.1038/tp.2013.7

Sethi, A., Sarkar, S., Dell'Acqua, F., Viding, E., Catani, M., Murphy, D. G. M., & Craig, M. C. (2018). Anatomy of the dorsal default-mode network in conduct disorder: Association with callous-unemotional traits. *Developmental Cognitive Neuroscience, 30*, 87–92. https://doi.org/10.1016/j.dcn.2018.01.004

Shirer, W. R., Jiang, H., Price, C. M., Ng, B., & Greicius, M. D. (2015). Optimization of rs-fMRI pre-processing for enhanced signal-noise separation, test-retest reliability, and group discrimination. *NeuroImage, 117*, 67–79. https://doi.org/10.1016/j.neuroimage.2015.05.015

Shirer, W. R., Ryali, S., Rykhlevskaia, E., Menon, V., & Greicius, M. (2012). Decoding subject-driven cognitive states with whole-brain connectivity patterns. *Cerebral Cortex, 22*(1), 158–165. https://doi.org/10.1093/cercor/bhr099

Silva, S. D., Dayarathna, S. U., Ariyarathne, G., Meedeniya, D., & Jayarathna, S. (2021). FMRI feature extraction model for

ADHD classification using convolutional neural network. *International Journal of E-Health and Medical Communications (IJEHMC), 12*(1), 81–105. https://doi.org/10.4018/IJEHMC.2021010106

Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar de Pablo, G., Il Shin, J., Kirkbride, J. B., Jones, P., Kim, J. H., Kim, J. Y., Carvalho, A. F., Seeman, M. V., Correll, C. U., & Fusar-Poli, P. (2021). Age at onset of mental disorders worldwide: Large-scale meta-analysis of 192 epidemiological studies. *Molecular Psychiatry*. https://doi.org/10.1038/s41380-021-01161-7

Sormaz, M., Murphy, C., Wang, H., Hymers, M., Karapanagiotidis, T., Poerio, G., Margulies, D. S., Jefferies, E., & Smallwood, J. (2018). Default mode network can support the level of detail in experience during active task states. *Proceedings of the National Academy of Sciences, 115*(37), 9318–9323. https://doi.org/10.1073/pnas.1721259115

Sporns, O. (2006). Small-world connectivity, motif composition, and complexity of fractal neuronal connections. *Bio Systems, 85*(1), 55–64. https://doi.org/10.1016/j.biosystems.2006.02.008

Sporns, O., Honey, C. J., & Kötter, R. (2007). Identification and classification of hubs in brain networks. *PLoS One, 2*(10), e1049. https://doi.org/10.1371/journal.pone.0001049

Sporns, O., Tononi, G., & Kötter, R. (2005). The human connectome: A structural description of the human brain. *PLoS Computational Biology, 1*(4), e42. https://doi.org/10.1371/journal.pcbi.0010042

Spreng, R. N. (2012). The fallacy of a "task-negative" network. *Frontiers in Psychology, 3*, 145. https://doi.org/10.3389/fpsyg.2012.00145

Staikova, E., Gomes, H., Tartter, V., McCabe, A., & Halperin, J. M. (2013). Pragmatic deficits and social impairment in children with ADHD. *Journal of Child Psychology and Psychiatry, 54*(12), 1275–1283. https://doi.org/10.1111/jcpp.12082

Tarchi, L., Damiani, S., La Torraca Vittori, P., Marini, S., Nazzicari, N., Castellini, G., Pisano, T., Politi, P., & Ricca, V. (2021). The colors of our brain: An integrated approach for dimensionality reduction and explainability in fMRI through color coding (i-ECO). *Brain Imaging and Behavior*. https://doi.org/10.1007/s11682-021-00584-8

Taylor, P. A., & Saad, Z. S. (2013). FATCAT: (An Efficient) functional and tractographic connectivity analysis toolbox. *Brain Connectivity, 3*(5), 523–535. https://doi.org/10.1089/brain.2013.0154

Toga, A. W., & Thompson, P. M. (2003). Mapping brain asymmetry. *Nature Reviews Neuroscience, 4*(1), 37–48. https://doi.org/10.1038/nrn1009

Tomasi, D., & Volkow, N. D. (2020). Network connectivity predicts language processing in healthy adults. *Human Brain Mapping, 41*(13), 3696–3708. https://doi.org/10.1002/hbm.25042

Vallesi, A. (2012). Organisation of executive functions: Hemispheric asymmetries. *Journal of Cognitive Psychology, 24*(4), 367–386. https://doi.org/10.1080/20445911.2012.678992

Vallesi, A. (2021). The quest for hemispheric asymmetries supporting and predicting executive functioning. *Journal of Cognitive Neuroscience, 33*(9), 1679–1697. https://doi.org/10.1162/jocn_a_01646

Vigneau, M., Beaucousin, V., Hervé, P.-Y., Jobard, G., Petit, L., Crivello, F., Mellet, E., Zago, L., Mazoyer, B., & Tzourio-Mazoyer, N. (2011). What is right-hemisphere contribution to phonological, lexico-semantic, and sentence processing? Insights from a Meta-Analysis. *Neuroimage, 54*(1), 577–593. https://doi.org/10.1016/j.neuroimage.2010.07.036

Vingerhoets, G. (2019). Phenotypes in hemispheric functional segregation? Perspectives and challenges. *Physics of Life Reviews, 30*, 1–18. https://doi.org/10.1016/j.plrev.2019.06.002

Vovk, A., Cox, R. W., Stare, J., Suput, D., & Saad, Z. S. (2011). Segmentation priors from local image properties: Without using bias field correction, location-based templates, or registration. *NeuroImage, 55*(1), 142–152. https://doi.org/10.1016/j.neuroimage.2010.11.082

Wang, D., Zhuo, K., Zhu, Y., Liu, D., & Li, Y. (2019). Abnormal interhemispheric functional interactions in drug-naïve adult-onset first episode psychosis patients. *Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference*, *2019*, 4346–4349. https://doi.org/10.1109/EMBC.2019.8856878

Wang, L., Li, K., Zhang, Q.-E., Zeng, Y.-W., Jin, Z., Dai, W.-J., Su, Y.-A., Wang, G., Tan, Y.-L., Yu, X., & Si, T.-M. (2013). Interhemispheric functional connectivity and its relationships with clinical characteristics in major depressive disorder: A resting state fMRI study. *PLoS One, 8*(3), e60191. https://doi.org/10.1371/journal.pone.0060191

Wei, J., Wei, S., Yang, R., Yang, L., Yin, Q., Li, H., Qin, Y., Lei, Y., Qin, C., Tang, J., Luo, S., & Guo, W. (2018). Voxel-mirrored homotopic connectivity of resting-state functional magnetic resonance imaging in blepharospasm. *Frontiers in Psychology, 9*, 1620. https://doi.org/10.3389/fpsyg.2018.01620

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., …, & Yutani, H. (2019). Welcome to the Tidyverse. *Journal of Open Source Software*, *4*(43), 1686. https://doi.org/10.21105/joss.01686

Wink, A. M., de Munck, J. C., van der Werf, Y. D., van den Heuvel, O. A., & Barkhof, F. (2012). Fast eigenvector centrality mapping of voxel-wise connectivity in functional magnetic resonance imaging: Implementation, validation, and interpretation. *Brain Connectivity, 2*(5), 265–274. https://doi.org/10.1089/brain.2012.0087

Wylie, K. P., & Regner, M. F. (2014). Large-scale network involvement in language processing. *Journal of Neuroscience, 34*(47), 15505–15507. https://doi.org/10.1523/JNEUROSCI.3539-14.2014

Yin, X., Han, Y., Ge, H., Xu, W., Huang, R., Zhang, D., Xu, J., Fan, L., Pang, Z., & Liu, S. (2013). Inferior frontal white matter asymmetry correlates with executive control of attention. *Human Brain Mapping, 34*(4), 796–813. https://doi.org/10.1002/hbm.21477

Zhang, S., Wang, W., Wang, G., Li, B., Chai, L., Guo, J., & Gao, X. (2020). Aberrant resting-state interhemispheric functional connectivity in patients with postpartum depression. *Behavioural Brain Research, 382*, 112483. https://doi.org/10.1016/j.bbr.2020.112483

Zhao, K., Duka, B., Xie, H., Oathes, D. J., Calhoun, V., & Zhang, Y. (2021). A dynamic graph convolutional neural network framework reveals new insights into connectome dysfunctions in ADHD. *NeuroImage*, 118774. https://doi.org/10.1016/j.neuroimage.2021.118774

Zhao, L., Wang, Y., Jia, Y., Zhong, S., Sun, Y., Qi, Z., Zhang, Z., & Huang, L. (2017). Altered interhemispheric functional connectivity in remitted bipolar disorder: A resting state fMRI study. *Scientific Reports, 7*(1), 4698. https://doi.org/10.1038/s41598-017-04937-6

Zhou, J., Gao, Y., Bu, X., Li, H., Liang, Y., Chen, H., Wang, M., Lin, F., Yang, C., & Huang, X. (2018). A multi-parameter resting-state functional magnetic resonance imaging study of brain intrinsic activity in attention deficit hyperactivity disorder children. *Sheng Wu Yi Xue Gong Cheng Xue Za Zhi = Journal of Biomedical Engineering = Shengwu Yixue Gongchengxue Zazhi, 35*(3), 415–420. https://doi.org/10.7507/1001-5515.201801001

Zhou, M., Yang, C., Bu, X., Liang, Y., Lin, H., Hu, X., Chen, H., Wang, M., & Huang, X. (2019). Abnormal functional network centrality in drug-naïve boys with attention-deficit/hyperactivity disorder. *European Child & Adolescent Psychiatry, 28*(10), 1321–1328. https://doi.org/10.1007/s00787-019-01297-6

Zhou, Q., Womer, F. Y., Kong, L., Wu, F., Jiang, X., Zhou, Y., Wang, D., Bai, C., Chang, M., Fan, G., Xu, K., He, Y., Tang, Y., & Wang, F. (2017). Trait-related cortical-subcortical dissociation in bipolar disorder: Analysis of network degree centrality. *The Journal of Clinical Psychiatry, 78*(5), 584–591. https://doi.org/10.4088/JCP.15m10091

Zuo, X.-N., Ehmke, R., Mennes, M., Imperati, D., Castellanos, F. X., Sporns, O., & Milham, M. P. (2012). Network centrality in the human functional connectome. *Cerebral Cortex, 22*(8), 1862–1875. https://doi.org/10.1093/cercor/bhr269

Zuo, X.-N., Kelly, C., Di Martino, A., Mennes, M., Margulies, D. S., Bangaru, S., Grzadzinski, R., Evans, A. C., Zang, Y.-F., Castellanos, F. X., & Milham, M. P. (2010). Growing together and growing apart: Regional and sex differences in the lifespan developmental trajectories of functional homotopy. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience, 30*(45), 15034–15043. https://doi.org/10.1523/JNEUROSCI.2612-10.2010

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The structure, profile, and diagnostic significance of intelligence in children with ADHD are impressively similar to those of children with a specific learning disorder

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ABSTRACT

This study examines the structure, profile, and diagnostic significance of intelligence in a group of 948 children diagnosed with attention deficit/hyperactivity disorder (ADHD) assessed with the WISC-IV and compared with children with specific learning disorders (SLDs) and with typically developing children. Based on four indexes, the WISC-IV configuration found in TD resulted applicable to ADHD, but with generally lower loadings on *g*. The Perceptual Reasoning and Verbal Comprehension indexes not only had higher loadings compared to the other two indexes but also represented the relative strengths of children with ADHD, as previously observed for children with SLD. In fact, the WISC pattern could be successfully used for discriminating between ADHD and TD, but not between ADHD and SLD. The latter result was not due to a co-occurrence of a learning disorder because the presence or absence of an associated diagnosis of SLD negligibly affected the pattern observed in ADHD. We concluded that the characteristics of intelligence in children with ADHD can be relevant for assessing this disorder, and that ADHD and SLDs share largely similar underlying cognitive features.

Despite their frequent co-occurrence, ADHD and specific learning disorders (SLDs) are typically considered two different clinical disorders. However, this differentiation may be due to the greater importance attributed to the manifest phenotype rather than to the underlying cognitive characteristics and, in particular, to intelligence.

Examining intelligence is crucial in the case of children with neurodevelopmental disorders because it helps to understand both the structure of intelligence as a construct and the nature of such disorders (e.g., Giofrè & Cornoldi, 2015; Mayes & Calhoun, 2007). This is particularly true for SLDs and ADHD in which cognitive weaknesses coexist with an overall near-average intellectual level. Most of the literature on these disorders has focused on specific failings in a remarkably large number of different cognitive tasks, but a growing body of research is stressing the importance of taking a more global approach to the children affected and comprehensively assessing their main intellectual characteristics. This latter type of research has mainly used the WISC-IV (Wechsler, 2003) battery, which generates psychometrically robust information on four basic factors underlying intelligence: (a) verbal abilities, such as

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comprehension and verbal reasoning (described by the Verbal Comprehension Index [VCI]); (b) nonverbal abilities, such as abstract problem solving and manipulating spatial and visual materials (described by the Perceptual Reasoning Index [PRI]); (c) verbal working memory (described by the Working Memory Index [WMI]); and (d) the ability to respond promptly and focus attention on a task (described by the Processing Speed Index [PSI]). Robust evidence supports the validity of measuring these four factors in typically developing (TD) children, as explained in the test manuals published in several languages (e.g., Wechsler, 2004).

Studies conducted with the WISC-IV have shown that the above-described four-factor structure of intelligence also applies to the intellectual profile of children with SLDs, but the loadings on *g* (i.e., the influence of *g* on the first-order factors) of three of the four factors (working memory, verbal comprehension, and processing speed) are lower in children with SLDs than they are in TD children (Cornoldi et al., 2014; Giofrè & Cornoldi, 2015). Furthermore, a series of studies (e.g., Toffalini et al., 2017a) showed that children with SLDs mostly obtain the same scores as TD children in the two indexes that have been associated with a General Ability Index (GAI; Prifitera et al., 2008), that is, the VCI and the PRI, but lower scores in the two indexes that have been associated with a Cognitive Proficiency Index (CPI; Saklofske et al., 2010), that is, the WMI and the PSI. This evidence was so strong that Giofrè and coauthors (2017) could identify cases with a learning disorder without using any learning measures, simply based on the strength of a child's discrepancy between GAI and full-scale IQ (including WMI and PSI). This is consistent with the fact that children with SLDs often reveal weaknesses in verbal working memory and processing speed (see Johnson et al., 2010).

The present study examines the same issues in children diagnosed with ADHD. There are several reasons for further exploring the intellectual profile in ADHD. First, ADHD is very common in the developmental age, and it may be important to establish whether a particular typical structure of intelligence can be found in this large population. Second, a better understanding of the intellectual profile of children with ADHD may generate new theoretical and clinical insights. In particular, the feasibility of distinguishing between different clinical profiles is debated. SLDs and ADHD are often presented as two separate clinical disorders (cf. *DSM-5*; American Psychiatric Association (APA, 2013), the first referring to learning failures and the second to difficulties in controlling attention and behavior. However, in some approaches to neurodevelopmental disorders, many cognitive deficits are assumed to underlie neurodevelopmental disorders (e.g., Willcutt et al., 2010), and SLDs and ADHD share several impairments (e.g., Willcutt et al., 2005). In fact, children with both SLDs and ADHD typically have shortcomings in working memory (e.g., Kofler et al., 2018) and processing speed (e.g., Shanahan et al., 2006). However, note that children with ADHD very often have SLDs as well (e.g., Mayes et al., 2000). This means that the similarities seen between SLDs and ADHD could actually stem from having examined samples of children with ADHD who have SLDs too, suggesting the need to distinguish between ADHD children who have or do not have an SLD.

The profile of children with ADHD that emerges from using the WISC-IV has already been discussed in the literature, but the picture is not perfectly clear. It is also based mainly on the North American population, which may have particular characteristics that are also due to specificities in sociocultural factors and identification procedures (these are included in small samples in some cases). These instances did not systematically distinguish between ADHD cases with and without an SLD, did not carry out a complete comparison of the structure of intelligence and of the profiles respectively emerging in the cases of ADHD, SLDs, and TD. The present study tried to overcome these limitations, focusing on three main issues that are still unclear.

The first issue concerns whether the structure of intelligence is similar in children with ADHD and those with SLDs (and therefore differs to some degree from that of TD children), and whether the four-factor WISC-IV structure of intelligence is applicable to children with ADHD. A stabilized body of literature already supports its use in both TD children (e.g., Wechsler, 2004) and children with SLDs (e.g., Toffalini et al., 2017a), but its value has been questioned in the case of ADHD. For example, Thaler and coauthors (2015) found evidence in favor of the five-factor solution that Keith and coauthors (2006) previously proposed, and was subsequently adopted by the WISC-V (Wechsler, 2014) version of the battery (see Becker et al., 2021). However, the value of the five-factor solution only emerges clearly when other subtests (in addition to the basic 10 WISC-IV subtests) are used. Styck and Watkins (2017) found the best fit for a four-factor structure combined with a higher-order *g* factor and concluded that the best index for describing the intellectual characteristics of children with ADHD is the general FSIQ. This had already been suggested in the case of SLDs (Beaujean, 2017), although some authors disagreed (Toffalini et al., 2017b). That said, all the studies on the topic, including Styck and Watkins (2017), presented the scores children with ADHD obtained in the four basic intelligence indexes, suggesting that this information may be relevant, even though their use is sometimes discouraged due to the predominance of the *g* factor.

In our view, considering the intellectual profile of children with ADHD only in terms of their individual overall IQ loses potentially important information because a large body of literature shows that they have specific cognitive strengths and weaknesses. Therefore, the second issue examined in the present study concerns the ADHD population's cognitive strengths and weaknesses. Taking the four WISC-IV indexes for reference, the literature on ADHD and its similarities with SLDs suggest that the most plausible distinctive feature of ADHD is a higher score in the two indexes of general ability (VCI and PRI) than in the two indexes of cognitive proficiency (WMI and PSI). Devena and Watkins (2012) judged this difference to have a very limited diagnostic utility, and the studies in the field, although consistently observing that children with ADHD scored higher on the VCI and PRI than on the WMI and PSI (a result also replicated in the case of adults with ADHD; Theiling & Petermann, 2016), reported small differences between the indexes. For example, Styck and Watkins (2017) found mean standardized scores on the VCI, PRI, WMI, and PSI of 96, 99, 92 and 93, respectively, which differ only slightly when we consider that 3 standardized points represent 0.2 *SD*s. There is also some inconsistency between the values attributed to the different indexes in the various studies. In some (e.g., Mayes et al., 2009), the lowest scores were associated with the WMI while in others (e.g., Thaler et al., 2015), they concerned the PSI. These differences could be due to the presence of different subtypes in the tested samples. However, the evidence emerging from studies on *DSM-5* subtypes of ADHD (*DSM-5*; APA, 2013), and whether they are associated with different intellectual profiles (e.g., Chhabildas et al., 2001; Fenollar-Cortés et al., 2015; Mayes et al., 2009), is unclear. According to Chhabildas and coauthors (2001), the two most common subtypes (i.e., the inattentive and the combined, which account for almost all of the populations described in the literature) cannot be differentiated by the cognitive profile. This has led many

clinicians to disregard the distinction between *DSM-5* subtypes and prompted some researchers to look for different subtypes based on clusters of cognitive profiles. For example, Thaler et al. (2013) distinguished between a cluster characterized by low processing speed, a cluster characterized by weaknesses in both processing speed and working memory, and clusters involving no processing speed impairment. Though the clusters Nuñez and coauthors (2020) identified in a Puerto Rican sample differed, they also insisted that children with ADHD could have different cognitive patterns regarding working memory and processing speed. In sum, due to the heterogeneities in the ADHD intellectual profiles and the small differences in the indexes, the separate consideration of the scores in the WISC indexes could be useless.

Another source of differences in ADHD groups may relate to the presence of a comorbid learning disorder, which is very common in children with ADHD (see Pham & Riviere, 2015). This aspect surprisingly has not been thoroughly investigated. Studies on intelligence and ADHD have not always provided information about any learning disorder in the samples examined, despite their relevance to such studies. A low processing speed of children with ADHD may be associated with the slowness and automatization deficits typical of children with reading and calculation disorders, for instance, and a weak working memory may be associated with difficulties in maintaining and processing information when reading, writing, and calculating (e.g., Johnson et al., 2010). In fact, the few studies that distinguished between children who have ADHD with and without SLDs suggested that there may be differences in their intellectual profiles (Becker et al., 2021; Crisci et al., 2021; Katz et al., 2011; Parke et al., 2020). However, the evidence remains partly unclear and was in some cases collected on groups of children that were small or identified with unclear criteria.

A third related issue concerned the possibility of using profiles of intelligence to discriminate between children with ADHD and TD children, which has already been successfully done in the case of SLDs (Giofrè et al., 2017). This possibility is very important when considering that the main psychometric evidence that clinicians can currently use for diagnosing ADHD in children is relatively weak because it mainly concerns observations and ratings that teachers and parents give. However, at the same time, if SLDs and ADHD share their most intellectual characteristics, then this discrimination cannot be successful between the latter two groups.

The present study examined these issues, taking advantage from a collaboration between several major clinical centers involved in assessing cases of ADHD in order to examine the three above-mentioned issues in a large sample of children.

1. Method

1.1. Participants

This study was based on a network encompassing a selected group of clinicians working in different parts of Italy who are experts on ADHD, and who share a common background and assessment procedures under the coordination both of a scientific association (AIRIPA) and of the University of Padova, Italy. Clinicians provided anonymized data obtained by administering the WISC-IV under their supervision to all the children referred to their centers in recent years who had received a certified clinical diagnosis of ADHD. In this way, we collected information on 1051 children and adolescents (80% males) between 6.0 and 16.9 years of age, who had been assessed on the 10 core subtests of the WISC-IV and clinically diagnosed with ADHD. After excluding cases also diagnosed with depression, autistic spectrum disorder, sensory disability, intellectual disability (or an overall IQ below 70), with missing data on age or incomplete data on intelligence, the sample included 948 children (81% males; $M_{age=}$10.25, SD=2.55). All children could be identified as Italian (immigrants were excluded) with a similar school background and lived in different parts of the country; no details could be collected on income or socioeconomic status. The experts had diagnosed their ADHD on the grounds of multiple sources of information. Following the *Diagnostic and Statistical Manual of Mental Disorders*, *5th Edition* (*DSM-5*; APA, 2013), the diagnostic criteria were established from rating scales, typically SDAI and SDAG (Marzocchi et al., 2010) for younger children and Conners-3 (Conners, 2008) for older children; interviews with the parents and children; neuropsychological tests mainly concerning attention and executive functions that were derived from the BIA battery (Marzocchi et al., 2010); observation of the children's behavior; and relevant information from their medical and academic records. As typically happens in Italy (Istituto Superiore di Sanità, 2011; Reale & Bonati, 2018), diagnosis of ADHD was only established with great caution, with reference to strict guidelines and without necessarily distinguishing between the three different *DSM-5* subtypes of ADHD. However, where this information was reported, the sample consisted mainly of children with either the inattentive (49%) or the combined subtype (49%; the only hyperactive sample was particularly small, probably because the assessment focus in their case was on behavior rather than on intelligence). Details of any pharmacological treatment administered were also heterogeneous and unclear, but it is rare for children with ADHD to be treated pharmacologically in Italy, even in the regions more inclined to prescribe it (Bonati et al., 2021).

Clinicians were asked to specify whether they also had diagnosed the children for SLDs. This diagnosis had to be given on the basis of the national guidelines the Italian Consensus Conference on Learning Disorder (Istituto Superiore di Sanità, 2011) published, which require: (a) academic achievement, as assessed using standardized tests concerning accuracy and speed in reading decoding of passages, words and pseudowords, accuracy in spelling passages, accuracy in written and mental calculation, number facts and other number abilities, consistently below the 5th percentile, or 2 *SD*s below average in more than one test in at least one specific learning area; and (b) failure in academic achievement not due to sociocultural or educational deprivation, or to sensory, neurological, or intellectual deficits.

We distinguished between ADHD alone and comorbidity for ADHD and SLDs only for the 755 children at least 8.0 years old because an SLD is not routinely diagnosed for younger children in Italy. In this subsample of children, 364 (80% males; $M_{age=}$11.04, SD=2.36) had ADHD with no associated SLD, while 391 (82% males; $M_{age=}$11.05, SD=2.13) also had SLDs. Most of the latter (263 children) had also been classified according to the ICD-10, indicating the prevailing type of SLD: 42% were cases of F81.0 (specific reading disorder); 18% were cases of F81.1 (specific spelling disorder); 7% were cases of F81.2 (specific disorder of arithmetical skills); 35% were cases of

F81.3 (mixed disorder of scholastic skills); 6% were cases of F81.8 (other developmental disorders of scholastic skills); and 3% were cases of F81.9 (developmental disorder of scholastic skills, unspecified). This is roughly consistent with the distribution of SLD subtypes previously seen in the population with SLDs alone (Toffalini et al., 2017a) that the present study also considered for a comparison.

The children and adolescents were assessed individually in a quiet room at the various centers. They were allowed to have breaks throughout the assessment to maintain high levels of motivation, effort, and attention. The research was conducted in accordance with local institutional review board policies. These participants were compared with TD children (using the sample of 2200 children whose data were drawn from the Italian WISC-IV manual; Orsini et al., 2012), and children with a diagnosis of an SLD without any comorbidity, using a sample of 1628 cases (58% males; M_{age}=11.58, SD=2.46; 7–17 years of age) drawn mainly from those that Toffalini et al. (2017a) and Giofrè et al. (2019) studied. This SLD sample includes children who were diagnosed with SLDs without comorbidity with any other neurodevelopmental disorders, by the same AIRIPA network of clinical centers that provided the ADHD profiles, and clinicians assessing them were specialized in the diagnosis and intervention on learning disabilities. All the diagnoses followed the public guidelines already reported above.

1.2. Instrument

All children were administered the core 10 subtests of the latest Italian adaptation of the WISC battery, that is, the WISC-IV (Orsini et al., 2012), which has internal consistencies, test–retest and interrater stability, and standard errors of measurement comparable with those of the English version (Wechsler, 2003). The 10 subtests are as follows: Block Design (BD), Similarities (SI), Digit Span (DS), Picture Concepts (PCn), Coding (CD), Vocabulary (VC), Letter-Number Sequencing (LN), Matrix Reasoning (MR), Comprehension (CO), and Symbol Search (SS). We calculated the Full-Scale IQ (FSIQ) from the sum of the 10 subtests, and the four main indexes: the PRI, which includes Block Design, Picture Concepts, and Matrix Reasoning; the VCI, which includes Similarities, Vocabulary, and Comprehension; the WMI, which includes Digit Span and Letter-Number Sequencing; and the PSI, which includes Coding and Symbol Search.

1.3. Data analysis

The structure of intelligence and cognitive profiles were analyzed for both the sample of children with ADHD as a whole and the two subsamples (children at least 8 years old with and without comorbid SLDs). Structure of intelligence was primarily assessed using the classical higher-order confirmatory factor analysis (CFA) reflecting the four factors of the WISC-IV battery. Theoretically plausible alternative models were tested. Following Giofrè and Cornoldi (2015) previous analyses on SLD participants, we tested: a single *g*-factor model, a modality-dependent model (with two factors for verbal [VCI+WMI subtests] and nonverbal [PRI+PSI subtests] areas), and a four-factor model without a higher-order *g* factor. In addition, a model with a "general ability" factor combining all VCI+PRI subtests, but differentiating WMI and PSI as separate correlated factors, was tested. In all cases, loadings of factors comprising only two observed indicators (e.g., WMI, PSI) were constrained to equality. To see how well the model fitted the data, we considered the following standardized fit indices (Jöreskog & Sörbom, 1993): the root mean square error of approximation (RMSEA; [0,1], small is good); the standardized root mean square residual (SRMS; ≥ 0, small is good); the comparative fit index (CFI; [0,1], large is good); and the nonnormed fit index (NNFI; can fall outside [0,1], large is good). The χ^2 index was not considered because, given the large sample size, we expected it would reach significance even for minor misspecifications. According to Schermelleh-Engel et al. (2003) recommendations, we interpreted the fit indices using the following cut-offs: for acceptable fit, RMSEA ≤ 0.08, SRMS ≤ 0.10, NNFI ≥ 0.95, and CFI ≥ 0.95; for good fit, RMSEA ≤ 0.05, SRMS ≤ 0.05, NNFI ≥ 0.97, and CFI ≥ 0.97.

Multigroup factor analysis was conducted to assess measurement invariance between the subsamples with versus without comorbid SLDs. In a first step, a multigroup CFA was fitted with all parameters freely estimated in each group to assess the overall adequacy (see above for the cut-offs for fit indices): adequate fit was interpreted as supporting configural invariance. In a series of subsequent models, the following sets of parameters were constrained to equality between groups: loadings (for metric or weak invariance), intercepts (scalar or strong invariance), and residual variances (strict invariance). The models were compared using the Bayesian Information Criterion (BIC; smaller is better). For the final model, the standardized coefficients were reported, with their 95% confidence intervals (CIs) calculated using bootstrap resampling with 1000 iterations.

To compare the two subgroups' cognitive profiles (regarding their average scores), mixed-effects linear models were tested with the Subgroup $\times$ Index interaction, treating the scores as repeated measures by participant, and random intercepts for participants (for more details on this method, cf. Toffalini et al., 2017a). Cohen's d values and their 95% CIs were also calculated and are reported for all scores to quantify the standardized mean differences between the two groups.

We also considered how much diagnostic information could be gleaned from the profile emerging from the four standardized indexes of the WISC-IV for the purpose of discriminating between children with ADHD and TD children, and between children with ADHD and children with SLDs. A recent paper (Giofrè et al., 2017) suggested that the diagnostic power of the four indexes combined is fairly good, AUC= 0.78 (0.76, 0.79), when children with SLDs are compared with the TD population. Here, we ran the same analysis, using logistic regression, with the four indexes as predictors and the diagnostic category (SLDs or TD) as the binomial outcome.

The Area Under the Curve (AUC) of the Receiver Operating Characteristic (ROC) curve was used as the measure of discriminatory power, with an AUC= 0.50 representing the chance level (i.e., no discriminatory power). The TD population was simulated with the Monte Carlo method, based on the normative data Orsini et al. (2012) provided. The 95% CIs were obtained using bootstrap resampling with 5000 iterations for the ADHD and SLD samples.

Considering that our goal was to compare directly cases with SLDs and cases with ADHD, we drew the ROC curves using the same equation, which we derived from the logistic regression that Giofrè et al. (2017) previously reported for the comparison between SLDs and TD. The equation is the following: $Threshold\ parameter = 0.021 * VCI + 0.041 * PRI - 0.069 * WMI - 0.036 * PSI$. Only if an AUC lower than 0.76 (i.e., the lower bound of the AUC previously reported for the SLDs sample) emerged for the ADHD population, we would newly recalculate the equation on the ADHD sample. Otherwise, a similar or even higher AUC would be interpreted as indicating good overlap between SLDs and ADHD in this aspect.

All analyses were run with the R free software (R Core Team, 2021) and its packages. The CFA models were fitted with "lavaan" (Rosseel, 2012).

2. Results

2.1. Confirmatory factor analysis (whole ADHD sample)

The fit indices for the four-factor higher-order model CFA in the overall ADHD group were acceptable, RMSEA= 0.05, SRMR= 0.05, CFI= 0.96, and NNFI= 0.95, confirming the overall adequacy of the traditional structure of the WISC-IV battery also in the case of ADHD. The alternative model with the *g* factor alone had inadequate fit, RMSEA= 0.13, SRMR= 0.09, CFI= 0.72, and NNFI= 0.64; as did the model with two modality dependent factors, RMSEA= 0.11, SRMR= 0.08, CFI= 0.82, and NNFI= 0.76; and the "general ability" model, RMSEA= 0.09, SRMR= 0.07, CFI= 0.87, and NNFI= 0.82. The four-factor model without a higher-order *g* factor had a good fit, RMSEA= 0.04, SRMR= 0.04, CFI= 0.98, and NNFI= 0.97. Although this is even slightly better than the fit of the higher-order model, we chose to keep the latter, both because the difference in fit was modest and because we wanted to allow a direct comparison with the same parameters in the general TD population (see Giofrè & Cornoldi, 2015, for a similar decision on the SLD population).

Fig. 1 shows the standardized loadings with 95% CIs for the four-factor higher-order model. The same loadings previously calculated for TD and SLD children are provided for comparison. Overall, the structure of the standardized loadings for the ADHD group was similar to that of the TD and SLD groups, although children with ADHD resembled the latter more than the former in some respects (e.g., a lower loading of *g* on the VCI than on the PRI) or came somewhere in between the two. The loadings of *g* on the WMI and the PSI were relatively low in the ADHD group, as seen to a greater extent in SLDs and to a lesser extent in TD. The full correlation matrix for the 10 core subtests is shown in Table S2, Supplemental Online Materials.

2.2. Cognitive profile (average scores)

We then analyzed the average WISC-IV scores the children with ADHD obtained in the factors and in the single subtests. The average profiles of scores, estimated via mixed models, are presented in Fig. 2 along with their 95% CIs. The ADHD profile featured

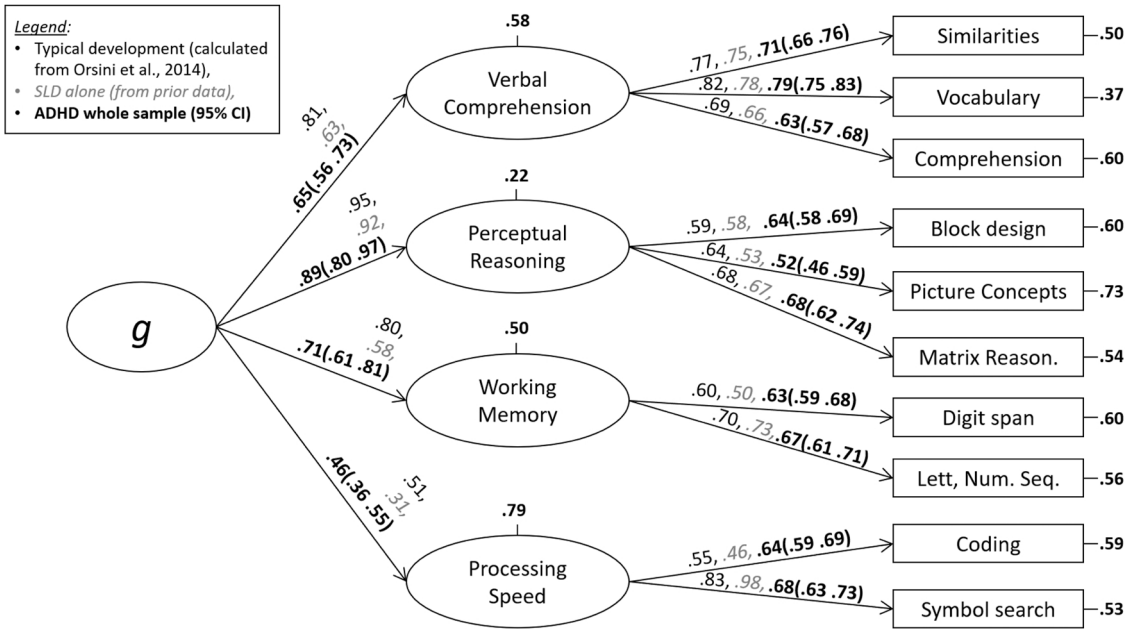

Fig. 1. Hierarchical Four-Factor Structure of the WISC-IV with Standardized Coefficients for: Children with ADHD (Whole Sample; Parameters in Bold with 95% Confidence Intervals, Where Reported); Typically Developing Children (Black Plain Text); and Children with SLDs Alone (Gray Parameters in Italics).

higher scores in the VCI and PRI compared to the WMI and PSI. The average difference between the former two and the latter two indexes was about 15 points. Concerning the comparison between the subgroups with and without SLDs, the only relevant difference concerned the PSI, which was significantly lower (albeit with a small effect size) in the group with comorbid SLDs than in the one with ADHD alone. Descriptive statistics and Cohen's d with 95% CIs are provided in Supplemental Materials, Table S1.

Mixed models on the two subgroups' standardized scores in the WISC-IV indexes revealed no significant overall difference between their average scores, $\chi^2(1) = 2.83$, $p = 0.09$; but there was a significant Subgroup × Index interaction, $\chi^2(1) = 12.09$, $p = 0.007$. Running the same models on the subtest scores likewise showed no significant effect of diagnosis, $\chi^2(1) = 1.34$, $p = 0.25$; but a significant Subgroup × Index interaction, $\chi^2(1) = 26.56$, $p = 0.002$. In both cases, the interaction stemmed from the two subgroups having almost exactly the same scores on the VCI and PRI, but different scores on the PSI, as shown in Fig. 2. The average profiles previously seen in SLD children with no comorbidity are shown for comparison. TD children, by definition, represent the normative sample, and have an average of 100 (*SD*=15) for all the factorial scores, and 10 (*SD*=3) for the subtests. Both ADHD subgroups had WMI and PSI scores that were about 1 *SD* lower than either their own VCI and PRI scores, or those of the TD population. Furthermore, the mean differences between the scores on the WMI and PSI were very small in both ADHD subgroups, although the WMI was always the index with the lowest score. Looking at the single subtests suggests that the relatively better scores on the PSI over the WMI are due to performance in the Symbol Search subtest in which the children with ADHD came closer to the average TD child, whereas their Coding scores were as low as in the two WMI subtests. Importantly, the overall profiles of the children with ADHD alone and those with ADHD and SLDs were similar to that of children with SLDs alone, except that both ADHD subgroups had slightly lower scores on the WMI and PSI. In particular, the average scores on the WMI and PSI were about 5 points lower for the children with ADHD and SLDs than for the group with SLDs alone, while their scores on the VCI and PRI were virtually the same.

2.3. Diagnostic power of the WISC-IV indexes

When the whole ADHD sample was compared with the TD population, the power of the four WISC-IV indexes in discriminating between the two was good, AUC= 0.84 (0.83, 0.85). Judging from Fig. 2, the profile emerging from the indexes predicts the diagnostic category in exactly the same way as already seen for children with SLDs (Giofrè et al., 2017), with high scores on the VCI and PRI, and low scores on the WMI and PSI. The indexes' power in discriminating between the whole ADHD sample and the sample with SLDs alone was very limited, although still higher than the chance level, AUC= 0.60 (0.58, 0.62). Fig. 2 suggests that the WMI and PSI being slightly lower in the ADHD sample than in the SLDs group drives the discriminatory power. When we compared the two ADHD subgroups, the discriminatory power of the indexes was again very limited, AUC= 0.58 (0.54, 0.62). Fig. 2 suggests that the only index with any real discriminatory power is the PSI, which was slightly lower in children with ADHD and comorbid SLDs.

Fig. 3 shows the ROC curves for the SLDs sample, and for the two ADHD subgroups separately, all compared against the TD populations.

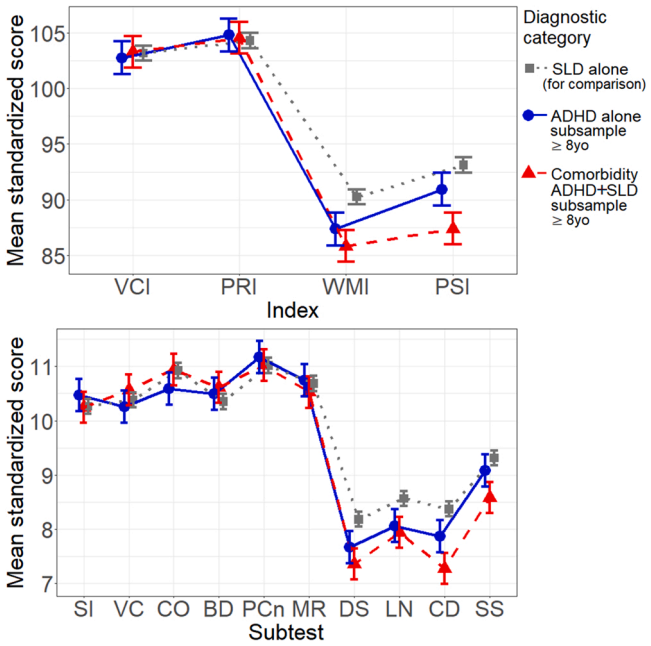

Fig. 2. Estimated Mean Scores of Primary WISC-IV Indexes (Above) and Subtests (Below) for Children with ADHD Alone, Comorbid ADHD and SLDs, and SLDs Alone for Comparison (From Previous Data). Error Bars Represent 95% Confidence Intervals.

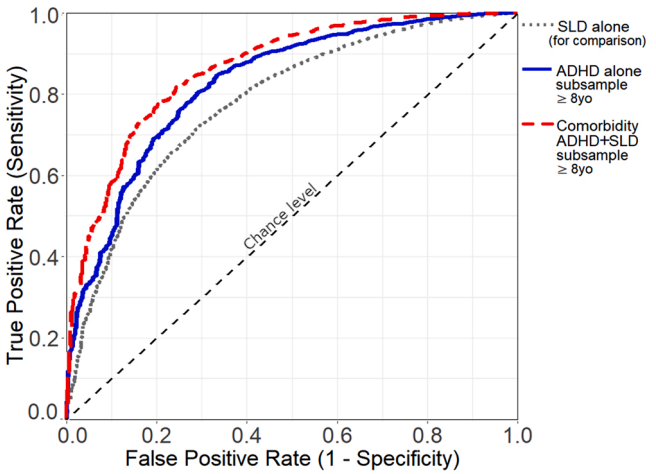

Fig. 3. ROC Curves for the SLDs Sample, and for the Two ADHD Subgroups Separately, All Compared Against the TD Populations. The Diagnostic Variable is a Linear Combination of the WISC-IV Indices Based on the Logistic Model Previously Fitted on the SLDs Sample (See Text for Details).

2.4. Multigroup CFA (with versus without Comorbid SLDs)

In a final analysis, we examined the structure of intelligence separately for the two ADHD subgroups. Each of these subgroups had a limited number of observations (less than 400), thus the results should be considered with caution. It is especially important to bear in mind the uncertainty (i.e., 95% CIs obtained via bootstrap).

The first step of the multigroup analysis procedure (i.e., unconstrained multigroup CFA model) had acceptable fit, supporting configural invariance, RMSEA= 0.05, SRMR= 0.05, CFI= 0.96, and NNFI= 0.94. Subsequently, the BIC decreased steadily through all the steps of the measurement invariance assessment: unconstrained model (BIC=36,002); model with between-group loadings constrained (BIC=35,961); model with between-group loadings and intercepts constrained (BIC=35,942); model with between-group loadings, intercepts, and residuals constrained (BIC=35,890). The last model still had acceptable fit indices, RMSEA= 0.05, SRMR= 0.06, CFI= 0.95, and NNFI= 0.95.

Based on the above, we could conclude for a strict invariance between the two ADHD subgroups, even though minor differences could emerge locally in some coefficients and be overshadowed when the overall BIC of the model is considered. Therefore, to include

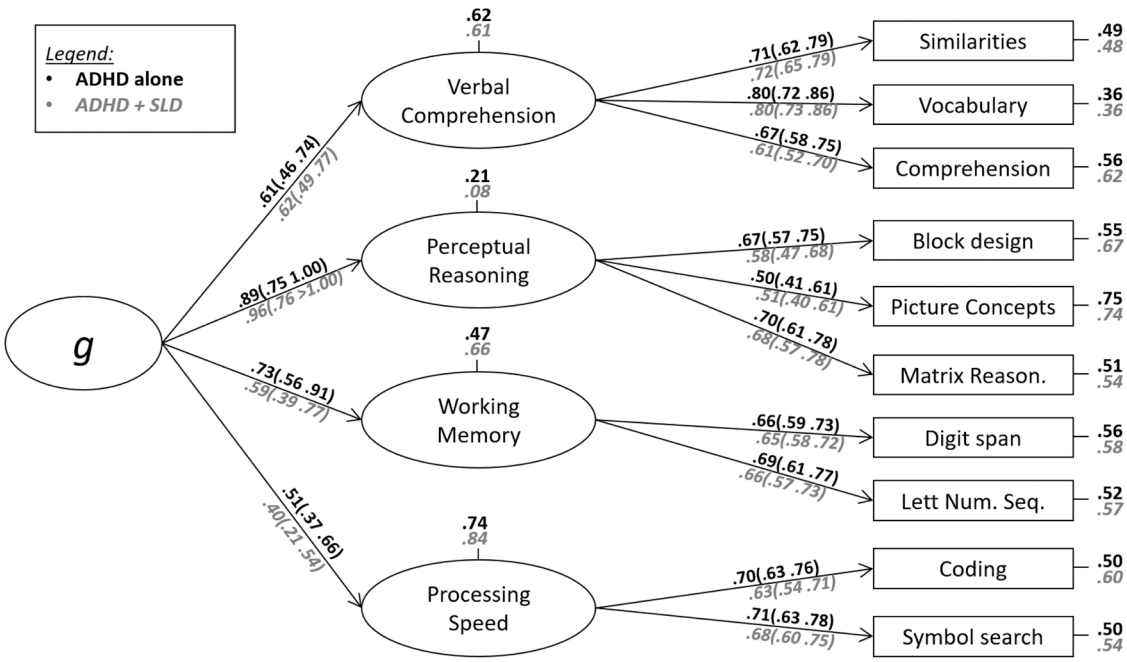

Fig. 4. Hierarchical Four-Factor Structure of the WISC-IV with Standardized Coefficients for the Subsamples of Children with ADHD Alone (Black Parameters in Bold) and with Comorbid ADHD and SLDs (Gray Parameters in Italics), with 95% Confidence Intervals, Where Reported.

additional details, we also report the coefficients separately by group (from the unconstrained model), focusing on the loadings. Fig. 4 shows the standardized loadings and residual variances separately for the two ADHD subgroups. Most loadings were almost exactly the same. Minor differences emerged in the loadings of *g* on the WMI and (to a lesser extent) on the PSI, which were slightly lower in the group with comorbid SLDs. This is in line with children with SLDs having lower loadings on these factors (e.g., Giofrè & Cornoldi, 2015), although the relatively large 95% CIs in Fig. 4 suggest caution in interpreting this result. The full correlation matrix for the 10 core subtests is given separately, by ADHD subgroup, in Table S3, Supplemental Online Materials.

3. Discussion

The present study examined the structure of intelligence, the intellectual profiles, and the diagnostic significance of the profiles in a large group of children with ADHD assessed with the WISC-IV battery, also considering possible differences between a subgroup without and a subgroup with comorbid SLDs. These findings were also compared with those obtained—using the WISC-IV—in samples of TD children and of children with a diagnosis of an SLD alone.

We obtained data on almost 1000 children with ADHD. This is a very large sample considering ADHD is diagnosed with caution in Italy (a fact that may also explain why females are slightly underrepresented in Italy compared with other countries; see also De Rossi et al., 2022), and we were able to examine three main issues. The first issue concerned the possibility of considering, in the case of ADHD, the same intelligence structure proposed for TD and SLDs. We found that the WISC-IV four-factor structure, which the original WISC-IV Manual (Wechsler, 2003) proposed, and was found to apply to children with SLDs (Giofrè & Cornoldi, 2015), also holds for children with ADHD. As seen in the case of SLDs, the loadings of the four factors on *g* were lower than they were in TD children, probably due to the fact that in ADHD, the WISC-IV scores in many subtests reflect not only general intelligence but also specific attentional and control abilities (see Cornoldi, Orsini, et al., 2013; Cornoldi, Giofrè et al., 2013), but remained quite high in absolute terms. The PSI had the lowest loading on *g*, as has also been observed in cases of SLDs and TD, with a value intermediate with respect to these two cases, confirming that speed does not represent a central aspect of intelligence. Using other test batteries or additional subtests, we might naturally expect the factorial structure to differ somewhat, although note that the four factors typically remain relevant even when a fifth factor is considered (see Becker et al., 2021). The differences identified between ADHD and TD further support the conviction that, when neurodevelopmental disorders are considered, a theory of intelligence should be applied that aims at being of general value (Giofrè & Cornoldi, 2015). Considering our sample of children with ADHD as a whole, the relatively low loadings of the VCI, WMI, and PSI on *g* raise the question of whether the nonverbal PRI alone represents the single best proxy of general intelligence, possibly even better than the full-scale IQ, as proposed in other intelligence scales such as the Leiter-3 (Roid et al., 2013). In addition, note that in the case of ADHD the Picture Concepts subtest described nonverbal intelligence less well than the other two PRI subtests did, probably because it may also involve verbal reasoning for children with ADHD (but not for TD children, as shown by Keith et al., 2006). In general, as the reliability of any single WISC-IV index may be poor after accounting for the *g* factor (Watkins & Smith, 2013), a complete nonverbal estimation of IQ using WISC-IV together with other instruments may often be appropriate in children with ADHD (with or without SLDs). In particular, other measures of intelligence, including the latest version of the WISC (i.e., the WISC-V, which is not yet available in many countries, including Italy), will need to be considered before our findings can be generalized. Nonetheless, we believe our results are already important because the WISC-IV was used in most of the literature on the topic, and it seems particularly appropriate for examining the intellectual characteristics of clinical populations of children, considering they present anomalies especially in the working memory and processing speed areas (Mayes & Calhoun, 2007).

In the ADHD subgroup with comorbid SLDs, where the loadings on *g* of the WMI and PSI were particularly low, the GAI alone, that is, the General Ability Index derived only from the six subtests related with the VCI and the PRI, could be used as a substitute for the FSIQ. This was already proposed for SLDs (Giofrè & Cornoldi, 2015) and used with a gifted group with SLDs alone by Toffalini et al. (2017). Some authors have provided guidelines on the GAI regarding criteria for describing the discrepancy between this index and the FSIQ. Flanagan and Kaufman (2004) suggested that, when the difference between indexes in the WISC-IV is high, then the FSIQ should not be considered, and other indexes (such as the GAI) should be used instead. In our opinion, the FSIQ should be dismissed when assessing children with ADHD and/or SLDs, and the GAI should be preferred because in these clinical populations, WMI and PSI weaknesses do not necessarily reflect a low general intelligence.

The second issue concerned the specific intellectual profile of children with ADHD. The four factors of the WISC-IV resulted particularly useful. Despite the limitations of the use of a "strengths and weaknesses approach" to neurodevelopmental disorders (e.g., Beaujean, 2017), we note that the repeated finding of particular weaknesses and relative strengths in children with ADHD supports the theoretical and clinical usefulness of considering their profile's specificities. Our findings offered further evidence on the main neuropsychological weaknesses of children with ADHD described in the literature, which also provided more clear-cut evidence of the difficulties that children with ADHD encounter in working memory and processing speed tasks, despite performing well in tasks that test their verbal and nonverbal abilities. In fact, the difference we found between their scores in these two types of tasks exceeded 1 *SD* (higher than in previous studies). The high within-profile discrepancy observed in the present study could be due to our ADHD sample having a more than usually severe disorder, given the strict criteria adopted for diagnosing ADHD in Italy (where clinicians are generally cautious about doing so), and that only severe cases are referred to clinical centers. Be that as it may, the clear weaknesses in working memory and processing speed seen in our sample with ADHD are consistent with numerous neuropsychological studies showing that children with ADHD perform particularly poorly in these areas (e.g., Johnson et al., 2010). These two weaknesses have also been associated with other impairments in ADHD populations. Working memory is one of the executive functions, and for a long time, these functions were considered the core neuropsychological deficiency in ADHD (Marzocchi et al., 2008). That said, impairments in the Letter-Number Sequencing subtest have been found smaller compared to those in the Digit Span subtest, despite the

former being generally regarded as the most "executive" subtest (Cornoldi, Orsini, et al., 2013). Conversely, processing speed (as the WISC-IV measures) is tested using tasks that demand sustained attention, and it is well known that children with ADHD struggle to maintain their executive attention (Mullane et al., 2011), whereas they have less difficulty in speedy time tasks making no demand on their executive functions (Jacobson et al., 2011). Regarding the PSI, note that children with ADHD had great trouble with the Coding subtest but lower trouble with the Visual Search subtest, with the consequence that their PSI was higher than their WMI was (as seen in some but not all previous studies). Their relatively superior performance in the (visual) Symbol Search subtest could be due to a lower cost (compared with other subtests) of initiating the response, as the child only has to mark one of two alternatives with a cross. The cost of initiating the response may be relevant in ADHD (Kliegel et al., 2006).

Despite the similarities between our two groups of children who have ADHD with and without SLDs, some differences emerged. For instance, the comorbid group performed well in the subtests related with the VCI and the PRI, and—in particular—even slightly better than the group with ADHD alone in the Comprehension subtest, but they performed worse in all subtests relating to working memory and processing speed. This result confirms a previous report that children with ADHD and comorbid SLDs performed significantly worse on the WISC-III Freedom from Distractibility Index (FDI), which partly coincides with the WMI, when compared with children with ADHD alone (Rucklidge & Tannock, 2002; Willcutt et al., 2005). This suggests that more severe weaknesses in working memory and processing speed are closely associated with learning difficulties. Note that in our sample of children with ADHD, the group without SLDs was defined by the fact of not having been diagnosed with an SLD, not necessarily via a good academic performance. Differences between the ADHD groups with and without SLDs could be clearer if the latter group had only included children with average or above-average achievement.

The intellectual pattern seen in ADHD, with higher scores on the VCI and PRI than on the WMI and PSI, largely mirrors the one identified in SLDs. In fact, when we focused on the third issue, that is, the possibility of discriminating between groups only based on their intellectual scores, we found that the pattern identified with the four indexes could help to discriminate between cases of ADHD and TD children, as already seen for cases of SLDs and TD children (Giofrè et al., 2017). In fact, the diagnostic power of the ADHD cognitive profile as a whole in differentiating between ADHD and TD was high (AUC $>$ 0.80), suggesting that this discrepancy could help support a diagnosis of ADHD. That said, the scores could not help to discriminate between SLDs and ADHD because of the similarities between the two profiles. As we distinguished between ADHD children with and without SLDs in the present study, and the pattern was much the same in the latter, this result cannot be attributed to the fact that many children with ADHD also have an SLD. In our view, it can be interpreted on the grounds of two main assumptions. First, many aspects—not just one, specific core aspect—may underlie a given neurodevelopmental disorder (e.g., Willcutt et al., 2010). Second, different neurodevelopmental disorders share several of these aspects, ADHD and SLDs in particular (Goker et al., 2014; Willcutt et al., 2005). In fact, biological evidence supports the substantial overlap between SLDs and ADHD (Pham & Riviere, 2015).

Limitations in the present study include the following points. First, the WISC-IV was used, while the WISC-V reflects the latest theoretical advancement. As explained above, we believe that this did not substantially affect the results concerning the two most relevant areas of interest for the present study (WMI and PSI), although differences might emerge with regard to PRI. Second, we could not collect achievement scores associated with the assessment for all children. However, as explained in the methods, the diagnostic guidelines currently used in Italy ensure homogeneity of the clinical cut-offs and instruments used for diagnosing all children. Third, no information on income and socioeconomic status could be collected for reasons of privacy. Fourth, we did not consider other aspects of ADHD children that could be relevant for the present issues, such as gender (see De Rossi et al., 2022), age (e.g., Qian et al., 2013), and subtypes (e.g., Chhabildas et al., 2001; Fenollar-Cortés et al., 2015; Mayes et al., 2009). Future research should examine whether they represent relevant moderators of the results that we reported.

In conclusion, our findings in a large sample of children with an ADHD diagnosis provide important information on the intellectual characteristics of children with this disorder. This information has not only theoretical but also clinical implications. For instance, when in doubt, clinicians could lean towards the assumption of a neurodevelopmental disorder if a child's scores on the WMI and PSI are substantially lower than they are on the VCI and PRI. The negative consequences of low scores on the WMI and PSI on a child's learning and everyday life should also be considered in an effort to contain their effects. Specific trainings devoted to reducing these deficits have been shown to have positive effects in some cases (Capodieci et al., 2018; Klingberg et al., 2002). Another possibility is to support ADHD children by reducing the demands on their working memory and processing speed, and teaching them strategies to help them cope. For instance, they could use written notes to aid their working memory and be allowed to complete activities requiring prolonged attention in portions with a break in between to reduce the effect of their deficits.

What this paper adds

The extant literature offers insights into intelligence in ADHD. Published articles tend to report relative weaknesses in Working Memory and Processing Speed areas, when compared to more general aspects of verbal and non-verbal reasoning. Other papers have examined the structure of intelligence, reporting that the configuration of factors is overall similar to that of the general population. While this may be true, systematic differences emerge at the quantitative level. Importantly, we notice that these pieces of information tend to overlap with those emerged for children with learning disorders, a condition that is frequently comorbid with ADHD. Our article combines for the first time a comprehensive series of analyses concerning the structure, profile, and diagnostic significance of intelligence scores in a large sample of children with ADHD. Furthermore, it separately examines cases with and without a comorbid learning disorder. We conclude that all aspects considered are similar not only qualitatively, but also quantitatively, between children with ADHD (with or without comorbid learning disorder), and children with a learning disorder alone.

CRediT authorship contribution statement

Enrico Toffalini: Conceptualization, Formal analysis, Visualization, Writing – review & editing. **Serafino Buono**: Data curation, Writing – review & editing. **Cesare Cornoldi**: Conceptualization, Project administration, Writing – original draft.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ridd.2022.104306.

References

American Psychiatric Association, 2013, Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Arlington, VA: American Psychiatric Publishing.
Becker, A., Daseking, M., & Koerner, J. K. (2021). Cognitive profiles in the WISC-V of children with ADHD and specific learning disorders. *Sustainability, 13*(17), 9948. https://doi.org/10.3390/su13179948
Beaujean, A. A. (2017). Commentary on strengths and weaknesses in the intellectual profile of different subtypes of specific learning disorder. *Clinical Psychological Science, 5*(5), 874–877. https://doi.org/10.1177/2167702617708629
Bonati, M., Scarpellini, F., Cartabia, M., Zanetti, M., & on behalf of the Lombardy ADHD Group. (2021). Ten Years (2011–2021) of the Italian Lombardy ADHD register for the diagnosis and treatment of children and adolescents with ADHD. *Children, 8*(7), 598. https://doi.org/10.3390/children8070598
Capodieci, A., Gola, M. L., Cornoldi, C., & Re, A. M. (2018). Effects of a working memory training program in preschoolers with symptoms of attention-deficit/hyperactivity disorder. *Journal of Clinical and Experimental Neuropsychology, 40*(1), 17–29. https://doi.org/10.1080/13803395.2017.1307946
Chhabildas, N., Pennington, B. F., & Willcutt, E. G. (2001). A comparison of the neuropsychological profiles of the DSM-IV subtypes of ADHD. *Journal of Abnormal Child Psychology, 29*, 529–540. https://doi.org/10.1023/A:1012281226028
Conners, C.K., 2008, Conners third edition (Conners 3). Los Angeles, CA: Western Psychological Services.
Cornoldi, C., Giofrè, D., Calgaro, G., & Stupiggia, C. (2013). Attentional WM is not necessarily specifically related with fluid intelligence: The case of smart children with ADHD symptoms. *Psychological Research, 77*(4), 508–515.
Cornoldi, C., Giofrè, D., Orsini, A., & Pezzuti, L. (2014). Differences in the intellectual profile of children with intellectual vs. learning disability. *Research in Developmental Disabilities, 35*, 2224–2230. https://doi.org/10.1016/j.ridd.2014.05.013
Cornoldi, C., Orsini, A., Cianci, L., Giofrè, D., & Pezzuti, L. (2013). Intelligence and working memory control: Evidence from the WISC-IV administration to Italian children. *Learning and Individual Differences, 26*, 9–14. https://doi.org/10.1016/j.lindif.2013.04.005
Crisci, G., Caviola, S., Cardillo, R., & Mammarella, I. C. (2021). Executive functions in neurodevelopmental disorders: Comorbidity overlaps between Attention Deficit and Hyperactivity Disorder and Specific Learning Disorders. *Frontiers in Human Neuroscience, 15*, Article 594234. https://doi.org/10.3389/fnhum.2021.594234
De Rossi, P., Pretelli, I., Menghini, D., D'Aiello, B., Di Vara, S., & Vicari, S. (2022). Gender-related clinical characteristics in children and adolescents with ADHD. *Journal of Clinical Medicine, 11*(2), 385. https://doi.org/10.3390/jcm11020385
Devena, S. E., & Watkins, M. W. (2012). Diagnostic utility of WISC-IV General Abilities Index and Cognitive Proficiency Index difference scores among children with ADHD. *Journal of Applied School Psychology, 28*(2), 133–154. https://doi.org/10.1080/15377903.2012.669743
Fenollar-Cortés, J., Navarro-Soria, I., González-Gómez, C., & García-Sevilla, J, A. (2015). Detección de perfiles cognitivos mediante WISC-IV en niños diagnosticados de TDAH: Existen diferencias entre subtipos? *Revista Dèlelőtt Psicodidáctica, 20*(1), 157–176. https://doi.org/10.1387/RevPsicodidact.12531
Flanagan, D.P., & Kaufman, S., 2004, Essentials of Assessment with WISC-IV. New York, NY: Wiley.
Giofrè, D., & Cornoldi, C. (2015). The structure of intelligence in children with specific learning disabilities is different as compared to typically development children. *Intelligence, 52*, 36–43. https://doi.org/10.1016/j.intell.2015.07.002
Giofrè, D., Toffalini, E., Altoè, G., & Cornoldi, C. (2017). Intelligence measures as diagnostic tools for children with specific learning disabilities. *Intelligence, 61*, 140–145. https://doi.org/10.1016/j.intell.2017.01.014
Giofrè, D., Pastore, M., Cornoldi, C., & Toffalini, E. (2019). Lumpers vs splitters: intelligence in children with specific learning disorders. *Intelligence, 76*, Article 101380. https://doi.org/10.1016/j.intell.2019.101380
Goker, Z., Uneri, O. S., Guney, E., Dinc, G., & Hekim-Bozkurt, O. (2014). Clinical and sociodemographic features of children and adolescents with specific learning disorder (SLD). *American Journal of Psychiatry and Neuroscience, 2*(6), 90–95. https://doi.org/10.11648/j.ajpn.20140206.12
I.S.D. Sanità, 2011, Consensus conference: Disturbi Specifici dell'Apprendimento [National consensus conference on specific learning disabilities]. Rome, Italy.
Jacobson, L. A., Ryan, M., Martin, R. B., Ewen, J., Mostofsky, S. H., Denckla, M. B., & Mahone, E. M. (2011). Working memory influences processing speed and reading fluency in ADHD. *Child Neuropsychology, 17*(3), 209–224. https://doi.org/10.1080/09297049.2010.532204
Johnson, E., Humphrey, M., Mellard, D., Woods, K., & Swanson, L. (2010). Cognitive processing deficits and students with specific learning disabilities: A selective meta-analysis of the literature. *Learning Disability Quarterly, 33*(1), 3–18. https://doi.org/10.1177/073194871003300101
Jöreskog, K. G., & Sörbom, D. (1993). Structural equation modeling with the SIMPLIS command language. Chicago: Scientific Software International.
Katz, L. J., Brown, F. C., Roth, R. M., & Beers, S. R. (2011). Processing speed and working memory performance in those with both ADHD and a reading disorder compared with those with ADHD alone. *Archives of Clinical Neuropsychology, 26*(5), 425–433. https://doi.org/10.1093/arclin/acr026
Keith, T. Z. T., Fine, J. G. J., Taub, G. G. E., Reynolds, M. R., & Kranzler, J. H. (2006). Higher-order, multisample, confirmatory factor analysis of the Wechsler Intelligence Scale for Children-fourth edition: What does it measure? *School Psychology Review, 35*(1), 108–127.
Kliegel, M., Ropeter, A., & Mackinlay, R. (2006). Complex prospective memory in children with ADHD. *Child Neuropsychology, 12*(6), 407–419. https://doi.org/10.1080/09297040600696040
Klingberg, T., Forssberg, H., & Westerberg, H. (2002). Training of working memory in children with ADHD. *Journal of Clinical and Experimental Neuropsychology, 24*(6), 781–791. https://doi.org/10.1076/jcen.24.6.781.8395
Kofler, M. J., Sarver, D. E., Harmon, S. L., Moltisanti, A., Aduen, P. A., Soto, E. F., & Ferretti, N. (2018). Working memory and organizational skills problems in ADHD. *The Journal of Child Psychology and Psychiatry, 59*, 57–67. https://doi.org/10.1111/jc
Marzocchi, G. M., Oosterlaan, J., Zuddas, A., Cavolina, P., Geurts, H., Redigolo, D., … Sergeant, J. A. (2008). Contrasting deficits on executive functions between ADHD and reading disabled children. *The Journal of Child Psychology and Psychiatry, 49*, 543–552. https://doi.org/10.1111/j.1469-7610.2007.01859.x

Marzocchi, G.M., Re, A.M., & Cornoldi, C., 2010, BIA. Batteria italiana per l'ADHID per la valutazione dei bambini con deficit di attenzione-iperattività. (Italian Battery for ADHD for the assessment of children with attention deficit hyperactivity disorder). Trento: Edizioni Erickson.
Mayes, S. D., & Calhoun, S. L. (2007). Learning, attention, writing, and processing speed in typical children and children with ADHD, autism, anxiety, depression, and oppositional-defiant disorder. *Child Neuropsychology, 13*(6), 469–493. https://doi.org/10.1080/09297040601112773
Mayes, S. D., Calhoun, S. L., Chase, G. A., Mink, D. M., & Stagg, R. E. (2009). ADHD subtypes and co-occurring anxiety, depression, and oppositional-defiant disorder: differences in Gordon diagnostic system and Wechsler working memory and processing speed index scores. *Journal of Attention Disorders, 12*(6), 540–550. https://doi.org/10.1177/1087054708320402
Mayes, S. D., Calhoun, S. L., & Crowell, E. W. (2000). Learning disabilities and ADHD: overlapping spectrum disorders. *Journal of Learning Disabilities, 33*(5), 417–424. https://doi.org/10.1177/002221940003300502
Mullane, J. C., Corkum, P. V., Klein, R. M., McLaughlin, E. N., & Lawrence, M. A. (2011). Alerting, orienting, and executive attention in children with ADHD. *Journal of Attention Disorders, 15*(4), 310–320. https://doi.org/10.1177/1087054710366384
Nuñez, A., San Miguel, L., Keene, J., Donohue, B., & Allen, D. (2020). Deconstructing cognitive heterogeneity in Puerto Rican Spanish-speaking children with ADHD. *Journal of the International Neuropsychological Society, 26*(7), 714–724. https://doi.org/10.1017/S135561772000020X
Orsini, A., Pezzuti, L., & Picone, L. (2012). WISC-IV: Contributo alla taratura Italiana. [WISC-IV Italian Edition]. Florence, Italy: Giunti O. S.
Parke, E. M., Thaler, N. S., Etcoff, L. M., & Allen, D. N. (2020). Intellectual profiles in children with ADHD and comorbid learning and motor disorders. *Journal of Attention Disorders, 24*(9), 1227–1236. https://doi.org/10.1177/1087054715576343
Pham, A. V., & Riviere, A. (2015). Specific learning disorders and ADHD: Current issues in diagnosis across clinical and educational settings. *Current Psychiatry Reports, 17*, 38. https://doi.org/10.1007/s11920-015-0584-y
Prifitera, A., Saklofske, D. H., & Weiss, L. G. (2008). WISC-IV Clinical Assessment and Intervention (2nd ed.). Amsterdam: Elsevier.
Qian, Y., Shuai, L., Chan, R. C., Qian, Q. J., & Wang, Y. (2013). The developmental trajectories of executive function of children and adolescents with attention deficit hyperactivity disorder. *Research in Developmental Disabilities, 34*(5), 1434–1445.
R Core Team, 2021, R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from ⟨http://www.r-project.org/⟩.
Reale, L., & Bonati, M. (2018). ADHD prevalence estimates in Italian children and adolescents: a methodological issue. *Italian Journal of Pediatrics, 44*, 108. https://doi.org/10.1186/s13052-018-0545-2
Roid, G. H., Miller, L. J., Pomplun, M., & Koch, C. (2013). Leiter International Performance Scale-third edition. Los Angeles, CA: Western Psychological Services.
Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36. Retrieved from http://www.jstatsoft.org/v48/i02/.
Rucklidge, J. J., & Tannock, R. (2002). Neuropsychological profiles of adolescents with ADHD: effects of reading difficulties and gender. *The Journal of Child Psychology and Psychiatry, 43*(8), 988–1003. https://doi.org/10.1111/1469-7610.00227
Saklofske, D. H., Coalson, D. L., Raiford, S. E., & Weiss, L. G. (2010). Cognitive proficiency index for the Canadian edition of the Wechsler Intelligence Scale for Children - fourth edition. *Canadian Journal of School Psychology, 25*(3), 277–286. https://doi.org/10.1177/0829573510380539
Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Test of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8*, 23–74.
Shanahan, M. A., Pennington, B. F., Yerys, B. E., et al. (2006). Processing speed deficits in attention deficit/hyperactivity disorder and reading disability. *Journal of Abnormal Child Psychology, 34*, 584. https://doi.org/10.1007/s10802-006-9037-8
Styck, K. M., & Watkins, M. W. (2017). Structural validity of the WISC-IV for students with ADHD. *Journal of Attention Disorders, 21*(11), 921–928. https://doi.org/10.1177/1087054714553052
Thaler, N. S., Barchard, K. A., Parke, E., Jones, W. P., Etcoff, L. M., & Allen, D. N. (2015). Factor structure of the Wechsler Intelligence Scale for Children: Fourth edition in children with ADHD. *Journal of Attention Disorders, 19*(12), 1013–1021. https://doi.org/10.1177/1087054712459952
Thaler, N. S., Bello, D. T., & Etcoff, L. M. (2013). WISC-IV profiles are associated with differences in symptomatology and outcome in children with ADHD. *Journal of Attention Disorders, 17*(4), 291–301. https://doi.org/10.1177/1087054711428806
Theiling, J., & Petermann, F. (2016). Neuropsychological profiles on the WAIS-IV of adults with ADHD. *Journal of Attention Disorders, 20*(11), 913–924. https://doi.org/10.1177/1087054713518241
Toffalini, E., Giofrè, D., & Cornoldi, C. (2017aaa). Strengths and weaknesses in the intellectual profile of different subtypes of specific learning disorder. *Clinical Psychological Science, 5*(2), 402–409. https://doi.org/10.1177/2167702616672038
Toffalini, E., Giofrè, D., & Cornoldi, C. (2017bbb). Pros and cons of using intelligence batteries for the study of clinical populations: A response to Beaujean (2017). *Clinical. Psychological Science, 5*(5), 878–879. https://doi.org/10.1177/2167702617720716
Toffalini, E., Pezzuti, L., & Cornoldi, C. (2017). Einstein and dyslexia: Is giftedness more frequent in children with a specific learning disorder than in typically developing children. *Intelligence, 62*, 175–179. https://doi.org/10.1016/j.intell.2017.04.006
Watkins, M. W., & Smith, L. G. (2013). Long-term stability of the Wechsler Intelligence Scale for Children - fourth edition. *Psychological Assessment, 25*(2), 477–483. https://doi.org/10.1037/a0031653
Wechsler, D., 2003, WISC-IV Technical and Interpretive Manual. San Antonio, TX: The Psychological Association.
Wechsler, D., 2004, The Wechsler Intelligence Scale for Children - fourth edition. London, UK: Pearson Assessment.
Wechsler, D., 2014, Wechsler Intelligence Scale for Children - fifth edition. London, UK: Pearson Assessment.
Willcutt, E. G., Betjemann, R. S., McGrath, L. M., Chhabildas, N. A., Olson, R. K., DeFries, J. C., & Pennington, B. F. (2010). Etiology and neuropsychology of comorbidity between RD and ADHD: The case for multiple-deficit models. *Cortex, 46*(10), 1345–1361. https://doi.org/10.1016/j.cortex.2010.06.009
Willcutt, E. G., Pennington, B. F., Olson, R. K., Chhabidas, N., & Hulslander, K. (2005). Neuropsychological analyses of comorbidity between reading disability and attention deficit hyperactivity disorder: In search of the common deficit. *Developmental Neuropsychology, 27*(1), 35–78. https://doi.org/10.1207/s15326942dn2701_3

PANDEMIA, NEUROSVILUPPO E SALUTE MENTALE DI BAMBINI E RAGAZZI

Le raccomandazioni dell'Autorità Garante per l'Infanzia e l'Adolescenza

«I problemi del neurosviluppo e della salute mentale di bambini e ragazzi manifestatisi durante la pandemia rischiano di diventare cronici e diffondersi su larga scala». È l'allarme che lancia l'Autorità Garante per l'Infanzia e l'Adolescenza (AGIA), in occasione della pubblicazione dello studio "Pandemia, neurosviluppo e salute mentale di bambini e ragazzi" promosso dall'AGIA con l'Istituto Superiore di Sanità e con la collaborazione del Ministero dell'Istruzione (disponibile al seguente indirizzo: https://www.garanteinfanzia.org/sites/default/files/2022-05/pandemia-neurosviluppo-salute-mentale.pdf).

LE EMERGENZE SEGNALATE DALLA RICERCA

I professionisti interpellati hanno riferito di *disturbi del comportamento alimentare, ideazione suicidaria (tentato suicidio e suicidio), autolesionismo, alterazioni del ritmo sonno-veglia e ritiro sociale.* In ambito educativo, poi, sono stati riscontrati *disturbi dell'apprendimento, dell'attenzione e del linguaggio, disturbi della condotta e della regolazione cognitiva ed emotiva*, oltre a paura del contagio, stato di frustrazione e incertezza rispetto al futuro, generando *insicurezza e casi di abbandono scolastico*. È stato inoltre riportato un aumento delle richieste di aiuto per l'uso di sostanze psicoattive, cannabinoidi e alcol, mentre i minori migranti non accompagnati hanno manifestato difficoltà nella gestione dell'isolamento e della quarantena nelle strutture di accoglienza.

Più in generale la pandemia ha provocato quella che i professionisti interpellati dall'*équipe* di ricerca hanno definito una *vera e propria "emergenza salute mentale"*. È stata infatti registrata un'impennata delle richieste di aiuto alla quale in molti casi sono corrisposte inadeguatezza e iniquità di risposte che hanno fatto emergere carenze e ritardi strutturali precedenti al coronavirus. *Bambini, ragazzi e famiglie si sono trovati spesso costretti a rivolgersi ai privati con impegni economici rilevanti e difficilmente sostenibili,* che hanno aumentato le disuguaglianze. Allo stesso tempo il *lockdown* ha fatto scoprire il potenziale della telemedicina applicata alla salute mentale, ma occorre investire rapidamente in formazione degli operatori e in tecnologie specifiche per assistere bambini e ragazzi.

«Il sostegno e la promozione del neurosviluppo e della salute mentale attraverso l'individuazione precoce, la presa in carico e i trattamenti appropriati e integrati costituiscono, infatti, un'importante opportunità e possibilità di ripristinare il benessere delle persone di minore età. Tali interventi non sono più differibili e vanno sistematizzati su scala nazionale per implementare un piano di azione che soddisfi i bisogni psicosociali e di salute mentale dei bambini e degli adolescenti vulnerabili durante e dopo la pandemia e che li accompagni nella ripresa per affrontare la realtà che li circonda». *Carla Garlatti*

LE RACCOMANDAZIONI DELL'AGIA

Sono finalizzate a garantire i diritti delle persone di minore età in tutto il territorio nazionale, a prescindere dalla condizione personale, familiare e sociale e dall'origine o provenienza geografica.

❑ Raccomandazioni a Presidente del Consiglio dei Ministri, Ministero della Salute, Ministro per le Politiche Giovanili, Ministro per le Disabilità, Ministero dell'Economia e delle Finanze, Regioni, Province autonome di Trento e Bolzano

Per fornire risposte adeguate sul piano sociosanitario per la promozione del neurosviluppo e del benessere psicologico, la prevenzione del disagio mentale e la cura dei disturbi neuropsichici associati, l'AGIA ritiene necessario:

- garantire che bambini e ragazzi ricevano sempre risposte specifiche, in base all'età;
- garantire la competenza dei Servizi pediatrici territoriali e ospedalieri fino al diciottesimo anno di età del paziente;
- garantire un'organizzazione omogenea e specifica del sistema dei Servizi di Neuropsichiatria dell'Infanzia e dell'Adolescenza (NPIA), dei Servizi di Riabilitazione dell'età evolutiva e dei Servizi di Psicologia, in integrazione a quanto previsto dal decreto 71/2022 del Ministro della Salute sugli standard dell'assistenza territoriale, al fine di superare le attuali gravi disomogeneità regionali e l'insufficiente specificità per l'età evolutiva;
- dotare i Servizi di NPIA, di Riabilitazione e di Psicologia dell'età evolutiva, i consultori e tutti i servizi dedicati alle persone di minore età di adeguate risorse strutturali, umane ed economiche, in maniera stabile e superando la logica del contratto a progetto e a tempo determinato, per poter assicurare la presa in carico tempestiva ed eliminare le liste d'attesa;
- garantire un numero congruo di posti letto nei reparti di NPIA;
- adottare un modello organizzativo che favorisca il coordinamento tra i differenti livelli di governo, in particolare attraverso l'istituzione di cabine di regia per la promozione del neurosviluppo, del benessere psicologico e della salute mentale a livello regionale e a livello di distretto sociosanitario;
- ampliare lo stanziamento di fondi dedicati alla ricerca per la promozione del neurosviluppo, del benessere psicologico e della salute mentale nonché per la cura e la prevenzione delle dipendenze;
- istituire, come previsto nel Piano infanzia, un servizio pubblico di Psicologia scolastica per bambini e adolescenti nelle scuole di ogni ordine e grado, in modo che venga garantito il raccordo tra scuola e territorio in una logica di lavoro di rete;
- viene chiesto inoltre di adottare, nella programmazione, un approccio che parta dall'interlocuzione con i cittadini - anche

minorenni - e con i servizi del territorio e, nell'erogazione delle prestazioni, un approccio propositivo, che superi la logica della prestazione come risposta alla richiesta di aiuto. Viene sollecitato poi il raccordo con le "Case di comunità", previste dal Piano Nazionale di Ripresa e Resilienza, per dare attuazione alla programmazione regionale e locale in un'ottica di prossimità e di presa in carico multidisciplinare. L'AGIA raccomanda pure di assicurare la continuità dei percorsi di cura, non solo dall'ospedale al territorio e viceversa, ma anche con gli ambiti sociali ed educativi.

❑ Raccomandazioni a Parlamento e Regioni

Ai titolari del potere legislativo l'AGIA chiede:

- di definire, quale livello essenziale di prestazione, la composizione minima delle *équipe* multi-professionali e degli standard di personale da garantire in ciascuna tipologia di servizio che si occupa di infanzia e adolescenza;
- di definire, quale livello essenziale di assistenza e/o prestazione sociale, i percorsi integrati di cura per i disturbi del neurosviluppo e del disagio psicologico dei minorenni al fine di offrire un servizio universalistico in maniera tempestiva, superando diseguaglianze e discriminazioni e facilitando l'accesso a minorenni in condizioni di vulnerabilità e/o provenienti da contesti socio-familiari a rischio e ai minorenni stranieri non accompagnati;
- di garantire, quale livello essenziale di prestazione, la supervisione professionale delle *équipe* interistituzionali che operano in campo nazionale e sociosanitario;
- di istituire la Giornata nazionale del neurosviluppo delle persone di minore età, per informare, sensibilizzare e promuovere una cultura del riconoscimento e dell'accettazione.

❑ Raccomandazioni a Ministero dell'Istruzione, Uffici scolastici regionali e provinciali, istituzioni scolastiche

In materia di istruzione, l'AGIA raccomanda:

- di realizzare una riorganizzazione del modello scolastico a partire dalla voce delle ragazze e dei ragazzi, prendendo in dovuta considerazione quanto da loro proposto nell'ambito della consultazione pubblica *La scuola che vorrei* promossa dall'AGIA;
- di offrire attività di consulenza e promozione del benessere psicologico in ogni grado di istruzione, quale parte integrante dell'offerta formativa;
- di curare una formazione specifica, iniziale e continua, per fornire ai docenti le competenze per coniugare il ruolo docente con il ruolo educativo, per promuovere il neurosviluppo, la salute mentale e il benessere psicologico dei minorenni e intercettare precocemente i segnali dei disturbi del neurosviluppo;
- di valorizzare i patti educativi di comunità, quale strumento per favorire un modello di scuola partecipata;
- di realizzare, in occasione della Giornata mondiale del neurosviluppo o di altre Giornate nazionali e internazionali dedicate, iniziative di sensibilizzazione e promozione del neurosviluppo, della salute mentale e del benessere psicologico.

Contemporaneamente il **Ministero dell'Università** viene sollecitato a integrare i percorsi di studio rivolti ai professionisti destinati a lavorare con i minorenni, prevedendo discipline volte a creare competenze per la valutazione e la presa in carico multidisciplinare, il lavoro di *équipe* e di rete, la progettazione, l'ascolto empatico, la partecipazione di bambini e ragazzi e

la conoscenza della Convenzione ONU sui Diritti dell'Infanzia e dell'Adolescenza.

❏ **Al Ministero del Lavoro e delle Politiche Sociali** viene poi chiesto di dare attuazione, di concerto con il Ministro della Salute e il Ministro dell'Economia, a quanto previsto dalla Legge di bilancio 2022 per indicare i livelli essenziali organizzativi degli ambiti territoriali sociali e garantire standard di qualità degli interventi omogenei nel territorio.

❏ **Al Ministero della Salute, alle Regioni e alle Province autonome** di Trento e Bolzano inoltre viene raccomandato di garantire la presenza di contenuti specifici sul neurosviluppo e sulla salute mentale dei minorenni nei percorsi di formazione manageriale e tecnico-professionale, anche orientati all'utilizzo efficace delle piattaforme di telemedicina da utilizzare per alcune attività e/o in caso di necessità secondo criteri di appropriatezza e opportunità da valutarsi caso per caso, assicurando, in tal modo, migliore qualità della cura e continuità del servizio e delle prestazioni. Sempre in tema di preparazione dei professionisti che lavorano a contatto con i minorenni, l'AGIA chiede ai Ministeri dell'Istruzione, dell'Università, della Salute, dell'Interno, della Giustizia e del Lavoro, al Dipartimento per le Politiche della Famiglia, alle Regioni, ai Comuni e ai Consigli nazionali degli Ordini degli assistenti sociali, degli psicologi e dei medici di curare una formazione specifica sul tema del neurosviluppo, della salute mentale e del benessere psicologico dei minorenni in un'ottica di prevenzione e in una logica multidisciplinare, di lavoro di rete e di *équipe*.

❏ **Al Ministero dell'Istruzione, al Ministero della Salute, al Ministro per le Politiche Giovanili, al Dipartimento per le Politiche della Famiglia, alle Regioni, ai Comuni e alle scuole** di ogni ordine e grado viene inoltre chiesto di prevedere, all'interno degli atti di programmazione economica, sociale ed educativa, la costituzione di tavoli sull'ascolto e la partecipazione dei bambini e dei ragazzi, il confronto intergenerazionale, la promozione del neurosviluppo, del benessere psicologico e della salute mentale.

Questi Tavoli dovrebbero:

- essere istituiti al livello di ogni istituzione scolastica;
- essere inseriti nell'ambito dei Patti di corresponsabilità scuola-famiglia e co-costruiti anche dalle persone di minore età;
- essere modulati sulla falsa riga dei gruppi di discussione, in modo da assicurare la partecipazione sullo stesso piano degli adulti e delle persone di minore età;
- prevedere il collegamento con i servizi territoriali nell'ambito del distretto (consultori, servizi di Psicologia, Centri per le famiglie, Case di comunità) ed essere inseriti nella programmazione dei patti educativi di comunità, ove esistenti.

Al Ministero dell'Istruzione, al Ministero del Lavoro e delle Politiche Sociali, al Dipartimento per le Politiche della Famiglia, alle Regioni, ai Comuni, all'Associazione dei Comuni italiani (ANCI) e agli organismi di promozione sociale e al Terzo settore, in collaborazione con i Garanti dell'Infanzia e dell'Adolescenza regionali e delle province autonome, infine, viene raccomandato di promuovere la definizione di accordi interistituzionali per la realizzazione dei patti educativi di comunità. Ciò perché i patti educativi di comunità sono uno strumento che è in grado di assicurare:

- la partecipazione attiva dei minorenni;
- la continuità scuola-lavoro;
- la continuità dei percorsi di cura e presa in carico;
- percorsi di accompagnamento e sostegno alla responsabilità genitoriale;
- ampliamento dell'offerta formativa scolastica;
- laboratori di cittadinanza attiva, di educazione alla legalità e di educazione al rispetto dell'ambiente;
- la promozione del lavoro di gruppo tra pari e l'attivazione di strategie di formazione basate sulla *peer-education*.

Roma, 11 maggio 2022

Il Commento

Il documento dell'AGIA di nuovo sottolinea opportunamente il problema della salute mentale di bambini e adolescenti, la carenza di risposte adeguate nella gran parte del Paese, e formula una serie di raccomandazioni che ci sentiamo di sottoscrivere. Tuttavia:

- *Si persiste, in questo come in altri documenti di origine politica come professionale, nel definire questa come un'emergenza, mentre i dati indicano che il problema esiste da parecchio tempo, ed è stata definita la priorità da diversi anni nel campo della salute dell'infanzia e dell'adolescenza*[1-3].
- *Si dice, correttamente, che la pandemia ha esacerbato il problema ma si tace su come la chiusura, molto prolungata, e in parte evitabile, delle scuole abbia molto contribuito a questo esito drammatico*[4-7]*. Non si tratta di indicare responsabilità (che pur vi sono state a vari livelli, a partire dagli esperti che non hanno saputo valutare i rischi della chiusura prolungata delle scuole ma solo quelli del contributo delle scuole al diffondersi dell'infezione) quanto di saper imparare dagli errori.*
- *Si punta gran parte dell'opera di prevenzione e presa in carico sui soli servizi di NPIA - del cui rafforzamento questa rivista ha sempre sottolineato la necessità*[8] *- e sui consultori, mentre un pilastro fondamentale su cui occorre lavorare, e molto, è la Pediatria di famiglia, la cui posizione nel sistema è unica e insostituibile per gli interventi di prevenzione, promozione e diagnosi precoce, sviluppando e rafforzando soprattutto per quanto riguarda la formazione, quanto già realizzato dall'Istituto Superiore di Sanità con le schede per la valutazione dello sviluppo da utilizzare durante i bilanci di salute con appropriati ulteriori passi soprattutto per rendere i pediatri competenti nel dialogo con i genitori sullo sviluppo.*
- *In generale, nonostante gli accenni alla prevenzione contenuti nel documento, manca un'analisi delle cause dell'incremento dei problemi di neurosviluppo e di salute mentale, e quindi una strategia che non sia solo emergenziale e riparativa. Tra i vari aspetti da curare, il principale è il lavoro precoce con genitori e famiglie, da attuarsi con il concorso di tutti i settori, in testa quello sanitario e quello educativo*[3,9]*. Genitori sostenuti nelle conoscenze e nelle*

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competenze genitoriali sono, come le evidenze dimostrano, non solo in grado di prevenire una serie importante di disturbi della condotta, dell'apprendimento e del comportamento, di ridurne il progresso verso forme più severe, e di ridurne la comorbidità derivante da approcci educativi inadeguati. In questo senso l'accenno al ruolo dei Patti Educativi è appropriato, ma non viene sufficientemente sottolineato che i Patti Educativi devono iniziare a operare a partire dai primi mille giorni, non dopo.

- *Le raccomandazioni che vengono riportate hanno degli interlocutori istituzionali, come è giusto che sia, ma la soluzione dei problemi, che deve essere iniziata ora, richiede l'attivazione immediata di interventi, anche parziali, basati sui servizi e sulle competenze già esistenti, su un lavoro di rete che preveda il concorso di diversi ruoli e professionalità, con il coinvolgimento della scuola, del Terzo settore, dei centri/gruppi di ascolto comunali, oltre che delle stesse famiglie e degli adolescenti[10], come viene richiamato nel documento del Garante e dalle linee di indirizzo pubblicate già nel 2019. Occorre innanzitutto superare la frammentazione esistente tra servizi e settori, sviluppando reti in grado di offrire proposte e sostegno alle famiglie e agli adolescenti che inizino a ovviare alle mancate risposte e ad affrontare anche il tema delle mancate richieste di aiuto.*

Bibliografia

1. Autorità Garante per l'Infanzia e l'Adolescenza. La salute mentale degli adolescenti. Documento di studio e di proposta. 21/12/2017.
2. Abbracciavento G, Cognini M, Riccio G, Carrozzi M. Covid-19 e salute mentale in età evolutiva: l'urgenza di darsi da fare. Medico e Bambino 2020;39(4)237-40.
3. Centro per la Salute del Bambino e Associazione Culturale Pediatri. Senza confini: come ridisegnare le cure per l'infanzia e l'adolescenza, integrando i servizi, promuovendo l'equità, diffondendo le eccellenze. Seconda ed. aprile 2021.
4. Tamburlini G, Marchetti F. Pandemia di Covid-19: motivazioni e indicazioni per l'apertura di spazi educativi per bambini. Medico e Bambino 2020;39(5):301-4.
5. AA.VV. Bambini e coronavirus: la doverosa ricerca di un equilibrio tra i presunti rischi e i documentati danni collaterali. Medico e Bambino 2020;39(6):355-6.
6. Viner RM, Russell SJ, Croker H, et al. School closure and management practices during coronavirus outbreaks including Covid-19: a rapid systematic review. Lancet Child Adolesc Health 2020;4(5):397-404.
7. Rajmil L, Hjern A, Boran P, Gunnlaugsson G, Kraus de Camargo O, Raman S; International Society for Social Pediatrics & Child Health (ISSOP) and International Network for Research on Inequalities in Child Health (INRICH) COVID-19 Working Group. Impact of lockdown and school closure on children's health and well-being during the first wave of COVID-19: a narrative review. BMJ Paediatr Open 2021;5(1):e001043. doi: 10.1136/bmjpo-2021-001043.
8. Marchetti F. I Servizi di salute mentale per i bambini in Inghilterra (e in Italia) "non sono neanche lontanamente sufficienti. Medico e Bambino 2021;40(3):157-8. doi: 10.53126/MEB40157.
9. Linee di indirizzo sui disturbi neuropsichiatrici e neuropsichici dell'infanzia e della adolescenza (Atti n. 70/CU del 25 luglio 2019).
10. Marchetti F. I cambiamenti partono da obiettivi concreti. Medico e Bambino 2021;40(5):279-80. doi: 10.53126/MEB40279.

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(in attuazione della D.G. sanità n. 3798 del 08/05/2014, n. 778 del 05/02/2015,
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