

NEWSLETTER



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BIBLIOGRAFIA ADHD MARZO 2020

Acta Psychiatr Scand. 2020.

ASSOCIATION BETWEEN PREECLAMPSIA AND ATTENTION-DEFICIT HYPERACTIVITY DISORDER: A POPULATION-BASED AND SIBLING-MATCHED COHORT STUDY.

Maher GM, Dalman C, et al.

OBJECTIVE: To examine the association between preeclampsia and attention-deficit hyperactivity disorder (ADHD), using a large Swedish-based registry cohort.

METHODS: This study comprised 2 047 619 children, with 114 934 (5.6%) cases of ADHD. Preeclampsia was based on two alternate definitions: (i) preeclampsia (using ICD-9/ICD-10) and (ii) preeclampsia and small for gestational age (SGA) combined. ADHD was determined in one of two ways: (i) if a diagnosis of ADHD was present in the National Patient Register or (ii) if an individual was in receipt of ADHD medication in the Prescribed Drug Register. Multivariate Cox proportional hazards regression analysis allowed adjustment for several perinatal/sociodemographic factors. Sibling-matched analysis further controlled for shared genetic and familial confounding.

RESULTS: In the adjusted Cox model, preeclampsia was associated with an increase in likelihood of ADHD (HR: 1.15, 95% CI: 1.12, 1.19). The HR for preeclampsia and those born SGA was 1.43 (95% CI: 1.31, 1.55) in the adjusted model, compared to those unexposed to preeclampsia/SGA. The sibling-matched analysis did not materially change these associations (HR: 1.13, 95% CI: 1.05, 1.22) and 1.55 (95% CI: 1.28, 1.88).

CONCLUSIONS: Exposure to preeclampsia or preeclampsia/SGA was associated with ADHD, independent of genetic/familial factors shared by siblings. However, it is important to note that sibling-matched analysis can only adjust for factors that are constant between pregnancies; therefore, residual confounding cannot be ruled out. Further research is needed to explore modifiable risk factors and identify those most-at-risk babies following delivery

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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.

Adv Neurobiol. 2020;24:481-504.

FOOD COLOR AND AUTISM: A META-ANALYSIS.

Bakthavachalu P, Kannan SM, Qoronfleh MW.

Autism has been increasing dramatically since its description by Leo Kanner in 1943. The Centers for Disease Control and Prevention (CDC) in 2018 has identified 1 in 59 children (1 in 37 boys and 1 in 151 girls) has autism spectrum disorder (ASD). Autistic spectrum disorders and ADHD are complex conditions in which nutritional and environmental factors play major roles. It is important to understand how food can have an impact on their current and future health. Appealing food colors stimulate the consumption of different food products. Since 2011, it is evident that dyes are linked to harmful effects in children. Artificial dyes have neurotoxic chemicals that aggravate mental health problems. Many families with autistic children avoid food dyes in their diet in order to avoid behavioral issues. A study reported that there is a correlation between yellow dye and sleep disturbance. Food colors Blue 1 and 2, Green 3, Red 3, Yellow 5 and 6, Citrus Red 2, and Red 40 can trigger many behaviors in most kids. Artificial food color usually contains petroleum and is manufactured in a chemical process that includes formaldehyde, aniline, hydroxides, and sulfuric acids. Most impurities in the food color are in the form of salts or acids. Sometimes lead, arsenic, and mercury may be present as impurities. The U.S. FDA is yet to study the effects of synthetic dyes on behavior in children. A study conducted at Southampton University in England found a link between food dyes and hyperactive behavior in children. The research does not prove that food coloring actually causes autism spectrum disorder, but there seems to be a link. This chapter attempts to provide a broad review of the available literature on food color and the epidemiology, etiology, prevention, and treatment of autistic spectrum disorder

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AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV. 2020.

CLINICAL CORRELATES AND ADVERSE OUTCOMES OF ADHD, DISRUPTIVE BEHAVIOR DISORDER AND THEIR CO-OCCURRENCE AMONG CHILDREN AND ADOLESCENTS WITH HIV IN UGANDA.

Taylor ST, Kinyanda E, Levin J, et al.

Attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) are important mental health concerns among children and adolescents living with HIV (CA-HIV). This study examines clinical correlates and adverse outcomes associated with ADHD, ODD/CD and ADHD + ODD/CD among (N = 1,336) CA-HIV living in Uganda. Being male, higher socio-economic status, emotional disorder, greater caregiver distress and youth-caregiver conflict were associated with a greater risk of behavioral disorders, particularly ADHD + ODD/CD. This group was also five-times more likely to have engaged in sex than their peers and report greater disciplinary problems at school than those without a behavioral disorder. These findings highlight the distinct clinical presentation and adverse outcomes associated with ADHD + ODD/CD among CA-HIV. As more CA-HIV are surviving into adulthood, screening and treatment of mental disorders is needed to ensure they are given the chance to thrive. In addition to youth, interventions should target caregivers due to their impact on youth outcomes

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Am Fam Phys. 2019;100:455.

PHARMACOLOGIC TREATMENT FOR OLDER CHILDREN WITH ADHD.

Hamilton S.

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Am J Med Genet Part B Neuropsychiatr Genet. 2020.

KTN1 VARIANTS AND RISK FOR ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Luo X, Guo X, Tan Y, et al.

Individuals with attention deficit hyperactivity disorder (ADHD) show gray matter volume (GMV) reduction in the putamen. KTN1 variants may regulate kinectin 1 expression in the putamen and influence putamen

structure and function. We aim to test the hypothesis that the KTN1 variants may represent a genetic risk factor of ADHD. Two independent family-based Caucasian samples were analyzed, including 922 parent-child trios (a total of 2,757 subjects with 924 ADHD children) and 735 parent-child trios (a total of 1,383 subjects with 613 ADHD children). The association between ADHD and a total of 143 KTN1 SNPs was analyzed in the first sample, and the nominally-significant ($p < .05$) risk SNPs were classified into independent haplotype blocks. All SNPs, including imputed SNPs within these blocks, and haplotypes across each block, were explored for replication of associations in both samples. The potential biological functions of all risk SNPs were predicted using a series of bioinformatics analyses, their regulatory effects on the putamen volumes were tested, and the KTN1 mRNA expression was examined in three independent human putamen tissue samples. We found that fifteen SNPs were nominally associated with ADHD ($p < .05$) in the first sample, and three of them remained significant even after correction for multiple testing ($1.3 \times 10^{-10} \leq p \leq 1.2 \times 10^{-4}$; $\alpha = 2.5 \times 10^{-3}$). These 15 risk SNPs were located in five haplotype blocks, and 13 SNPs within four of these blocks were associated with ADHD in the second sample. Six haplotypes within these blocks were also significantly ($1.2 \times 10^{-7} \leq p \leq .009$) associated with ADHD in these samples. These risk variants were located in disease-related transposons and/or transcription-related functional regions. Major alleles of these risk variants significantly increased putamen volumes. Finally, KTN1 mRNA was significantly expressed in putamen across three independent cohorts. We concluded that the KTN1 variants were significantly associated with ADHD. KTN1 may play a functional role in the development of ADHD

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Anadolu Psikiyat Derg. 2020;21:62-69.

INVESTIGATION OF PSYCHOMETRIC PROPERTIES OF CONNERS' PARENT RATING SCALE LONG FORM-REVISED FOR PRIMARY SCHOOL STUDENTS IN TRNC.

Alkan D, Kaner S, Cakici E.

Objective: The purpose of this study was to investigate the psychometric properties of Conners' Parent Rating Scale Long Form-Revised (CPRS-RL), which is used for assessing behavioral problems especially attention deficit hyperactivity disorder (ADHD) among children, for primary school students in TRNC.

Methods: Confirmatory factor analysis (CFA) was performed for the data which was obtained by random stratified sampling from the parents of 469 children who attended 1st-5th grade of primary school. The relationships between subscales were investigated by using Pearson's correlation as another method of testing the structure validity. The mean scores obtained from two groups with diagnose of ADHD and without any diagnose were compared by t-test analysis to show discriminant validity of CPRS-RL. The internal consistency of the CPRS-RL subscales scores was evaluated with Cronbach's alpha. Test-retest reliability of CPRS-RL subscales were examined with t-test analysis at a 4 week interval. Item analysis of CPRS-RL was conducted in two ways. The item-total score correlation was calculated and the 27% sub-upper group difference were compared by t-test for each subscale in order to demonstrate the internal consistency of CPRS-RL.

Results: CFA resulted in seven factors which is the same factor structure as the original form. Correlations between subscales were found as 0.13-0.73. Item analyzes showed that all subscales had high internal consistency. It was found that the scale could discriminate the groups with and without diagnose of ADHD; the Cronbach's alpha coefficients of the CPRS-RL's subscales were between 0.57-0.90 and test-retest reliability values were between 0.34-0.73.

Conclusion: The results of the analysis show that CPRS-RL is a valid and reliable instrument for TRNC population

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Ann Gen Psychiatry. 2020;19.

EPIDEMIOLOGY OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) IN CHILDREN AND ADOLESCENTS IN AFRICA: A SYSTEMATIC REVIEW AND META-ANALYSIS.

Ayano G, Yohannes K, Abraha M.

Background: Attention-deficit/hyperactivity disorder (ADHD) is the most common neurodevelopmental disorders in childhood and adolescence, affecting 2.2 to 17.8% of all school-aged children and adolescents. ADHD in children has been associated with a wide range of developmental deficits including limitations of learning or control of executive functions as well as global impairments of social skills. However, no review has been conducted to report the consolidated magnitude of ADHD in children and adolescents in Africa. Therefore, this systematic review and meta-analysis aimed to estimate the prevalence of ADHD in Africa.

Methods: Following the PRISMA guideline, we systematically reviewed and meta-analyzed studies that investigated the prevalence of ADHD in Africa from three electronic databases (PubMed, Embase, and Scopus). We also looked at the reference lists of included studies to include other relevant studies. Subgroup and sensitivity analysis was carried out based on the study setting, tools used to measure ADHD, sex of participants, and the subtype of ADHD. Heterogeneity across the studies was evaluated using Cochran's Q- and the I²-test. We assessed potential publication bias using Egger's test and visual inspection of the symmetry in funnel plots.

Results: In the present meta-analysis, 7452 articles were initially identified and evaluated. Of these, 12 studies that met the inclusion criteria were included in the final analysis. The pooled prevalence of ADHD in children and adolescents in Africa was 7.47% (95% CI 60-9.26). The prevalence of ADHD was apparently greater in boys (10.60%) than in girls (5.28%) with a male:female ratio of 2.01:1. In our subgroup analysis, the predominantly inattentive type (ADHD-I) was found to be the most common subtype of ADHD, followed by hyperactive-impulsive type (ADHD-HI) and the combined type (ADHD-C) with the prevalence of 2.95%, 2.77%, and 2.44% respectively. The predominantly inattentive type (ADHD-I) was the most common type of ADHD in both boys (4.05%) and girls (2.21%). The funnel plot and Egger's regression tests provided no evidence of substantial publication bias in the prevalence of ADHD.

Conclusion: Our systematic review suggested a higher prevalence of ADHD (7.47%) in children and adolescents in Africa, indicating that ADHD is a serious public health problem in children and adolescents in Africa. The prevalence of ADHD was considerably greater in males than in females. The predominantly inattentive type (ADHD-I) was the most common type of ADHD in both males and females. Greater attention needs to be paid to the prevention and treatment of ADHD

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Asian J Psychiatry. 2020;49.

COGNITIVE REHABILITATION IN CHILDREN WITH ATTENTION DEFICIT- HYPERACTIVITY DISORDER: TRANSFERABILITY TO UNTRAINED COGNITIVE DOMAINS AND BEHAVIOR.

Nejati V.

Transferability of cognitive rehabilitation is a crucial point for efficacy. The purpose of the present study is to determine the transfer effect of cognitive rehabilitation to the untrained cognitive domains and behavior in children with attention deficit- hyperactivity disorder (ADHD). Thirty children with ADHD randomly allocated into two intervention and control groups. The intervention group received cognitive rehabilitation in 12-15 sessions. Analyses indicated that the experimental group shows an improvement in the trained domain. The result found a lack of near transfer to selective attention and inhibitory control with a successful far transfer effect to the risky decision making and delay discounting. Furthermore, the transfer occurred to behavioral symptoms of the intervention group. Attention and working memory training decrease delay discounting and delay discounting. The near transfer is not a prerequisite of far transfer. Cognitive rehabilitation can transfer horizontally to other cognitive domains at the same level and vertically to behaviors in a top-down manner

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Australas Psychiatry. 2020.

STIMULANT PRESCRIBING FOR ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD): WHAT GUIDES CLINICIANS IN THEIR CHOICE OF AN UPPER LIMIT FOR DOSE TITRATION?

Poulton AS, Paterson R.

Objective: There is little evidence to support the current stimulant dose upper limit restrictions in the treatment of attention deficit hyperactivity disorder (ADHD). Within Australasia, there is inconsistency in dose maxima in different jurisdictions. Clinician experience in this area may be worth gauging when trying to improve the understanding of optimal maximal dosing. Our objective was to survey prescribers experience of whether the current stimulant maximum doses ever conflict with dose optimisation and how such conflicts are managed.

Method: We conducted an anonymous online survey of health professionals treating children, adolescents and adults with ADHD.

Results: Responses were received from 128 prescribers, mainly paediatricians (52%) and adult psychiatrists (39%). The designated maximum dose of stimulant was a constraint to dose optimisation experienced by 91% for the Product Information maxima and 82% for their respective state/territory regulations maxima. When clinically indicated, 72% would exceed the designated maxima, either with or without obtaining a second opinion or applying for special authority. Of the remaining 28%, the majority (16%) would opt for polypharmacy, with only two accepting a suboptimal dose.

Conclusion: The current stimulant dose maxima act as a constraint to stimulant dose optimisation and may promote undertreatment and polypharmacy

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Autism. 2019;23:1051-56.

MEASURING THE SERVICE SYSTEM IMPACT OF A NOVEL TELEDIAGNOSTIC SERVICE PROGRAM FOR YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDER.

Stainbrook JA, Weitlauf AS, Juárez AP, et al.

As prevalence of autism spectrum disorder continues to increase, so too does the need for timely, accessible diagnostic consultation. The present work extends from a previous study which provided preliminary evidence for the feasibility of expert clinicians to utilize telemedicine to triage autism spectrum disorder risk in young children. However, it did not examine whether a telediagnostic model had a demonstrable impact on tertiary care center referrals and usage. We therefore examined whether the introduction of telemedicine-based diagnostic consultation for families served by a rural medical facility affected referrals overall as well as to a metropolitan tertiary care diagnostic center. Results suggest that telemedicine diagnostic consultation in partnership with a referring early intervention system may positively impact referrals for diagnostic evaluation as well as the ability of families to schedule and attend appointments

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Autism. 2019;23:1018-27.

RESISTANCE TO TEMPTATION IN TODDLERS AT GENETIC RISK FOR AUTISM SPECTRUM DISORDER.

Campbell SB, Northrup JB, Tavares AB.

Children with autism spectrum disorder often demonstrate difficulties with self-regulation, although studies of this construct in young children with autism spectrum disorder are limited. In this study, developmental changes were examined using a measure of self-regulation appropriate for young children, resistance to temptation. At 22, 28, and 34 months, toddlers with an older sibling with autism spectrum disorder (high risk) and toddlers with typically developing older siblings (low risk) were presented with an appealing toy and instructed not to touch it. Observers coded whether or not children touched the toy and the strategies they used to resist touching it. At 36 months, children were assessed for autism spectrum disorder, yielding three groups: high risk children with autism spectrum disorder, high risk children without autism spectrum disorder, and low risk children. At 22 months, most children, regardless of group, touched the forbidden toy; at 28 and 34 months, many high risk children without autism spectrum disorder and low risk children resisted the temptation to touch the toy, whereas most of the children with autism spectrum disorder did not. Differences

in delay strategies were also evident. Some, but not all group differences, were accounted for by differences in language ability. Results highlight one early index of impulse control that differentiates children with emerging autism spectrum disorder from age-mates prior to the third birthday

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Autism. 2019;23:821-33.

MOTHERS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS: PLAY BEHAVIORS WITH INFANT SIBLINGS AND SOCIAL RESPONSIVENESS.

Schwichtenberg AJ, Kellerman AM, Young GS, et al.

Mother infant interactions are a proximal process in early development and may be especially salient for children who are at risk for social difficulties (i.e. infant siblings of children with autism spectrum disorder). To inform how indices of maternal behaviors may improve parent-mediated interventions designed to mitigate autism spectrum disorder risk, the present study explored maternal social responsiveness ratings and social behaviors during dyadic play interactions. Dyads were recruited from families with at least one older child with autism spectrum disorder (high-risk group, n = 90) or families with no history of autism spectrum disorder (low-risk group, n = 62). As part of a prospective study, interactions were coded when infant siblings were 6, 9, and 12 months of age, for gaze, affect, vocalizations, and multimodal bids or responses (i.e. social smiles). Maternal social responsiveness was indexed via the Social Responsiveness Scale. Mothers in both risk groups had comparable Social Responsiveness Scale scores and social behaviors during play. Two maternal behaviors emerged as positive correlates of infant social behaviors and are thus of high relevance to parent-mediated interventions. Specifically, more maternal positive affect and the use of multimodal bids or responses were associated with more infant positive affect, vocalizations, gaze to face, and multimodal bids or responses

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Behav Genet. 2020.

A TWIN STUDY OF INHIBITORY CONTROL AT AGE TWO AND ADHD BEHAVIOR PROBLEMS AT AGE THREE.

Gagne JR, Asherson P, Saudino KJ.

Low levels of childhood inhibitory control (IC) are phenotypically and genetically associated with externalizing behavior problems and attention deficit hyperactivity disorder (ADHD). Unfortunately, there is little research on this topic in early childhood, when IC first emerges. This investigation extends the previous findings of contemporaneous genetic covariance between parent-rated and laboratory-assessed IC and ADHD at age 2 by examining longitudinal links between IC at age two and ADHD behavior problems at age three in a sample of 314 same-sex twin pairs (145 monozygotic or MZ, 169 dizygotic or DZ). There were significant phenotypic associations between both parent and laboratory IC assessments at age two and later ADHD behavioral problems (correlations ranged from -.15 to -.44). In our model-fitting strategy, we included measures of ADHD and IC at age 2 as predictors of ADHD at age 3. Longitudinal genetic analyses showed that phenotypic covariance between age two IC and ADHD behavior problems one year later were explained by overlapping genetic variance (genetic correlations ranged from .28 - to .60). However, these effects were not unique to IC and reflect variance shared with ADHD at age 2. Parent-rated IC at age two showed higher phenotypic and genetic covariance with ADHD at age three than lab ratings of IC at age two. This is the first investigation examining genetic covariance between parent and lab-based IC at age two and ADHD behavior problems at age three. Findings show that after accounting for co-occurring ADHD, early temperamental IC is not a unique genetic risk factor for later ADHD

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Biological Psychiatry: Cognitive Neuroscience and Neuroimaging. 2020.

FIXEL-BASED DIFFUSION MAGNETIC RESONANCE IMAGING REVEALS NOVEL ASSOCIATIONS BETWEEN WHITE MATTER MICROSTRUCTURE AND CHILDHOOD AGGRESSIVE BEHAVIOR.

Grazioplene R, Tseng W-L, Cimino K, et al.

Background: Childhood aggression has been linked to white matter abnormalities, but research has been inconsistent with regard to both regions of alterations and directionality of the associations. We examined white matter microstructure correlates of aggression using a novel diffusion imaging analysis technique, fixel-based analysis, which leverages connectivity and crossing-fiber information to assess fiber bundle density.

Methods: The sample included 70 children with aggressive behavior and 25 healthy control children without aggressive behavior. Aggression was measured by the parent-rated Aggressive Behavior scale of the Child Behavior Checklist. Fixel-based analysis was conducted at the whole-brain and region-of-interest levels, including the uncinate fasciculus, inferior longitudinal fasciculus, fornix, cingulum bundle, and genu, body, isthmus, and splenium of the corpus callosum.

Results: Whole-brain analysis of covariance revealed that children with aggressive behavior, relative to control children, had lower fiber density in a cluster of limbic and cortical pathways, including the inferior fronto-occipital fasciculus, fornix, middle cerebellar peduncle, and superior thalamic radiations (familywise error-corrected $p < .01$), and had higher fiber density in the corpus callosum (body and splenium) (familywise error-corrected $p < .05$). Region-of-interest analyses showed decreased fiber density in cingulum bundles associated with aggression. These effects were independent of age, sex, IQ, symptoms of attention-deficit/hyperactivity disorder, medications, and head motion. In children with aggressive behavior, co-occurring callous-unemotional traits and anxiety did not moderate the association between aggression and white matter density.

Conclusions: Diminished white matter density in pathways connecting limbic and cortical regions is associated with childhood aggression. Abnormal interhemispheric connectivity via corpus callosum may also reflect a potential neural mechanism involved in aggression

Biological Psychiatry: Cognitive Neuroscience and Neuroimaging. 2020.

DISRUPTIVE BEHAVIOR PROBLEMS, CALLOUS-UNEMOTIONAL TRAITS, AND REGIONAL GRAY MATTER VOLUME IN THE ADOLESCENT BRAIN AND COGNITIVE DEVELOPMENT STUDY.

Waller R, Hawes SW, Byrd AL, et al.

Background: Neurobiological differences linked to socioemotional and cognitive processing are well documented in youths with disruptive behavior disorders (DBDs), especially youths with callous-unemotional (CU) traits. The current study expanded this literature by examining gray matter volume (GMV) differences among youths with DBD with CU traits (DBDCU+), youths with DBD without CU traits (DBD-only), and youths that were typically developing (TD).

Methods: Data were from the first full sample release of the Adolescent Brain and Cognitive Development Study (mean age = 9.49 years; 49% female). We tested whether the GMVs of 11 regions of interest selected a priori differentiated between our 3 groups: DBDCU+ ($n = 288$), DBD-only ($n = 362$), and TD ($n = 915$). Models accounted for demographic confounders, attention-deficit/hyperactivity disorder, and intracranial volume. We examined two potential moderators of the relationship between GMVs and group membership: sex and clinically significant anxiety (i.e., primary vs. secondary CU traits subtype).

Results: Youths in the DBDCU+ group had lower right amygdala GMV, and youths in the DBD-only group had lower bilateral amygdala GMV relative to TD youths. Youths in the DBDCU+ group had lower bilateral hippocampal GMV, and youths in the DBD-only group had lower left hippocampal GMV relative to TD youths. Youths in the DBDCU+ group evidenced lower left insula GMV relative to TD youths. Finally, youths in the DBD-only group had lower left superior frontal gyrus and lower right caudal anterior cingulate cortex GMVs relative to TD youths. There was no moderation of associations between GMV and group membership by sex.

Conclusions: Our findings implicate structural aberrations in both the amygdala and hippocampus in the etiology of DBDs, with minimal evidence for differences based on the presence or absence of CU traits

Biological Psychiatry: Cognitive Neuroscience and Neuroimaging. 2020.

EMOTION–COGNITION INTERACTIONS IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: INCREASED EARLY ATTENTION CAPTURE AND WEAKENED ATTENTIONAL CONTROL IN EMOTIONAL CONTEXTS.

Karalunas SL, Weigard A, Alperin B.

Background: Emotion dysregulation is a key dimensional trait in psychopathology. It is of particular interest in attention-deficit/hyperactivity disorder (ADHD) because individual differences in emotion dysregulation predict impairment. Despite growing recognition of its importance, an understanding of emotional functioning in ADHD needs to be better integrated with the well-known nonemotional attentional impairments in the disorder. Here, we assess differences in early, reactive and later, regulatory attention to emotional stimuli, as well as how impairments in attentional control to nonemotional stimuli are affected under different emotional contexts.

Methods: In all, 130 adolescents (nADHD = 61) completed an emotional go/no-go task while 32-channel electroencephalography data were recorded. Reaction time and accuracy were analyzed using the linear ballistic accumulator model.

Results: The multimethod approach provided convergent evidence of increased early, reactive attention capture and overarousal (faster drift rates, increased P1) by positively valenced stimuli in ADHD, but no differences in later attention to emotional stimuli. Overarousal in positive-valence contexts appeared to exacerbate existing ADHD-related impairments in attentional control to nonemotional stimuli as well (reduced N2 amplitude). In contrast, positive-valence contexts facilitated attentional control to nonemotional stimuli for typically developing adolescents.

Conclusions: Results highlight the dynamic interaction of emotion with attentional control in ADHD. Distinguishing reactive and regulatory contributions to emotion dysregulation has been informative for clarifying mechanisms and spurring the development of novel interventions in other disorders. It can be informative in ADHD as well

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Biomedicine Hub. 2019;4:43.

TRACE ELEMENTS IN NEURODEVELOPMENTAL DISORDERS.

Skalny A, V.

Micronutrients and especially essential trace elements play a significant role in brain development, whereas alteration of their handling (both excess and deficiency) is associated with neurodevelopmental disorders. Moreover, exposure to heavy metals may also interfere with essential metal metabolism and its role in neurodevelopment. Therefore, the objective of a series of studies was to investigate both essential and toxic trace element levels in biosamples of children with neurodevelopmental disorders (autism spectrum disorder, attention-deficit hyperactivity disorder, cerebral palsy). Our recent data demonstrate that hair and urinary selenium levels were found to be increased in communication disorders, ASD and to a lesser extent in ADHD, whereas serum Se concentration tended to decrease in neurodevelopmental disorders. An inverse association between serum Se and heavy metal (Pb, Hg) levels was observed in patients with ASD. Taken together, these findings are indicative of increased selenium loss and selenium deficiency in children with the studied disorders that may be at least partially associated with toxic metal overload. Moreover, serum levels of certain essential elements (Mg, V, Se, Cr) were also associated with markers of neuroinflammation. In addition, alteration of trace element metabolism was shown to be associated with particular symptoms and syndromes of neurodevelopmental disorders. It is proposed that essential micronutrients (Zn, Se, Mg) may possess neuroprotective effect through their antioxidant, anti-inflammatory, and detoxicative activity, thus being a potent target and tool for nutritional management of neurodevelopmental disorders

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BMC Psychiatry. 2020;20.

EMPIRICAL EXAMINATION OF EXECUTIVE FUNCTIONING, ADHD ASSOCIATED BEHAVIORS, AND FUNCTIONAL IMPAIRMENTS IN ADULTS WITH PERSISTENT ADHD, REMITTENT ADHD, AND WITHOUT ADHD.

Rosell B, Berenguer C, Baixauli I, et al.

Background: Previous studies suggest that childhood attention deficit hyperactivity disorder (ADHD) may continue in adulthood, producing adverse effects. Therefore, identifying factors that help to differentiate characteristics of ADHD persistence and remission has practical implications for evaluation and treatment. The first aim of this study was to analyze differences in executive functions (shift, working memory, inhibition, and plan/organize), symptoms associated with ADHD (inattention, hyperactivity, emotional lability, and self-concept), and functional impairments in adults with persistent ADHD (ADHD-P), with remittent ADHD (ADHD-R), and without ADHD (N-ADHD). The second aim was to study the contribution of functional impairments in these three groups based on executive functions and associated ADHD behaviors.

Methods: Participants were 115 adults, 61 with a childhood ADHD diagnosis (40 persisters and 21 remitters) and 54 individuals with typical development. Self-reports were collected on executive functions, symptoms associated with ADHD, and functional impairments. Multivariate Analyses of Variance were conducted to test differences between the ADHD-P, ADHD-R, and N-ADHD groups on the evaluated variables. In addition, analyses were performed using two structural equation models with observed variables (path analyses).

Results: The results indicated that significant executive and behavioral impairments and adverse functional outcomes in different life domains are related to the diagnostic persistence of ADHD. Recovery from the disorder is associated with better results, although hyperactivity/restlessness behaviors and plan/organize deficits continue to be present in remitter individuals.

Conclusions: The ADHD-P and ADHD-R groups showed some differences in their executive, behavioral, and functional impairments. Furthermore, the impairments in each group can be predicted by different executive functions and other symptoms associated with the disorder. These results should be taken into account in order to improve clinical practice

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BMC Psychiatry. 2020;20.

EFFICACY OF WEB-ASSISTED SELF-HELP FOR PARENTS OF CHILDREN WITH ADHD (WASH) - A THREE-ARM RANDOMIZED TRIAL UNDER FIELD/ROUTINE CARE CONDITIONS IN GERMANY.

Dapfner M, et al.

Background: Current clinical guidelines recommend parent management training (PMT) in the treatment of attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD). However, (a) a lack of supply and (b) structural barriers to attending and continuing face-to-face PMT restrict the access to this training. The main purpose of this study is to investigate the efficacy of online PMT in decreasing ADHD symptoms and oppositional behavior problems and to evaluate the effects of additional telephone-based support of the parents.

Methods: The target sample size is $n = 495$ children with suspected or even clinical diagnosis of ADHD and current symptoms of ADHD or ODD. The study is based on a randomized three-arm parallel group design, in which the effects of treatment as usual (TAU) are compared to TAU plus web-assisted self-help (TAU+WASH) and to TAU plus web-assisted self-help and telephone-based support (TAU+WASH+SUPPORT).

Discussion: The results will provide important insights into the efficacy of web-assisted self-help for parents of children with ADHD and the additional effects of telephone-based support.

Trial registration: German Clinical Trials Register (DRKS) DRKS00013456. January 3rd 2018.

World Health Organization Trial Registration Data Set: Universal Trial number (UTN) U1111-1205-6181. November 23rd 2017

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Brain Imaging Behav. 2020 Feb;14:308-19.

WHITE MATTER INTEGRITY DISPARITIES BETWEEN NORMAL-WEIGHT AND OVERWEIGHT/OBESE ADOLESCENTS: AN AUTOMATED FIBER QUANTIFICATION TRACTOGRAPHY STUDY.

Carbine KA, Duraccio KM, Hedges-Muncy A, et al.

Obese adults have been shown to have poorer white brain matter integrity relative to normal-weight peers, but few studies have tested whether white matter integrity is compromised in overweight and obese adolescents. Also, it is unclear if age interacts with body mass to affect white matter integrity in adolescents. We used Automated Fiber Quantification, a tractography method, to compare fractional anisotropy between normal-weight and overweight/obese adolescents in the corpus callosum, corticospinal tract, cingulum, inferior fronto-occipital fasciculus, and uncinate fasciculus. Further, we tested whether any differences were moderated by age. Forty-seven normal-weight and forty overweight/obese adolescents were scanned using a diffusion tensor imaging (DTI) scan sequence. Overweight/obese compared to normal-weight adolescents had decreased white matter integrity in the superior frontal corpus callosum, left and right uncinate fasciculi, left inferior fronto-occipital fasciculus, and left corticospinal tract, which may be related to heightened reward processing. Overweight/obese compared to normal-weight adolescents had increased white matter integrity in the orbital and anterior frontal corpus callosum, right inferior fronto-occipital fasciculus, left cingulum, and left corticospinal tract, which may be related to heightened attentional processing. As age increased, six tracts showed poorer white matter integrity as body mass index percentile (BMI%) increased, but three tracts showed greater white matter integrity as BMI% increased. Future research examining associations between white matter integrity and neural indices of food-related reward and attention are needed to clarify the functional significance of white matter integrity discrepancies between normal-weight and overweight/obese adolescents

Brain Sciences. 2020;10.

DESIGN FLUENCY IN CHILDREN WITH ADHD AND COMORBID DISORDERS.

Fournier A, Gauthier B, Guay M-C, et al.

Background: Attention deficit/hyperactivity disorder (ADHD) is often associated with frontal executive impairment in children. Oppositional defiant disorder (ODD) and anxiety disorders (AD) frequently accompany ADHD, but the impact of these comorbid disorders on cognition remains elusive. The five-point test (FPT), a design fluency task, has been shown to be sensitive to neurological damage, specifically to frontal lobe lesions in patients with brain injuries. The purpose of this study was to compare the performances of neurotypical children with that of children with ADHD, ADHD-ODD, and ADHD-AD on the FPT in order to examine whether these groups could be distinguished from one another based on their cognitive profile.

Methods: A total of 111 children aged 8 to 11 years old participated in the study. Six measures from the FPT were used to characterize their performance.

Results: Statistically significant differences between groups were observed for five of the six FPT measures. Essentially, children with ADHD-ODD made more repeated designs than the three other groups (control $p > 0.001$, ADHD $p = 0.008$, ADHD-AD $p = 0.008$), while children with ADHD-AD produced fewer total and correct designs than the control and ADHD groups ($p = 0.009$).

Conclusions: This suggests that comorbidities have an additive impact on the cognitive profile of children with ADHD. Design fluency may be a sensitive measure for capturing the subtle cognitive deficits that are likely to be involved in these disorders

Child & Family Social Work. 2020 Feb;25:74-82.

PERCEIVED SOCIAL SUPPORT, PERCEPTION OF COMPETENCE, AND HOPE AMONG CHINESE CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN A CHINESE CONTEXT: CHILDREN'S PERSPECTIVE.

Joyce LCM, Lai KY, Xia LL.

This paper reports on the results of a study ($n = 113$ children with attention deficit hyperactivity disorder) that examined the effects of the children's perception of the social support (PSS) they receive from their mothers,

fathers, teachers, and friends on their sense of competence and hope. PSS explained 13% of the children's overall sense of competence and 4% of their sense of hope. In the perspective of children with attention deficit hyperactivity disorder, the amount of maternal support, both in terms of importance and availability, was higher than that of their paternal support. However, the results of a multiple regression analysis have shown that paternal support accounted for 3% of the variance in the children's overall sense of competence and 5% in the variance of their physical competence. PSS from teachers had significantly explained 5%, 4%, and 4% of the variance in the children's overall, social, and physical competence, respectively. The PSS from friends significantly explained 7% of the variance in the children's cognitive competence and 4% of the variance in hope. Theoretical and clinical implications of the study are discussed

Child Psychiatry Hum Dev. 2020 Apr;51:310-20.

ADHD AND ODD SYMPTOMS IN TODDLERS: COMMON AND SPECIFIC ASSOCIATIONS WITH TEMPERAMENT DIMENSIONS.

Sanchez-Pérez N, Putnam SP, Gartstein MA, et al.

The aim of this work was to study the relationship between temperament and signs of psychopathology in typically developing toddlers. More specifically, Attentional Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD) symptoms were analyzed in connection with fine-grained temperament dimensions. The sample was composed of 65 toddlers aged between 18 and 35 months. Bivariate correlations showed that higher levels of negative emotionality and approach tendencies, and lower levels of inhibitory control, were related to more ADHD and ODD manifestations. Bivariate correlations also indicated unique associations: lower levels of soothability were associated with higher ODD symptoms, whereas lower attentional focusing and low-intensity pleasure were related with higher ADHD symptoms. Additionally, regression and path analysis models indicated that ADHD was predominantly associated with attentional focusing and motor activation whereas ODD was most closely related to frustration. Our findings highlight the relevance of studying early correlates of psychopathological manifestations to identify children who could benefit from prevention and early intervention programs

Chinese Journal of Traumatology - English Edition. 2020.

OCULAR INJURIES, ATTENTION DEFICIT AND HYPERACTIVITY DISORDER, AND MATERNAL ANXIETY/DEPRESSION LEVELS: IS THERE A LINK?

Kafali HY, Biler ED, Palamar M, et al.

Purpose: Given the increased risk of accidents in patients with attention deficit and hyperactivity disorder (ADHD) or maternal anxiety/depression, we aimed to investigate the frequency of the two diseases in children with penetrating eye injury (PEI).

Methods: Altogether 79 children, 39 with PEIs and 40 healthy individuals (control group), aged 5-15 years, underwent a complete ophthalmologic examination. Afterwards, schedule for affective disorders and schizophrenia for school-aged children was conducted to assess the psychiatric diagnosis of the volunteers. Turgay diagnostic and statistical manual of mental disorders (DSM-IV) -based child and adolescent behavior disorders screening and rating scale (T-DSM-IV-S) was filled by parents to evaluate the severity of ADHD symptoms. The depression and anxiety levels of mothers of each group were evaluated by two self-report measures: the Beck depression scale and the state-trait anxiety inventory(STAI), respectively. Data were analyzed by IBM SPSS version 22.0. The Chi-square and Fisher's exact test were used to determine whether there is a significant difference between qualitative variables while independent sample t and Mann-Whitney U tests to compare quantitative variables.

Results: The only diagnostic difference was a significantly higher frequency of ADHD among patients with PEIs (48.7% in PEIs. 17.5% in control group, $\chi^2 = 7.359$, $p = 0.007$). The total scores of the T-DSM-IV-S (attention subscale $U = 418.000$, $p = 0.006$; hyperactivity subscale $U = 472.000$, $p = 0.022$) and maternal state-trait anxiety inventory (maternal STAI-state $U = 243.000$, $p = 0.003$; maternal STAI-trait $U = 298.000$,

$p = 0.021$) were significantly higher in the PEI group than in control group. In logistic regression, children with PEI had a tendency to have a 3.5-fold increased risk for ADHD (OR = 3.538, CI = 0.960-13.039, $p = 0.058$). **Conclusion:** ADHD was detected almost 1 in 2 children with PEIs. Besides, the maternal anxiety level was significantly higher in the PEI group than in the control group. This association should be further explored via a future prospective longitudinal study. Since a proper treatment of ADHD in children and anxiety treatment in mothers may prevent vision loss following PEIs in children

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Clin Neurophysiol. 2020;131:e16-e17.

ADVERSE EFFECTS REPORTED BY CHILDREN WITH ADHD UNDERGOING TRANSCRANIAL DIRECT CURRENT STIMULATION.

Schertz M, Karni-Visel Y, Genizi J, et al.

Introduction: Transcranial direct current stimulation (TDCS) treatment studies in children with neurodevelopmental disorders in general and ADHD in particular have begun to emerge. However, there is a paucity of studies regarding safety. Objectives: We report on Adverse Effect (AE) data from an ongoing double-blind, randomized, sham-controlled pilot study in children with ADHD undergoing treatment with TDCS.

Patients & methods: 12 children (9 boys) (mean age 10.38 years, SD = 1.15, range 8.54-11.85) with ADHD underwent TDCS. No child received chronic medication during the study. All children had passed a cognitive screen, had normal vision, had a non-focal neurological examination and had normal baseline awake EEG. Montage employed the anode over Left Dorsolateral Prefrontal Cortex and cathode at Vertex. 1.0 mA current was applied for twenty minutes using two 5 5 cm electrodes with a 30 second ramp up and down. Twelve stimulations were given three times weekly for four weeks. During stimulation the child was provided a video game, COGNIFIT, that practices attentional tasks. Placebo (sham) controls underwent identical procedure except that current received was 1.0 mA for 30 s at the start and conclusion of session with ramp up/down over 10 s. AE was obtained by physician at each pre and post stimulation by questioning the child using a published TDCS AE questionnaire assessing headache, neck/scalp pain, tingling, burning and/or itching sensations, sleepiness, trouble concentrating, dizziness, nausea, skin redness. Scoring employed a 1-5 rating scale (1-no complaint, 2-mild, 3-moderate, 4-severe, 5-extreme). Frequency and average of the delta (post-pre stimulation) for each and overall AE was obtained. Blinded data is reported as the study is ongoing.

Results: No serious AE were noted. One boy, reporting headache at post testing of stimulation #1 and at pre and post testing of stimulation #2, was removed from the study. Thus, data is presented on 11 subjects (Group A = 6, Group B = 5) for 12 possible AE obtained at each of the 12 stimulation sessions, for a total of 1584 (11 12 12) possible AE observations. At pre-stimulation, five children reported a total of 12 mild and 2 moderate AE. At post-stimulation, children reported AE for 5.7% of the 1584 possible AE (72 mild and 19 moderate). Two children from Group B (child 1 at one session and child 2 at two sessions) reported discomfort at the beginning of the stimulation, so current was gradually increased up to 1 mA and was well tolerated. Most common AE reported was tinging in Group A and itching, tingling and burning in Group B. No significant differences ($P > 0.05$) were found between the two groups for the delta of individual and overall AE (Fig. 1). No child reported severe/extreme AE at any session. There were no missed appointments and no child requested to stop stimulation.

Conclusion: TDCS was well tolerated by children in our cohort with only mild/moderate AE reported

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Clin Neurophysiol. 2020;131:e27-e28.

THE SIGNIFICANCE OF THE ONLOOKER'S ATTENTION ON MOTOR FACILITATION DURING ACTION OBSERVATION: A TRANSCRANIAL MAGNETIC STIMULATION STUDY OF CORTICOSPINAL EXCITABILITY IN MOTOR LEARNING.

Hashemi N, Tendera A, Banks R.

Introduction: The interaction between vision and motor commands as the result of the passive observation of movement triggers the recruitment of motor neurons, promoting motor resonance. Therefore, action observation (AO) is a promising therapeutic approach to motor function rehabilitation. Corticospinal

excitability during AO is evaluated using single-pulse TMS (spTMS) and corresponding motor-evoked potential (MEP), recorded transcutaneously using EMG. spTMS-evoked MEPs measured during AO (e.g. hand grasp) demonstrate that corticospinal excitability is enhanced by motor observation in a muscle-specific manner, where an increase in MEP size reflects an increase in corticospinal excitability. To encourage consistent attention, previous studies instructed participants to actively attend to visual stimuli presented and be prepared to complete a cognitive task related to what was observed. However, the significance of attention as a requirement for obtaining reliable data has not yet been quantified. The purpose of the current work is to quantitatively demonstrate whether active attention to visual stimuli is essential in motor learning by observation. Specifically, we aimed to discover whether a lack of attention to movement-related visual stimuli would lead to comparable motor resonance to those which were attended to.

Methods: 15 typically developed right-handed adults were recruited. spTMS-induced MEPs were collected from the first dorsal interosseous muscle of both hands while participants observed videos of hands squeezing a ball. The videos included right and left hands side by side, each holding a ball. Participants were visually cued to maintain their attention on one of the hands randomly by framing either the right or left hand prior to a squeeze/non-squeeze event. Trials included one of two conditions: (1) the hand in the primary focus of attention (framed) squeezed the ball or (2) the hand that was not in the primary focus of attention (unframed but still in the visual field) squeezed the ball. The same number of trials for each of the two conditions were presented randomly to participants so as to reduce predictability. The relative difference between the MEPs recorded during condition 1 and condition 2 was used as the measure of modulation that was caused by active attention.

Results: We anticipate that motor resonance via AO is achievable as long as the visual stimuli are within the field of vision without requiring the participant to keep active attention. AO is a promising paradigm for the rehabilitation of motor impairment, such as those present in spinal cord injury and stroke. Therefore, understanding the role of active attention in resonating the motor response intended by the visual stimuli, enables us to accommodate children and those individuals with attention deficits for observational learning

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Clin Neurophysiol. 2020;131:e42.

FIVE-DAY APPLICATION OF HD-tDCS OVER THE RIGHT IFG IN CHILDREN AND ADOLESCENTS WITH ADHD.

Breitling C, Zaehle T, Dannhauer M, et al.

Introduction: ADHD related deficits in response inhibition and working memory are associated with hypoactivation of the right inferior frontal gyrus (IFG). Repeated tDCS applications could induce long-lasting activity increase in this area and therefore enhance cognitive functions.

Objectives: This study aimed to improve working memory and response inhibition performance in children and adolescents with ADHD via repeated applications of anodal HD-tDCS over the right IFG.

Patients & methods: Five sessions of HD-tDCS on consecutive days were applied in 29 ADHD patients and in 11 healthy controls between 10 and 16 years. ADHD patients received either sham (n = 13), 500 [Formula presented] (n = 8) or 250 [Formula presented] (n = 8) anodal stimulation over the right IFG. Current intensity depended on individual dermal sensitivity. All healthy controls received sham stimulation. During 20 minutes of tDCS participants solved a combined working memory and response inhibition paradigm (n-back/go-nogo). At pre, post and at a 3-months follow up EEG was recorded during this n-back/go-nogo task and performance in transfer tasks of visuo-spatial working memory (span board task) and interference control (flanker task) was assessed.

Results: In controls and ADHD patients of the sham group, ERP amplitudes of nogo and working memory P3 were reduced at the post session but reduction was larger in patients. The ADHD group that received 500 [Formula presented] tDCS showed no effect of stimulation on n-back/go-nogo performance. However, accuracy in the flanker task was improved after tDCS applications. On a neurophysiological level, amplitude of the nogo P3 was increased in the 500 [Formula presented] compared to the sham group and therefore resembled healthy controls. Unexpectedly, patients who received only 250 [Formula presented] tDCS showed converse effects. They made more nogo commission errors post tDCS than patients who received sham stimulation. Interestingly, this effect started not during the first but during the second tDCS application and increased throughout the course of the five-day stimulation. Furthermore, accuracy during the flanker

task at the post session was lower compared to the sham group. In all groups, effects of tDCS were not significant after a period of three month.

Conclusion: The increase of response inhibition related ERP amplitudes and improved flanker task accuracy indicates that consecutive tDCS sessions of the right IFG with 500 [Formula presented] modulated inhibitory processes. This method is therefore promising as a potential cognitive treatment in ADHD. Further, the present study demonstrated the outstanding importance of current intensity for the success of stimulation. It is especially remarkable that performance decline manifested only from the second tDCS session, which shows the necessity of investigating repeated tDCS applications

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Clin Pract Epidemiol Ment Health. 2019;15:160-71.

CLINICAL AND NEUROPSYCHOLOGICAL PREDICTORS OF METHYLPHENIDATE RESPONSE IN CHILDREN AND ADOLESCENTS WITH ADHD: A NATURALISTIC FOLLOW-UP STUDY IN A SPANISH SAMPLE.

Vallejo-Valdivielso M, de Castro-Manglano P, D+jez-Su+írez A, et al.

Background: Methylphenidate (MPH) is the most commonly used medication for Attention-Deficit/Hyperactivity Disorder (ADHD), but to date, there are neither consistent nor sufficient findings on conditions differentiating responsiveness to MPH response in ADHD.

Objective: To develop a predictive model of MPH response, using a longitudinal and naturalistic follow-up study, in a Spanish sample of children and adolescents with ADHD.

Methods: We included all children and adolescents with ADHD treated with MPH in our outpatient Clinic (2005 to 2015), evaluated with the K-SADS interview. We collected ADHD-RS-IV.es and CGI-S scores at baseline and at follow up, and neuropsychological testing (WISC-IV, Continuous Performance Test (CPT-II) & Stroop). Clinical response was defined as >30% reduction from baseline of total ADHD-RS-IV.es score and CGI-S final score of 1 or 2 maintained for the previous 3 months.

Results: We included 518 children and adolescents with ADHD, mean (SD) age of patients was 11.4 (3.3) years old; 79% male; 51.7% had no comorbidities; and 75.31% had clinical response to a mean MPH dose of 1.2 mg/kg/day. Lower ADHD-RS-IV.es scores, absence of comorbidities (oppositional-defiant symptoms, depressive symptoms and alcohol/cannabis use), fewer altered neuropsychological tests, higher total IQ and low commission errors in CPT-II, were significantly associated with a complete clinical response to methylphenidate treatment.

Conclusion: Oppositional-defiant symptoms, depressive symptoms, and a higher number of impaired neuropsychological tests are associated with worse clinical response to methylphenidate. Other stimulants or non-stimulants treatment may be considered when these clinical and neuropsychological variables converged in the first clinical interview

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CNS Drugs. 2020.

GENETIC INFLUENCE ON EFFICACY OF PHARMACOTHERAPY FOR PEDIATRIC ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: OVERVIEW AND CURRENT STATUS OF RESEARCH.

Elsayed NA, Yamamoto KM, Froehlich TE.

Multiple stimulant and non-stimulant medications are approved for the treatment of attention-deficit/hyperactivity disorder (ADHD), one of the most prevalent childhood neurodevelopmental disorders. Choosing among the available agents and determining the most effective ADHD medication for a given child can be a time-consuming process due to the high inter-individual variability in treatment efficacy. As a result, there is growing interest in identifying predictors of ADHD medication response in children through the burgeoning field of pharmacogenomics. This article reviews childhood ADHD pharmacogenomics efficacy studies published during the last decade (2009-2019), which have largely focused on pharmacodynamic candidate gene investigations of methylphenidate and atomoxetine response, with a smaller number investigating pharmacokinetic candidate genes and genome-wide approaches. Findings from studies which have advanced the field of ADHD pharmacogenomics through investigation of meta-analytic approaches and gene-gene interactions are also overviewed. Despite recent progress, no one genetic variant or currently

available pharmacogenomics test has demonstrated clinical utility in pinpointing the optimal ADHD medication for a given individual patient, highlighting the need for further investigation

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Complement Ther Med. 2020;49.

USE OF COMPLEMENTARY AND ALTERNATIVE MEDICINE IN CHILDREN WITH ADHD: RESULTS FROM THE 2012 AND 2017 NATIONAL HEALTH INTERVIEW SURVEY.

Wang C, Li K, Seo D-C, et al.

Objective: To examine the prevalence, patterns, and factors associated with CAM use among children with ADHD.

Method: We used data from the 2012 and 2017 National Health Interview Survey. Descriptive statistics, Wald F chi-square test, and multivariable logistic regression were performed.

Results: Approximately 8.4 % of U.S. children had ADHD in 2017. Children with ADHD had greater CAM use than those without ($p < 0.05$). Meditation (10.8 %), yoga (9.6 %), and deep breathing (7.3 %) were the most commonly used mind-body CAM modalities in ADHD children in 2017, with their use increased 468 %, 433 %, and 192 %, respectively, since 2012. Nearly all children experiencing ADHD (91.9 %) have comorbid psychiatric disorders, and they are more likely to use CAM than those without comorbidities ($p < .0001$). Less than one-third of the respondents disclosed children's CAM use to their medical doctors. Among children with ADHD, CAM use is generally not correlated with conventional medical care use, except for a significant inverse relationship between CAM use and use of prescription medication for more than three months.

Conclusion: The use of mind-body CAM modalities has substantially increased among children with ADHD, compared to those without ADHD, from 2012 to 2017. Parents' reasons for the use of CAM among their children with ADHD included their unique function in reducing ADHD symptoms and their lack of unwanted side-effects. It is imperative to improve effective communication between health care providers and ADHD patients and their parents, in order to understand patients' values and preferences for using CAM therapies as a natural holistic therapy for ADHD

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Conf Proc IEEE Eng Med Biol Soc. 2019 Jul;2019:1444-47.

PANDAS: PAEDIATRIC ATTENTION-DEFICIT/HYPERACTIVITY DISORDER APPLICATION SOFTWARE.

Mwamba HM, Fourie PR, den Heever DV.

Attention-deficit/hyperactivity disorder (ADHD) is a common neuropsychiatric disorder that impairs social, academic, and occupational functioning in children, adolescents and adults. In South Africa, youth prevalence of ADHD is estimated as 10%. It is therefore necessary to further investigate methods that objectively diagnose, treat, and manage the disorder. The aim of the study was to develop a novel method that could be used as an aid to provide screening for ADHD. The study comprised of a beta-testing phase that included 30 children (19 non-ADHD and 11 ADHD) between the ages of 5 and 16 years old. The strategy was to use a tablet-based game that gathered real-time user data during game-play. This data was then used to train a linear binary support vector machine (SVM). The objective of the SVM was to differentiate between an ADHD individual versus a non-ADHD individual. A feature set was extracted from the gathered data and sequential forward selection (SFS) was performed to select the most significant features. The test set accuracy of 85.7% and leave-one-out cross-validation (LOOCV) accuracy of 83.5% were achieved. Overall, the classification accuracy of the trained SVM was 86.5%. Finally, the sensitivity of the model was 75% and this was seen as a moderate result. Since the sample size was fairly small, the results of the classifier were only seen as suggestive rather than conclusive. Therefore, the performance of the classifier was indicative that a quantitative tool could indeed be developed to perform screening for ADHD

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Dev Psychopathol. 2020 Feb;32:205-17.

SELF-DIRECTED SPEECH AND SELF-REGULATION IN CHILDHOOD NEURODEVELOPMENTAL DISORDERS: CURRENT FINDINGS AND FUTURE DIRECTIONS.

Mulvihill A, Carroll A, Dux PE, et al.

Self-directed speech is considered an important developmental achievement as a self-regulatory mediator of thinking and behavior. Atypical self-directed speech is often implicated in the self-regulatory challenges characteristic of children with neurodevelopmental disorders. A growing body of evidence provides snapshots across age-levels and diagnoses, often presenting conflicting results. This systematic review is undertaken to impose clarity on the nature, extent, and self-regulatory implications of self-directed speech interruption in children with developmental language disorder (DLD), autism spectrum disorder (ASD), and attention deficit hyperactivity disorder (ADHD). A rigorous search process of relevant databases (i.e., PsychInfo, PubMed, CINAHL, ERIC) uncovered 19 relevant peer-reviewed articles that investigate self-directed speech in children with neurodevelopmental disorders. Consistent across the research, children with DLD, ASD, and ADHD present with differential development and use of self-directed speech. In its synthesis of findings, this systematic review clearly explicates the differential ontogenesis of self-directed speech in neurodevelopmental disorders and interprets the self-regulatory implications for children with DLD, ASD, and ADHD. Furthermore, the review spotlights important future research directions to better understand the mechanistic relationship between self-directed speech and self-regulation

Diabetes Technology and Therapeutics. 2020;22:A229-A230.

THE EFFECTS OF ADVANCED TECHNOLOGY IN CHILDREN WITH DUAL DIAGNOSIS OF TYPE 1 DIABETES MELLITUS AND ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Mazor-Aronovitch K, Pinhas-Hamiel O, Pivko-Levy D, et al.

Background and Aims: Data regarding the effect of CGM use on glycemic control in children with a dual diagnosis of type 1 diabetes mellitus (T1DM) and attention-deficit/hyperactivity disorder (ADHD) are limited. The aims of the study were to compare CGM use and various aspects of diabetes control among children with T1DM in the following groups: those without ADHD, those with medically treated ADHD and those with untreated ADHD.

Methods: In this cross-sectional study of 111 children with T1DM, 15 had untreated ADHD, 12 had treated ADHD and 84 did not have ADHD (Control Group). Glycemic data were downloaded from glucometers, pumps, and continuous glucose monitoring systems. HbA1c levels, hospitalizations, severe hypoglycemic and diabetes ketoacidosis events were retrieved from the medical files.

Results: Untreated ADHD patients used CGM significantly less than treated ADHD and Control Groups (27%, 75%, 58% respectively), although most of them had approval to use CGMs. Mean HbA1c levels were highest in the untreated ADHD group: 8.6-11.2%, 8.3-11.1%, and 7.8-11.0% respectively ($p = 0.009$). Time in range (70-180 mg/dl) was lower and mean glucose was higher in this group. Untreated ADHD had more hospitalizations compared to the treated ADHD and the control group.

Conclusions: In this study untreated ADHD patients with T1DM used CGM less than treated ADHD patients and had worse diabetes control. Healthcare providers should be aware of the difficulties facing children with T1DM and ADHD in coping with the current intensive treatment of diabetes and encourage the use of advanced technology in those patients

Encephale. 2020.

OBSERVATION AND COMPARISON OF SOCIAL ABILITIES IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND AUTISM SPECTRUM DISORDER CHILDREN.

Lager M, Piat N, Jean FA, et al.

Objectives: Different studies centered on social relationship issues among ADHD children struggled to provide a unicast explanation between primary social cognition process alteration on the one hand and a mere symptomatic outcome of the disorder triad on the other. Some authors support the idea of a potential

social phenotype shared at a different intensity by Attention Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD). The point of the study is to characterize this possible social disability in a French ADHD population and compare it to control subjects and subjects with Autism Spectrum Disorder (ASD).

Methods: Three groups, composed of 319 subjects aged 6 to 12 years, were recruited in Bordeaux: 88 untreated ADHD subjects, 24 ASD subjects and 207 control subjects. The main measure was the social skill disruption through the rating of the Social Responsiveness Scale (SRS). The ADHD-RS-IV, WFIRS-P and CBCL scales were also used.

Results: Asignificant alteration in social abilities in ADHD children in comparison with controls was noted, with an average raw total SRS score intermediary between the control group and the ASD group (respectively 65.31 -| 20.99, 37.15 -| 16.37 and 95 75 -| 30.83, $P < 0.05$). When the 5 sub-scores of the SRS were taken into account, if the ASD subjects showed the highest average scores, the alteration pattern appeared qualitatively similar between the ADHD and TSA groups, with also an intermediate dispersion for the ADHD group between the control group and the group with ASD. Finally, more severe impairment of social skills in children with ADHD was associated with increased severity of the disorder (on ADHD-RS-IV scale cotation), higher daily functional impact (WFIRS-P scale), and more frequent behavioral issues (according to CBCL).

Conclusions: Our results suggest the presence of social disturbances in ADHD and characterize a symptomatic profile qualitatively similar to that of ASD, but of less intensity. Overall results promote a need for a systematic dimensional assessment of social disability in ADHD

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Eur Child Adolesc Psychiatry. 2020 Feb;29:145-51.

DEVELOPMENTAL TRAJECTORIES OF CHILDHOOD SYMPTOMS OF HYPERACTIVITY/INATTENTION AND SUICIDAL BEHAVIOR DURING ADOLESCENCE.

Forte A, Orri M, et al.

Hyperactive/inattentive symptoms (ADHD symptoms) are associated with suicidal behavior in clinical studies, but there is still a lack of population-based longitudinal investigations on the developmental aspects of this association. Additionally, it is unclear whether the association is similar for boys and girls. The objectives of the study were to test the association between the ADHD symptoms during childhood and suicidal ideation and attempt during adolescence, and to investigate sex differences. 1407 children from the Québec Longitudinal Study of Child Development were followed up from 5 months to 17 years of age. We used teacher-reports of ADHD symptoms from 6 to 12 years, and self-report of suicidal ideation and attempt at 13, 15, and 17 years. We identified three ADHD symptoms trajectories: low (boys: 32.2%, girls: 48.7%), moderate (boys: 44.6%; girls: 42.2%) and high (boys: 23.2%; girls: 9.1%). Compared to boys on a low trajectory, boys on a moderate trajectory were at higher risk for suicidal ideation (OR 4.2, 95% CI 1.2–14.8), and boys on a high trajectory were at high risk for suicide attempts (OR 4.5, 95% CI 1.1–17.9). Girls on moderate or high ADHD symptoms trajectories were not at higher risk for suicidal ideation or attempts than girls on low trajectories. For boys, but not for girls, moderate-to-high ADHD symptoms increased the suicidal risk in adolescence. Interventions with boys showing ADHD symptoms should include suicide prevention component.

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Eur Child Adolesc Psychiatry. 2020.

Task-related motivation and academic achievement in children and adolescents with ADHD.

Morsink S, Sonuga-Barke E, Van der Oord S, et al.

Academic impairment in individuals with attention-deficit/hyperactivity disorder (ADHD) is in part due to reduced motivation for academic tasks, which is likely to vary as a function of task characteristics. The current study employed a new questionnaire the Child and Adolescent Motivational Profile (CHAMP) to examine; (1) which task characteristic participants with ADHD perceive as most motivating relative to typically developing peers (TDP) and (2) whether these differences mediate academic functioning. 34 participants with ADHD and 435 TDP (8-16-years) completed the CHAMP. Academic achievement (grade point average) and self-reported positive/negative classroom experiences were recorded. No task characteristics were rated higher

in terms of their motivational salience in the ADHD group than in the control sample. Marked/graded, Socially evaluated, Collaborative, Requiring focus and Cognitively challenging task characteristics were rated significantly lower by the ADHD group than controls. The lower rating of Socially evaluated was explained by comorbid ODD symptoms. Cognitively challenging was rated as particularly unmotivating by individuals with ADHD. ADHD was associated with a decreased GPA and a more negative classroom experience. The associations between ADHD and GPA/negative classroom experience were both partially mediated by scores on the Cognitively Challenging scale. For children and adolescents with ADHD tasks that are cognitively challenging were not particularly motivating. To increase task motivation, and improve academic performance of individuals with ADHD, it may be important to include rewarded task elements as they are appraised as particularly motivating by these individuals and this appraisal was similar to that of TDP

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Eur Child Adolesc Psychiatry. 2020;29:395-408.

HOME-BASED PARENT TRAINING FOR SCHOOL-AGED CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND BEHAVIOR PROBLEMS WITH REMAINING IMPAIRING DISRUPTIVE BEHAVIORS AFTER ROUTINE TREATMENT: A RANDOMIZED CONTROLLED TRIAL.

Nobel E, Hoekstra PJ, Agnes BJ, et al.

The objective is to investigate the effectiveness of home-based behavioral parent training for school-aged children with attention-deficit/hyperactivity disorder (ADHD) and behavior problems with remaining impairing disruptive behaviors after routinely offered treatments in clinical practice. In a randomized controlled study including 73 referred children with ADHD and impairing disruptive symptoms after routine clinical pharmacotherapy and/or clinic-based parent training had been tried or, at least, offered, home-based behavioral parent training (n = 26) was compared to a waiting list (n = 23) and a care-as-usual home-based treatment (n = 24). It was unknown to families which of the home-based treatments that they received. Using mixed models for repeated measures, we examined the effectiveness on the primary outcome measure of children's severity of disruptive behaviors and on a number of secondary outcome measures [the degree to which parents experienced the disruptive behaviors as troublesome, ADHD symptoms, oppositional-defiant disorder (ODD) symptoms, and internalizing problems]. Compared to the waiting list, children receiving home-based parent training improved significantly more regarding severity of disruptive behaviors (ES = 0.75), ADHD symptoms (ES = 0.89), ODD symptoms (ES = 0.65), and internalizing problems (ES = 0.60). Compared to care-as-usual, home-based parent training was more effective in reducing disruptive behaviors (ES = 0.57), ADHD symptoms (ES = 0.89), and ODD symptoms (ES = 0.88). Significantly more reduction of children's internalizing problems was not found. In conclusion, children with ADHD and residual behavioral problems after routine treatment may benefit from home-based behavioral parent training

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Eur Child Adolesc Psychiatry. 2020;29:137-44.

THE TEMPORAL ORDER OF FLUCTUATIONS IN ATOPIC DISEASE SYMPTOMS AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER SYMPTOMS: A TIME-SERIES STUDY IN ADHD PATIENTS.

van der Schans J, Cao Q, Bos EH, et al .

In a recent meta-analysis, we found that atopic diseases, like asthma and allergic rhinitis, occur more frequently prior to the onset of attention-deficit/hyperactivity disorder (ADHD). Our aim was to determine the temporal order of the association between daily fluctuations in atopic disease symptoms and in ADHD symptoms in individual participants. In this observational study among 21 participants, age 7-16-years, we performed a replicated time-series analysis of symptom fluctuations in asthma and/or allergic rhinitis and ADHD. Data were collected through parents who filled in a daily online questionnaire during up to 50-days. In each individual, we investigated the temporal order of fluctuations in atopic disease symptoms and ADHD symptoms using a vector autoregressive (VAR) model while using sleep problems and medication use as covariates. For 16 out of 21 participants, we constructed a VAR model. For a majority of the participants, significant associations were detected between atopic disease symptoms and ADHD symptoms. The results were heterogeneous; the direction, sign, and timing of the relationship between ADHD, atopy, sleep

problems, and medication use varied between individuals. This study provides additional evidence that the symptom expression of atopy and ADHD are related. However, the connection between both diseases in children is found to be heterogeneous within our study population

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Eur Child Adolesc Psychiatry. 2020;29:315-26.

NEURO-PHYSIOLOGICAL CORRELATES OF SLUGGISH COGNITIVE TEMPO (SCT) SYMPTOMS IN SCHOOL-AGED CHILDREN.

Yung TWK, Lai CYY, Chan JYC, et al.

This study was the first to examine the relationship between neurophysiological abnormalities and symptoms of sluggish cognitive tempo (SCT) in children. Thirty children aged 6-12 years were recruited. Their heart rate variability (HRV) was measured under resting and warning signal conditions. At rest, the children's SCT symptoms were found to be positively associated with their HRV (indicated by the standard deviation of the Poincar plot along the line of identity in normalized units, SD2 nu). SCT symptoms were also positively associated with a change in SD2 nu between the resting and warning signal conditions. When controlling for symptoms of attention deficit hyperactivity disorder, the children's SCT symptoms were significantly predicted by their resting SD2 nu and by changes in SD2 nu and the percentage of successive RR intervals that differ by more than 50 ms (pNN50) between the resting and warning signal conditions. These findings suggest that the readiness and regulation of the autonomic nervous system may contribute to symptoms of SCT. Specifically, disturbances in the internal neurophysiological system may explain the difficulties experienced by children when exposed to environmental stimulation. These initial data support the hypothesis that SCT results from deficiencies in arousal

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Frontiers in Pediatrics. 2020;8.

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER MIMICS THE POST-CONCUSSION SYNDROME IN ADOLESCENTS.

Cook NE, Sapigao RG, Silverberg ND, et al.

The objective of this study was to evaluate concussion-like symptom reporting among uninjured adolescents with Attention-deficit/hyperactivity disorder (ADHD), stratified by several cooccurring conditions, and to examine the base rate and predictors of uninjured adolescents with ADHD meeting diagnostic criteria for the International Classification of Diseases, 10th Revision (ICD-10) post-concussional syndrome (PCS). Participants in this cross-sectional, observational study, were drawn from a cohort of 48,834 adolescent student athletes from Maine (ages 13-18) with no concussion in the past 6 months who completed a preseason, baseline testing program between 2009 and 2015. The final sample included 3,031 students with ADHD, 2,146 (70.8%) boys and 885 (29.2%) girls. They were 15.2 years old on average (SD = 1.3). Concussion-like symptom reporting was more common in girls than boys. Most students with ADHD reported one or more symptoms (69.3% of boys and 81.1% of girls). The presence of an additional, co-occurring condition or comorbidity was associated with increased symptom reporting. In the absence of a recent concussion, 28.8% percent of boys and 47.1% of girls with ADHD endorsed symptoms resembling an ICD-10 diagnosis of post-concussional syndrome (PCS). Adolescents with pre-existing conditions were even more likely to endorse symptoms that resembled PCS (28-47% of boys and 45-69% of girls). Prior treatment for a psychiatric condition was the strongest independent predictor for meeting PCS criteria in boys, followed by treatment for migraines and co-occurring learning disorder. For girls, the only independent predictor was prior treatment of a psychiatric condition. In uninjured adolescent student athletes, ADHD appears to mimic the post-concussion syndrome. Adolescents with ADHD commonly endorse concussion-like symptoms in the absence of a recent concussion. Demographic characteristics (sex) and the presence of co-occurring conditions are related to symptom reporting in adolescents with ADHD. Understanding factors associated with baseline symptom reporting, such as pre-existing ADHD, is important when evaluating youth who have persistent symptoms following concussion as well as making both return to school and return to athletics decisions

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Indian J Psychiatry. 2020;62:S48.

CROSS SECTIONAL COMPARATIVE STUDY OF PARENTS ATTITUDE BETWEEN CHILDREN DIAGNOSED WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND UNAFFECTED SIBLINGS.

Shailly S.

Background- ADHD is a chronic neurodevelopmental disorder affecting approximately 3-7 % of children. It affects all areas of child's life, Children with ADHD may cause high stress in parents due to their behavioral problems and so parents report low quality of life, health problems, poor family and social support, low parenting satisfaction. These problems and cognitive errors may affect their attitude and interfere with their responsibility towards the child. Prashant Maravi - To study comparison of parent's attitude between children diagnosed with Attention deficit hyperactivity disorder and their unaffected sibling.

Methods- This cross sectional comparative study was conducted in school mental health clinic of our hospital. Comprises Of 30 pairs of children, 30 children diagnosed with ADHD as per DSM 5 criteria, 30 were unaffected siblings. Index of parental attitude (IPA) was filled by parents of all children along with semi structured proforma with demographic details and questionnaire regarding their children diagnosed with ADHD and the unaffected sibling.

Results- There is a difference in the attitude of parents towards children with ADHD as compared to their siblings.

Conclusion- Parents attitude was found to be unfavorable towards children with ADHD as compared to their unaffected siblings. So Health care systems and professionals should provide support and understanding to these families

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Indian J Psychiatry. 2020;62:S122.

ADHD AND PHARMACOTHERAPY: A GLOBAL PERSPECTIVE.

Hossien SA, Karki U, Dutta B.

Attention deficit hyperactivity disorder (ADHD) is a common childhood-onset neurodevelopmental disorder. The estimated prevalence of ADHD worldwide ranges between 5.29% and 7.1%. In the Indian scenario, the prevalence of ADHD falls in the range of 2% to 17%. ADHD is the only neurodevelopmental disorder in which pharmacotherapy has a major role. Acceptance to the medication has been increased and stigma got reduced, but still there remain preconceptions in public as well as most health professionals because often their views are ill-informed and inaccurate, and based on poor reporting by the lay media. However, the role of behavioural interventions cannot be ignored. Understanding of the neurobiology in terms of brain structure, brain function, and brain chemistry certainly supports the use of medications in ADHD. Stimulant medications have been used to treat symptoms of ADHD for over 80 years, longer than the use of antibiotics to treat an infection. Stimulants and nonstimulants are approved by FDA, AACAP and NICE guidelines. NICE guideline 2018 recommends focused group parent-training program of children under 5 years with ADHD as first-line treatment and medications for children above 5 years only after poor response to behaviour therapy. In India, considering affordability, availability, distance to travel and access to care, the pattern of ADHD medication use may not be in line with the standard guidelines. Medication choice may differ for people with comorbidities like anxiety disorder, psychosis, autism spectrum disorder, and intellectual disabilities. Based on the family's preference, each patient's treatment must be individualized. Close monitoring of adverse effects and tolerability is an essential component of medication management in ADHD, hence regular follow up and monitoring is imperative. Finally, many studies have found short term benefit of ADHD medications but the long-term benefit remains uncertain. Learning Objectives: The participant delegates will be able to learn the following: Neurobiological underpinnings for pharmacotherapy Medications for ADHD - past, present, and future Guidelines and practice parameters across the world vs Indian scenario

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Indian J Psychiatry. 2020;62:S24.

PREFRONTAL CORTICAL ACTIVITY IN CHILDREN WITH ADHD: A FUNCTIONAL NEAR INFRARED SPECTROSCOPY (FNIRS) STUDY.

Rajkumar S, Sagar R, Deepak KK, et al.

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder with a prevalence of 6-8% in children. The real time task related activation data in brain regions can be acquired using functional Near-infrared spectroscopy (fNIRS).

Objectives: The objective of the study was to examine and create a comprehensive clinical and neurocognitive profile of children with ADHD and matched controls then to correlate with prefrontal cortical activity as assessed by fNIRS.

Methodology: 15 children with drug naïve ADHD and 15 matched controls were interviewed according to semi structured performa, MINI-KID was used to screen for comorbidities. The cases fulfilled DSM 5 criteria of ADHD and were again subjected to Conner's Parent Rating Scale 3 - Revised (CPRS-3R) to ascertain type and severity of ADHD. Cases and controls were subjected to 16 channel fNIRS with software package for analysis during carefully designed working memory tasks (Stroop test, Visual and Verbal N-back (1 step and 2 step) tasks).

Results & Discussion: Out of 15 cases of ADHD, majority belonged to combined type (n=11), the inattentive and the hyperactive/impulsive subtype were equally represented (n=2). Mean CPRS-3-R scores on Inattention was 80.67(SD=6.97), Hyperactivity was 87(SD=8.46), Learning Difficulty was 72.27(SD=12.17), Executive function was 72.97(SD=10.38), Aggression was 78.20(SD=15.9) and Peer Relation was 84(SD=11.14). There was a significant difference between cases and controls with cases performing poorly in measures of executive function like verbal two back (p=0.02), visual one back (p=0.04), visual two back (p=0.03). The comparison of functional imaging data obtained by using fNIRS on channel wise analysis showed evidence of hypofrontality and deficient recruitment of regions necessary for effective performance of tasks (p<0.01).

Conclusion: The finding from our study confirms working memory deficits in ADHD its relation to dysfunction in corresponding neurobiological substrate ie. prefrontal cortex

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Indian J Psychiatry. 2020;62:S93.

SENSORY PROCESSING DIFFICULTIES AND ITS IMPACT IN CHILDREN WITH ADHD.

Ghosh P, Ghosh S, Moulick S.

Introduction - ADHD is one of the common behavioral disorders in children. Sensory processing difficulties that affect interpretation of sensory information can be present in children with ADHD and increase their difficulties in dealing with environmental sensory stimulation. Children with ADHD, have problems interacting effectively in the everyday environment due to sensory problem. Altered sensory information may cause poor motor coordination, incessant movement, inattention and impulsive behavior which leads to overall functional impairment in family life, academics, peer groups, social activities and in other activities of regular life. Aim- In this discussion an attempt has been taken to understand the impact of sensory processing difficulties on functional behavior in children with ADHD and discussing the outcome of occupational therapy as one of the treatment choice alongside the conventional treatment of ADHD.

Methodology- Discussion will be divided into 3 parts. Part 1> introduction and overview of sensory processing difficulties. Part 2> impact of sensory processing difficulties in attention deficit hyperactivity disorder in children. Part 3> effect of occupational therapy

Conclusion- Occupational therapy can improve the overall functioning of the children with ADHD who have associated sensory difficulties especially in the area of self-organization, self-regulation, sensory arousal and physical coordination

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Indian J Psychiatry. 2020;62:S17.

EARLY ADVERSITY, HPA AXIS DYSFUNCTION, SLC6A4 METHYLATION AND ADHD IN CHILDREN OF ALCOHOLICS.

Timothy A.

Background: Children of alcoholics (COA) face high early adversity with vulnerability to psychiatric disorders in later life. These children have also been shown to have HPA axis impairment. Attention Deficit and Hyperactivity Disorder (ADHD) has been shown to be associated both with hypercortisolism and hypocortisolism. We studied the association of early adversity with cortisol reactivity, gene methylation and ADHD in a sample of COAs and matched controls.

Methods: We examined children of alcoholics (N=50) and matched healthy controls (N=50) for exposure to early adversity. Cortisol reactivity was tested using Trier Social stress test for children (TSST-C). The children were screened for ADHD with or without disruptive behavior disorder (DBD). CpG methylation at specific CpG sites in SLC6A4 gene was ascertained in salivary DNA.

Results: COA had higher prevalence of ADHD (44% vs 22% in controls) Children with ADHD had higher levels of adversity (<0.001) and lower cortisol reactivity ($p < 0.001$) compared to those without ADHD. Children with ADHD and comorbid DBD had higher adversity and lower cortisol reactivity than those without. SLC6A4 methylation ($p > 0.44$) ($p < 0.05$) did not differ between the two groups. A binary logistic regression revealed that with early adversity, cortisol output and SLC6A4 methylation scores are predictors of ADHD. A mediational analysis revealed that reduced cortisol reactivity as well as increased SLC6A4 CpG methylation are mediational factors between early adversity and ADHD.

Conclusion: Our study provides further evidence that children with ADHD have higher early adversity and reduced cortisol reactivity. Cortisol reactivity is further blunted in children with ADHD and comorbid DBD. Cortisol reactivity and SLC6A4 methylation are mediating factors between early adversity and behavioural dysregulation in high risk children

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Indian J Psychiatry. 2020;62:S46-S47.

EXECUTIVE DYSFUNCTION IN INDIAN ADHD PROBANDS INFLUENCED MORE BY INATTENTION THAN I.Q. AS REVEALED BY DOPAMINERGIC GENE ANALYSIS.

Anon.

Background: Organizational inefficiency and inattention are speculated to be the reason for executive deficit (ED) of ADHD probands. Even with average IQ, probands often perform poorly due to higher inattention. Pharmacotherapy, cognitive behavioural therapy, and counselling provide only symptomatic relief. Several candidate genes showed involvement with ADHD; the most consistent are dopamine receptor 4 (DRD4) and solute carrier family 6 member 3 (SLC6A3). **Objective:** We analyzed the association of rarely investigated DRD4 and SLC6A3 variants with ADHD core traits in Indo-Caucasoid probands.

Methods: ED, inattention, organizational efficiency, and IQ were measured by Barkley Deficit in Executive Functioning-Child & Adolescent scale, DSM-IV-TR, Conners' Parent Rating Scale-revised, and WISC respectively. Target sites were analyzed by PCR, RFLP, and/or Sanger sequencing of genomic DNA.

Results: DRD4 variants mostly affected inattention while SLC6A3 variants showed association with IQ. Few DRD4 and SLC6A3 variants showed dichotomous association with IQ and inattention. DRD4 Exon3 VNTR >4R showed negative impact on all traits excepting IQ. Inattention showed correlation with attention span, organizational efficiency, and ED, while IQ failed to do so.

Conclusion: We infer that IQ and attention could be differentially regulated by dopaminergic gene variants affecting functional efficiency in ADHD and the two traits should be considered together for providing better rehabilitation

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Int J Environ Res Public Health. 2020;17.

APPLICATION AND PERCEIVED EFFECTIVENESS OF COMPLEMENTARY AND ALTERNATIVE INTERVENTION STRATEGIES FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: RELATIONSHIPS WITH AFFILIATE STIGMA.

Chou W-J, Liu T-L, Hsiao RC, et al.

This cross-sectional questionnaire survey study was designed to examine the complementary and alternative intervention strategies (CAIS) employed by caregivers for their children's attention-deficit/hyperactivity disorder (ADHD) and the associations of affiliate stigma with the employment and rated effectiveness of these strategies in Taiwan. A total of 400 caregivers of children with ADHD participated. CAIS that the caregivers employed and their effectiveness rated by the caregivers were surveyed. Associations of affiliate stigma with the application and rated effectiveness of the strategies were determined using logistic regression analysis. The results indicated that sensory integration (30.3%), exercise training (29.3%), sugar restriction (20.5%), and omega fatty acid supplementation (11.3%) were the most common CAIS that the caregivers employed. Caregivers with stronger affiliate stigma were more likely to employ sensory integration, exercise training, and omega fatty acid supplementation but also rated them as ineffective in treating their children's ADHD. Various CAIS were employed by the caregivers to manage their children's ADHD. Affiliate stigma was significantly associated with the application and rated ineffectiveness of several CAIS

Int J Environ Res Public Health. 2020;17.

TACTILE DISCRIMINATION, PRAXIS AND COGNITIVE IMPULSIVITY IN ADHD CHILDREN: A CROSS-SECTIONAL STUDY.

Romero-Ayuso D, Maciver D, Richmond J, et al.

Background: The study of attention deficit hyperactivity disorder (ADHD) has traditionally focused on deficit of inhibitory control and cognitive impulsivity. However, the pathophysiology of ADHD has also been associated with the somatosensory cortex. The aim of this study was to explore if there were differences in tactile discrimination and praxis between neurotypical and ADHD children and whether these differences could be explained by cognitive impulsivity.

Methods: A cross-sectional study was conducted. The sample comprised 74 children aged 7 to 11 years divided in two groups: 43 with neurotypical development, 31 with ADHD. To assess tactile discrimination, the finger localization and the graphesthesia tests were used. Praxis was assessed with the Kaufman Assessment Battery for Children (K-ABC) hand movement subtest, the action program and the Zoo Map subtests of the Behavioral Assessment of Dysexecutive Syndrome, and the complex figure of Rey-Osterrieth test (ROCF). Cognitive impulsivity was assessed using the Magallanes Computerized Impulsivity Scale test (EMIC).

Results: Children with ADHD showed greater cognitive impulsivity ($p = 0.038$) and scored lower in Zoo Map ($p = 0.023$) and hand-movement subtests ($p = 0.002$), and in ROCF test ($p = 0.004$). Differences in praxis skills still remained after controlling by gender and cognitive impulsivity.

Conclusion: Praxis deficit might have repercussions not only on the characterization of ADHD but also on its treatment

Int J Environ Res Public Health. 2020;17.

CAREGIVER-ATTRIBUTED ETIOLOGIES OF CHILDREN'S ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A STUDY IN TAIWAN.

Chou W-J, Liu T-L, Hsiao RC, et al.

The aim of this survey study was to examine the etiologies of attention-deficit/hyperactivity disorder (ADHD) attributed by caregivers of Taiwanese children with ADHD, particularly factors affecting such attribution. This study had 400 caregivers of children with ADHD as participants. We examined the caregiver-attributed etiologies of ADHD and factors affecting such attribution. Caregivers completed the self-report questionnaire to rate how likely they perceived various etiologies of ADHD to be; the Affiliate Stigma Scale for the level of affiliate stigma; and the short Chinese version of the Swanson, Nolan, and Pelham, Version IV Scale for child's ADHD and oppositional symptoms. Brain dysfunction (84.8%) was the most commonly attributed etiology, followed by failure of caregivers in disciplining the child (44.0%); a poor diet, such as a sugar-rich

diet (40.8%); a poor living environment (38.8%); the child imitating their peers improper behavior (37.3%); failure of school staff in disciplining the child (29.0%); the education system's overemphasis on academic performance (27.3%); and supernatural beings or divination-based reasons (3.8%). Caregivers affiliate stigma was significantly associated with the attribution of several nonbiological etiologies other than brain dysfunction. Caregivers education level and children's sex, hyperactivity/impulsivity, and oppositional symptoms were significantly associated with various caregiver-attributed etiologies. Therefore, to deliver more accurate knowledge about ADHD in educational programs, health professionals should consider those etiologies that are attributed by caregivers of children with ADHD

International Journal of Language & Communication Disorders. 2020 Mar;55:231-42.

THE ROLE OF LINGUISTIC AND COGNITIVE FACTORS IN EMOTION RECOGNITION DIFFICULTIES IN CHILDREN WITH ASD, ADHD OR DLD.

Ohtonen P, et al.

Background Many children with neurodevelopmental disorders such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD) or developmental language disorder (DLD) have difficulty recognizing and understanding emotions. However, the reasons for these difficulties are currently not well understood. **Aims** To compare the emotion recognition skills of children with neurodevelopmental disorders as well as those children's skills with the skills of their typically developing (TD) age peers. Also, to identify the role of underlying factors in predicting emotion recognition skills.

Methods & Procedures The 6-10 year old children (n = 50) who participated in the study had either ASD, ADHD or DLD and difficulties recognizing emotions from face and/or in voice. TD age peers (n = 106) served as controls. Children's skills were tested using six forced choice tasks with emotional nonsense words, meaningful emotional sentences, the FEFA 2 test, photographs, video clips and a task in which facial expressions and tones of voice had to be matched. Expressive vocabulary, rapid serial naming, auditory and visual working memory and Theory of Mind skills were explored as possible explanatory factors of the emotion recognition difficulties of the diagnosed children.

Outcomes & Results Children with ASD, ADHD or DLD did not significantly differ from each other in their linguistic or cognitive skills. Moreover, there were only minor differences between children with these diagnoses in recognizing facial expressions and emotional tone of voice and matching the two. The only significant difference was that children with ADHD recognized facial expressions in photographs better than children with DLD. The participants with diagnoses scored significantly lower than the controls in all but one emotion recognition tasks presented. According to the linear regression analysis, first-order Theory of Mind skills predicted the delay relative to typical development in the recognition of facial expressions in the FEFA 2 test, and expressive vocabulary and working memory skills together predicted the delay in the recognition of emotions in the matching task.

Conclusions & Implications Children with ASD, ADHD or DLD showed very similar emotion recognition skills and were also found to be significantly delayed in their development of these skills. Some predictive factors related to linguistic and cognitive skills were found for these difficulties. Information about impaired emotion recognition and underlying linguistic and cognitive skills helps to select intervention procedures. Without this information, therapy might unnecessarily focus on only symptoms

JAMA Network Open. 2020.

ASSOCIATION BETWEEN MATERNAL EXPOSURE TO MAGNETIC FIELD NONIONIZING RADIATION DURING PREGNANCY AND RISK OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN OFFSPRING IN A LONGITUDINAL BIRTH COHORT.

Li D-K, Chen H, Ferber JR, et al.

Importance: An association between maternal exposure to magnetic field (MF) nonionizing radiation during pregnancy and the risk of attention-deficit/hyperactivity disorder (ADHD) has been reported in both animal and human studies.

Objectives: To determine whether maternal exposure to high levels of MF nonionizing radiation is associated with an increased risk of ADHD in offspring by using more accurate measurements of MF nonionizing radiation levels and physician-diagnosed ADHD, rather than self-reports, and to determine whether the association differs for the subtypes of ADHD with or without immune-related comorbidities.

Design, Setting, and Participants: A longitudinal birth cohort study was conducted at Kaiser Permanente Northern California among 1482 mother-child pairs whose mothers were participants of an existing birth cohort and whose level of exposure to MF nonionizing radiation was captured during pregnancy in 2 studies conducted from October 1, 1996, to October 31, 1998, and from May 1, 2006, to February 29, 2012. The offspring were followed up from May 1, 1997, to December 31, 2017.

Exposure: All participating women wore a monitoring meter for 24 hours during pregnancy to capture the level of exposure to MF nonionizing radiation from any sources.

Main Outcomes and Measures: Physician-diagnosed ADHD and immune-related comorbidities of asthma or atopic dermatitis up to 20 years of age in offspring captured in the Kaiser Permanente Northern California electronic medical record from May 1, 1997, to December 31, 2017. Confounders were ascertained during in-person interviews during pregnancy.

Results: Among the 1454 mother-child pairs (548 white [37.7%], 110 African American [7.6%], 325 Hispanic [22.4%], 376 Asian or Pacific Islander [25.9%], and 95 other or unknown [6.5%]; mean [SD] maternal age, 31.4 [5.4] years), 61 children (4.2%) had physician-diagnosed ADHD. Using Cox proportional hazards regression to account for follow-up time and confounders, compared with children whose mothers had a low level of exposure to MF nonionizing radiation during pregnancy, children whose mothers were exposed to higher levels of MF nonionizing radiation had more than twice the risk of ADHD (adjusted hazard ratio [aHR], 2.01; 95% CI, 1.06-3.81). The association was stronger for ADHD that persisted into adolescence (12 years of age), with an aHR of 3.38 (95% CI, 1.43-8.02). When the subtypes of ADHD were examined, the association existed primarily for ADHD with immune-related comorbidities (asthma or atopic dermatitis), with an aHR of 4.57 (95% CI, 1.61-12.99) for all ADHD cases and an aHR of 8.27 (95% CI, 1.96-34.79) for persistent cases of ADHD.

Conclusions and Relevance: Consistent with the emerging literature, this study suggests that in utero exposure to high levels of MF nonionizing radiation was associated with an increased risk of ADHD, especially ADHD with immune-related comorbidity. The findings should spur more research to examine the biological association of in utero MF exposure with risk of ADHD in offspring, given that almost everyone is exposed to it

J Abnorm Child Psychol. 2020 Mar;48:391-406.

SLUGGISH COGNITIVE TEMPO IN ADOLESCENTS WITH AND WITHOUT ADHD: DIFFERENTIATION FROM ADOLESCENT-REPORTED ADHD INATTENTION AND UNIQUE ASSOCIATIONS WITH INTERNALIZING DOMAINS.

Becker SP, Leonard BG, Smith ZR, et al.

A growing number of studies support the internal and external validity of youth self-reported sluggish cognitive tempo (SCT) symptoms. However, no study has examined SCT in adolescents without ADHD, examined whether adolescent self-reported SCT is distinct from adolescent self-reported ADHD inattention (ADHD-IN), or evaluated whether links between SCT and internalizing problems differ for adolescents with or without ADHD. The present study is the first to (1) determine the convergent and discriminant validity of self-reported SCT and ADHD-IN symptoms in both adolescents with and without ADHD, (2) test the invariance of SCT and ADHD-IN symptoms across ADHD and comparison groups, (3) examine SCT as uniquely related to a range of internalizing-relevant domains, and (4) evaluate if the association between SCT with internalizing correlates differs for adolescents with or without ADHD. Participants were adolescents (Mage = 13 years) with (n = 162) and without (n = 140) ADHD. Adolescents and parents completed measures of internalizing symptoms and emotion dysregulation; adolescents completed measures of rumination and suicidal ideation. Analyses indicated that 13 of the 15 SCT items demonstrated convergent and discriminant validity from ADHD-IN, and SCT and ADHD-IN demonstrated invariance across the ADHD and comparison groups and across sex. SCT, but not ADHD-IN, was uniquely associated with greater adolescent-reported internalizing symptoms and suicidal ideation. Both SCT and ADHD-IN were uniquely associated with adolescent-reported emotion dysregulation and parent-reported internalizing symptoms. Only ADHD-IN was uniquely associated

with parent-reported emotion dysregulation. Findings support the differentiation of adolescent-reported SCT and ADHD-IN and demonstrate associations between SCT and increased internalizing problems in adolescents with and without ADHD

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J Abnorm Child Psychol. 2020 Apr;48:511-23.

MITIGATION OF A PROSPECTIVE ASSOCIATION BETWEEN EARLY LANGUAGE DELAY AT TODDLERHOOD AND ADHD AMONG BILINGUAL PRESCHOOLERS: EVIDENCE FROM THE GUSTO COHORT.

Goh Shaun KY, Yang H, Tsotsi S, et al.

There is accumulating evidence of a prospective relation between early language problems and ADHD, a disorder associated with deficits in executive functioning. However, little is known regarding this link among bilingual children. Here, we investigate whether (i) the prediction from language to ADHD may be lower among bilinguals, and (ii) explore if this moderation can be explained by differential executive functioning ability. Utilising a prospective sample of 408 South-East Asian toddlers, bilingual exposure as a moderator of the link between language delay at 24 months to ADHD intermediate diagnosis at 54 months was first examined with an interaction model. Next, structural equation mediated moderation models examined if the proposed moderation could be explained by executive function measures of Snack Delay and Dimensional Change Card Sort (DCCS) task, when children were 41 months. Results indicate that higher levels of bilingual exposure moderated the prospective risk of language delay to ADHD diagnosis (Predominantly single-language exposed OR = 6.37; $p = .011$; Predominantly dual-language exposed OR = 0.30, $p = .156$). Thus, language delay associated with ADHD among toddlers predominantly exposed to one but not two languages. However, this could not be explained by differential executive functioning, as this moderation was not mediated by performance on Snack Delay or DCCS. Unexpectedly, bilingual exposure associated with ADHD among toddlers of typical language development. Possible explanations, including variation in the degree of social stigma and persistence of language delay between bilingual and monolingual children, and bilingualism as an additional cognitive load for ADHD, are discussed

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J Abnorm Child Psychol. 2020 Mar;48:375-89.

TRAINING EXECUTIVE, ATTENTION, AND MOTOR SKILLS (TEAMS): A PRELIMINARY RANDOMIZED CLINICAL TRIAL OF PRESCHOOL YOUTH WITH ADHD.

Halperin JM, Marks DJ, Chacko A, et al.

This preliminary randomized controlled trial compared Training Executive, Attention and Motor Skills (TEAMS), a played-based intervention for preschool children with attention-deficit/hyperactivity disorder (ADHD), to an active comparison intervention consisting of parent education and support (ClinicalTrials.gov Identifier: NCT01462032). The primary aims were to gauge preliminary efficacy and assist in further development of TEAMS. Four- and 5-year-old children with ADHD were randomly assigned to receive TEAMS (N = 26) or the comparison intervention (N = 26) with blinded assessments by parents, teachers and clinicians ascertained pretreatment, post-treatment, and 1- and 3-months post-treatment. Changes in ADHD severity, impairment, parenting factors, and neuropsychological functioning over time as a function of treatment condition were assessed using the PROC MIXED procedure in SAS. Across most measures, significant main effects for Time emerged; both treatments were associated with reduced ADHD symptoms that persisted for three months post-treatment. There were no significant Treatment effects or Time x Treatment interactions on symptom and impairment measures, suggesting that the magnitude of improvement did not differ between the two interventions. However, significant correlations emerged between the magnitude of behavioral change, as assessed by parents and clinicians, and the amount of time families engaged in TEAMS-related activities during treatment. Across a wide array of parenting and neuropsychological measures, there were few significant group differences over time. TEAMS and other

psychosocial interventions appear to provide similar levels of benefit. Play-based interventions like TEAMS represent a potentially viable alternative/addition to current ADHD treatments, particularly for young children, but more research and further development of techniques are necessary

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J Abnorm Child Psychol. 2020 Apr;48:495-510.

DECISION-MAKING DEFICITS IN ADOLESCENT BOYS WITH AND WITHOUT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD): AN EXPERIMENTAL ASSESSMENT OF ASSOCIATED MECHANISMS.

Dekkers TJ, Huizenga HM, Popma A, et al.

Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD) demonstrate increased levels of real-life risk-taking behavior like substance abuse and reckless behavior in traffic, which potentially originates in decision-making deficits. Using experimental gambling tasks, the current study investigated three potential underlying mechanisms: (1) risky vs. suboptimal decision making, (2) the complexity of decision-making strategies and (3) the influence of feedback. Participants were 181 male adolescents (81 ADHD, 100 Typically Developing (TD); Mage=15.1 years). First, we addressed a common confound in many gambling tasks by disentangling risk seeking from suboptimal decision making, and found that ADHD-related decision-making deficits do not originate in increased risk seeking but in suboptimal decision making. Second, we assessed decision-making strategies with a Bayesian latent mixture analysis and found that ADHD-related decision-making deficits are characterized by the use of less complex strategies. That is, adolescent boys with ADHD, relative to TD adolescent boys, less often adopted strategies in which all characteristics relevant to make an optimal decision were integrated. Third, we administered two gambling task conditions with feedback in which adolescents experience the outcomes of their decisions and found that adolescents with ADHD performed worse relative to TD adolescents on both conditions. Altogether, this set of studies demonstrated consistent decision-making deficits in adolescent boys with ADHD: The use of less complex decision-making strategies may cause suboptimal decision making, both in situations with and without direct feedback on performance

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J Adolesc Health. 2020.

CANNABIS USE AND INTERNALIZING/EXTERNALIZING SYMPTOMS IN YOUTH: A CANADIAN POPULATION-BASED STUDY.

Girgis J, Pringsheim T, Williams J, et al.

Purpose: With the recent legalization of cannabis for nonmedicinal purposes in Canada, it is becoming increasingly important to understand the potential mental health risks that cannabis may present. The objective of this study was to estimate associations between the frequency of cannabis use and the presence of elevated internalizing (e.g., anxiety and depression) and externalizing (e.g., conduct disorder and attention deficit hyperactivity disorder) symptoms within Ontario youth aged 12-17 years.

Methods: The 2014 Ontario Child Health Study included Emotional and Behavioural Scales used to assess internalizing and externalizing symptoms. To assess associations between internalizing/externalizing symptoms and cannabis use, the Ontario Child Health Study-Emotional and Behavioural Scales were dichotomized using the upper quintile (those with the most severe symptoms). Logistic regression was used to estimate odds ratios (ORs) to quantify the association between the frequency of cannabis use and the presence of elevated internalizing and externalizing symptoms. Estimates used a recommended procedure (replicate bootstrap weighting) to address design effects.

Results: A significant association between frequent cannabis use and elevated externalizing symptoms was observed with an OR of 2.17 (1.80-2.62) in males and 5.13 (4.24-6.21) in females. Similar significant associations were also observed between frequent cannabis use and elevated internalizing symptoms with an OR of 2.07 (1.74-2.47) in males and an OR of 3.40 (2.73-4.24) in females. These associations were still present after adjusting for age, binge drinking, smoking, and negative/positive parenting.

Conclusions: Cannabis use, especially in females and frequent users, is associated with elevated levels of internalizing and externalizing symptoms

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J Child Adolesc Psychopharmacol. 2020 Mar;30:87-96.

PSYCHOTROPIC MEDICATION PRESCRIPTION RATES AND TRENDS FOR NEW ZEALAND CHILDREN AND ADOLESCENTS 2008-2016.

Barczyk ZA, Rucklidge JJ, Eggleston M, et al.

Objectives: The prescription of psychotropic medication used to treat psychiatric disorders has increased worldwide over the past two decades and has been discussed widely in the literature; however, limited data have been available for New Zealand. The current article aimed to address this knowledge gap.

Methods: Prescription data obtained from The Pharmaceutical Management Agency of New Zealand (PHARMAC) were analyzed to obtain prescription dispensing rates and trends for antidepressants, antipsychotics, anxiolytics, sedatives and hypnotics, and stimulants/attention-deficit/hyperactivity disorder medications for youth aged 0-17 years in New Zealand during 2008-2016, including a gender and ethnicity breakdown for 2016 to provide a snapshot of prescription demographics. These data sets contained all individual prescriptions dispensed in New Zealand during this time period, alongside a unique encrypted National Health Index number to distinguish individuals and demographic data.

Results: In 2016, 2.36% of New Zealand youth, totaling 26,175 individuals, were prescribed at least one psychotropic medication, an increase of 65.03% from 2008. Rate of prescription for youth in 2016 and percentage increase since 2008 for each medication class were as follows: antidepressants: 1.07%, 78.33% increase; antipsychotics: 0.37%, 105.60% increase; anxiolytics: 0.15%, 50% increase; and sedatives and hypnotics: 0.22%, 37.50% increase. Stimulants were prescribed to 1.06% of the population, a 41.33% increase since 2011. In 2016 the number of prescriptions was split roughly equally between males and females, with more males receiving stimulant prescriptions and more females receiving antidepressant prescriptions. Stimulants were the medication most likely to be prescribed to Mori, Pacific, and Middle Eastern/Latin American/African groups, with antidepressants most likely for European and Asian groups. Mori tended to be prescribed medications at rates lower than the general population.

Conclusions: Overall, prescription rates and the increase in prescription of psychotropic medication to children and adolescents in New Zealand fall within the mid range compared to other Western countries worldwide

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J Child Adolesc Psychopharmacol. 2020 Feb;30:48-54.

STANDARDIZED OBSERVATION ANALOGUE PROCEDURE IN THE TREATMENT OF SEVERE CHILDHOOD AGGRESSION STUDY.

Grondhuis SN, Farmer CA, Arnold LE, et al.

Objective: To explore blinded observational outcomes in the Treatment of Severe Childhood Aggression (TOSCA) study.

Methods: During a 9-week acute trial, children with severe physical aggression and attention-deficit/hyperactivity disorder received parent training + titrated psychostimulant for 3 weeks, and those who failed to show an optimal response during Week 4 through Week 6 received in addition either randomly assigned placebo (Basic treatment) or titrated risperidone (Augmented treatment). Child and parent behaviors were videotaped in a Standardized Observation Analogue Procedure (SOAP) designed to elicit problems and strengths in child and parent interactions. SOAPS were collected at baseline and Week 9 and 52 follow-up.

Results: During the acute 9-week trial, augmented treatment was associated with better outcomes than basic treatment for 3 of 13 measures: increased Child Compliance ($p=0.004$; significant after correction for multiple tests), greater use of positive Parent Reinforcement ($p=0.03$), and more Shared Enjoyment ($p=0.04$). At follow-up, when medication was no longer by randomized assignment, parents used more Alpha Commands and displayed fewer Parent Negative Behaviors, and the dyads showed more Shared Enjoyment regardless

of original randomization. Thus, there were better parent-child interactions with Augmented treatment, and interactions improved overall at follow-up regardless of original treatment assignment.

Conclusions: The SOAP demonstrated sensitivity to behavior changes between short-term treatments for a few (but not most) measures. The acute treatment differences for Child Compliance and Child Negative Behavior are generally consistent with the moderate superiority of Augmented over Basic treatment previously reported for the primary study outcome

J Child Adolesc Psychopharmacol. 2020 Apr;30:173-76.

LEVELS OF PRONENESS TO BOREDOM IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER ON AND OFF METHYLPHENIDATE TREATMENT.

Golubchik P, Manor I, Shoval G, et al.

Objective: To evaluate the relationship between attention-deficit/hyperactivity disorder (ADHD) severity and propensity for boredom in children with ADHD, both on and off methylphenidate (MPH).

Methods: A group of children and adolescents with ADHD (n = 30), aged 7-18 years, were assessed using the Parent-Reported-ADHD Rating Scale-5 (PR-ADHD-RS-5) and Short Boredom Proneness Scale (SBPS), at baseline, after 3 months of MPH treatment, and again after 3 weeks of MPH treatment discontinuation.

Results: Significant correlation was found at baseline between PR-ADHD-RS-5 and SBPS scores [n = 30, r = 0.40 (95% confidence interval {CI} = 0.048-0.67), p = 0.027]. Both ADHD and boredom levels decreased significantly after 3 months of MPH treatment. Significant correlation was found between the reductions in PR-ADHD-RS-5 and SBPS scores at this time [n = 30, r = 0.39 (95% CI = 0.035-0.66), p = 0.045]. MPH discontinuation for 3 weeks resulted in mild but statistically significant increases in ADHD and SBPS levels. No significant correlation was detected between the changes in PR-ADHD-RS-5 and SBPS scores after 3 weeks of MPH discontinuation.

Conclusions: Three months of MPH treatment resulted in parallel improvement in ADHD severity and in the level of proneness to boredom (PtB), whereas discontinuation of MPH administration is associated with increases in the two parameters, causing them to approach pretreatment levels. Clinicians and parents should be aware of the possibility of increased PtB in children with ADHD who discontinue MPH treatment. Structured daily activity and continuation of MPH treatment may preserve the beneficial effects of MPH on academic and leisure activities and may prevent aggravation of subjective boredom sensations that could lead to risky sensation-seeking behaviors and overuse of electronic devices

J Child Adolesc Psychopharmacol. 2020 Mar;30:119-22.

METABOLIC MONITORING RATES OF YOUTH TREATED WITH SECOND-GENERATION ANTIPSYCHOTICS IN USUAL CARE: RESULTS OF A LARGE US NATIONAL COMMERCIAL HEALTH PLAN.

Hayden JD, Horter L, Parsons T, III, et al.

Objectives: To examine metabolic monitoring rates in commercially insured children and adolescents treated with a second-generation antipsychotic (SGA) during calendar years (CYs) 2016 and 2017.

Methods: In this retrospective study, data were collected from a large national commercial health plan for the period covering January 1, 2016 to December 31, 2017. Commercially insured children and adolescents, aged 8-19 years with ≥ 2 SGA prescription claims during the CY, were identified for the CY2016 and CY2017 cohorts. The primary outcome of interest was the percentage of subjects with any glucose or lipid metabolism parameter monitoring. Other calculated metabolic testing rates included glucose, hemoglobin A1c (HbA1c), low-density lipoprotein cholesterol (LDL-C), other cholesterol (including triglycerides), and combined glucose and lipid metabolism testing (≥ 1 test for blood glucose or HbA1c and ≥ 1 test for LDL-C or other cholesterol).

Results: In CY2016 and CY2017, 1502 and 1239 subjects, respectively, were identified for this study. The most common psychiatric diagnoses in CY2016 and CY2017 were major depressive disorder (57.1%, 56.5%, respectively), anxiety disorders (42.9%, 47.5%), attention-deficit/hyperactivity disorder (41.6%, 45.8%), and bipolar disorder (24.1%, 25.9%). The rate of any metabolic testing was 53.5% in CY2016 and 51.3% in CY2017. Glucose testing (50.3%, 46.9%, respectively) was most common in both CYs, followed by LDL-C

testing (31.2%, 28.5%). Rates of combined glucose and lipid metabolism testing were 30.7% in CY2016 and 26.9% in CY2017.

Conclusions: Given the known potential for adverse cardiometabolic effects, rates of metabolic monitoring associated with SGA use in children and adolescents urgently need to be improved. There is a critical need for understanding barriers to routine monitoring, particularly of lipids, and developing interventions to enhance metabolic monitoring

J Child Adolesc Psychopharmacol. 2020 Mar;30:58-68.

RANDOMIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED, FLEXIBLE-DOSE TITRATION STUDY OF METHYLPHENIDATE HYDROCHLORIDE EXTENDED-RELEASE CAPSULES (APTENSIO XR) IN PRESCHOOL CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Childress AC, Kollins SH, Foehl HC, et al.

Objectives: To assess the efficacy and safety of a methylphenidate hydrochloride extended-release capsule (MPH-MLR) formulation in treating attention-deficit/hyperactivity disorder (ADHD) in preschool children.

Methods: Children aged 4 to <6 years with qualifying ADHD Rating Scale Fourth Edition (ADHD-RS-IV) Preschool Version scores (≥ 90 th percentile for age/gender) participated in four behavior management training (BMT) sessions or immediately entered (based on investigator assessment of symptom severity or previous participation) into a 6-week, open-label, flexible MPH-MLR dose optimization phase. After BMT, children with <30% improvement in ADHD-RS-IV score and ≥ 3 score on the Clinical Global Impression-Improvement (CGI-I) scale also entered the open-label period. All children began the open-label period with MPH-MLR 10 mg once daily; weekly adjustments permitted once-daily maximum of up to 40 mg. Children with $\geq 30\%$ improvement in ADHD-RS-IV total score and a CGI-I score of 1-2 at open-label completion were randomized to their optimized dose of MPH-MLR or placebo for 2 weeks (double blind [DB]). Safety measures included adverse events (AEs), vital signs, and electrocardiograms.

Results: Open-label enrollment was 119 children. Mean (SD) ADHD-RS-IV total scores at open-label start and open-label end was 40.8 (10.4) and 19.5 (11.1), respectively. Ninety children were enrolled in the DB phase. Mean (SD) ADHD-RS-IV total scores for the MPH-MLR and placebo group were similar at DB beginning and was 25.8 (14.6) and 34.9 (14.1), respectively, at DB end. Mean change from baseline in ADHD-RS-IV total score during DB was significantly greater in children randomized to placebo compared with MPH-MLR; least squares mean change difference from baseline was -11.2, $p=0.002$. During open-label dosing, the most common AEs ($\geq 10\%$) were decreased appetite, decreased weight, insomnia, hypertension, emotional disorder, and affect lability.

Conclusion: Results demonstrate MPH-MLR efficacy in preschool children and a safety profile consistent with known AEs of methylphenidate when used for ADHD

J Child Adolesc Psychopharmacol. 2020 Feb;30:21-31.

PHASE II/III STUDY OF LISDEXAMFETAMINE DIMESYLATE IN JAPANESE PEDIATRIC PATIENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Ichikawa H, Miyajima T, Yamashita Y, et al.

Objective: To further define the efficacy and safety profiles of lisdexamfetamine dimesylate (LDX) in Japanese pediatric patients with attention-deficit/hyperactivity disorder (ADHD).

Methods: This was a multicenter, randomized, double-blind, placebo-controlled study of LDX 30, 50, or 70 mg/day for 4 weeks in 76 patients 6-17 years of age with ADHD in Japan. The primary efficacy endpoint was the change in the ADHD Rating Scale-IV (ADHD-RS-IV) total score from baseline to 4 weeks. Secondary efficacy endpoints were: Conners' Third Edition (Japanese version) Parent Rating Scale (Conners 3), Clinical Global Impression-Improvement (CGI-I) scale, and Parent Global Assessment (PGA) scale.

Results: Change in the ADHD-RS-IV total score from baseline to 4 weeks was significantly greater ($p < 0.0001$) in all LDX dosage groups versus placebo (30 mg, -16.38; 50 mg, -18.10; 70 mg, -16.47; placebo, -2.78). At all time points, improvements (decreases) in the ADHD-RS-IV total score were significantly greater

in all LDX groups versus placebo. At weeks 3 and 4, improvements from baseline in Conners 3 inattention plus hyperactivity/impulsivity subscale scores were significantly greater ($p \leq 0.0082$) for all LDX dosages versus placebo. At week 4, the proportion of LDX-treated patients "much improved" or "very much improved" was 61%-71% on the CGI-I scale ($p \leq 0.0019$) and 56%-65% on the PGA scale ($p \leq 0.0170$). LDX was generally well tolerated. The most frequent treatment-emergent adverse events (AEs) were decreased appetite, headache, and initial insomnia. No severe/serious AEs occurred, and no AEs specific to Japanese patients were evident.

Conclusions: The superiority of LDX 30, 50, and 70 mg/day over placebo was confirmed in Japanese pediatric patients with ADHD, and no major safety or tolerability concerns were identified

J Child Adolesc Psychopharmacol. 2020 Apr;30:128-36.

LISDEXAMFETAMINE DIMESYLATE FOR PRESCHOOL CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Childress AC, Findling RL, Wu J, et al.

Objectives: Describe the safety and tolerability of lisdexamfetamine dimesylate (LDX) and provide data on clinical effects for efficacy-related endpoints and pharmacokinetics in preschool-aged children with attention-deficit/hyperactivity disorder (ADHD).

Methods: This phase 2, multicenter, open-label, dose-optimization study (ClinicalTrials.gov registry: NCT02402166) was conducted at seven U.S. sites between April 15, 2015, and June 30, 2016. Children (4-5 years of age) meeting Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision criteria for ADHD and having ADHD Rating Scale-IV Preschool version (ADHD-RS-IV-PS) total scores ≥ 28 (boys) or ≥ 24 (girls) were eligible. Open-label LDX (8-week duration) was initiated at 5 mg and titrated to 30 mg until achieving an optimal dose. Assessments included treatment-emergent adverse events (TEAEs), vital sign changes, ADHD-RS-IV-PS total score changes, and pharmacokinetic evaluations.

Results: Among 24 participants, the most frequently reported TEAE was decreased appetite (8/24; 33%). At week 8/early termination, mean (standard deviation) systolic and diastolic blood pressure and pulse changes from baseline were -1.1 (7.31) and 1.5 (6.93) mmHg and -0.8 (12.75) bpm, respectively. The mean (95% confidence interval) change from baseline ADHD-RS-IV-PS total score at the final on-treatment assessment was -26.1 (-32.2 to -20.0). Pharmacokinetic parameters of d-amphetamine, a major active metabolite of LDX, were characterized: d-amphetamine exposure increased with LDX dose; mean t_{max} and $t_{1/2}$, respectively, ranged from 4.00 to 4.23 hours and 7.18 to 8.46 hours.

Conclusions: In preschool-aged children with ADHD, LDX was generally well tolerated and reduced ADHD symptoms, consistent with observations in children 6-17 years of age. Based on these findings, a starting LDX dose as low as 5 mg in phase 3 studies in preschool-aged children is supported

J Child Adolesc Psychopharmacol. 2020 Apr;30:189-97.

THE EFFECTS OF METHYLPHENIDATE TREATMENT ON CHILD GROWTH IN THAI CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Koonrungsesomboon K, Koonrungsesomboon N.

Objectives: To determine the effects of methylphenidate treatment on child growth in Thai pediatric patients with attention-deficit/hyperactivity disorder (ADHD).

Methods: The medical records of children and adolescents with ADHD, between 5 and 18 years of age, who received pharmacological treatment with methylphenidate as a sole psychiatric medication for ≥ 1 year between 2001 and 2018 at the Rajanagarindra Institute of Child Development, Thailand, were retrospectively reviewed. Data on anthropometric parameters and methylphenidate use were extracted. Height and weight were converted to age- and gender-corrected standard scores (z-scores) using norms from the Thai pediatric population. Changes in height and weight z-scores were assessed using a paired t-test or one-way repeated measures ANOVA with the Bonferroni correction.

Results: In this retrospective observational study, 911 children and adolescents were eligible, with the mean age of 95.0 ± 19.5 months at baseline, the cumulative duration of methylphenidate treatment of 39.4 ± 23.5 months, and the average daily dosage of 14.1 ± 6.2 mg/day. Comparative analysis found no statistically significant change in height z-scores between baseline and last recorded measurement (mean difference = 0.0017, confidence interval [95% CI] = -0.0004 to 0.0038, $p = 0.107$), while a slight, but significant increase in weight z-scores was observed (mean difference = 0.0271, 95% CI = 0.0179-0.0362, $p < 0.001$). Longitudinal analysis observed that weight z-scores were significantly decreased during the first year of therapy, but regained in the second year and continued to increase in subsequent years of therapy.

Conclusion: Treatment with methylphenidate in our cohort of Thai pediatric patients with ADHD was not associated with growth deficits, except for a slightly significant decrease in weight during the first year of therapy

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J Child Adolesc Psychopharmacol. 2020 Apr;30:166-72.

DEVELOPMENT OF A COMPOSITE PRIMARY OUTCOME SCORE FOR CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND EMOTIONAL DYSREGULATION.

Johnstone JM, Leung BM, Srikanth P, et al.

Objective: Study goals were to (1) provide a rationale for developing a composite primary outcome score that includes symptom severity for attention-deficit/hyperactivity disorder (ADHD) and emotional dysregulation, plus symptom-induced impairment; (2) demonstrate weighting methods to calculate the composite score using a sample of children diagnosed with ADHD and aggression; and (3) identify the optimal weighting method most sensitive to change, as measured by effect sizes.

Methods: We conducted secondary data analyses from the previously conducted Treatment of Severe Childhood Aggression (TOSCA) study. Children aged 6-12 years were recruited through academic medical centers or community referrals. The composite primary outcome comprised the ADHD, oppositional defiant disorder, disruptive mood dysregulation disorder, and peer conflict subscales from the Child and Adolescent Symptom Inventory (CASI), a DSM (Diagnostic and Statistical Manual)-referenced rating scale of symptom severity and symptom-induced impairment. Five weighting methods were tested based on input from senior statisticians.

Results: The composite score demonstrated a larger (Cohen's d) effect size than the individual CASI subscales, irrespective of the weighting method (10%-55% larger). Across all weighting methods, effect sizes were similar and substantial: approximately a two-standard deviation symptom reduction (range: -1.97 to -2.04), highest for equal item and equal subscale weighting, was demonstrated, from baseline to week 9, among all TOSCA participants. The composite score showed a medium positive correlation with the Clinical Global Impressions-Severity scores, 0.46-0.47 for all weighting methods.

Conclusions: A composite score that included severity and impairment ratings of ADHD and emotional dysregulation demonstrated a more robust pre-post change than individual subscales. This composite may be a more useful indicator of clinically relevant improvement in heterogeneous samples with ADHD than single subscales, avoiding some of the statistical limitations associated with multiple comparisons. Among the five similar weighting methods, the two best appear to be the equal item and equal subscale weighting methods

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J Child Adolesc Psychopharmacol. 2020 Mar;30:104-18.

DIAGNOSIS AND TREATMENT OPTIONS FOR PRESCHOOLERS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Wigal S, Chappell P, Palumbo D, et al.

Objective: The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), classifies attention-deficit/hyperactivity disorder (ADHD) as a neurodevelopmental disorder, with symptoms becoming apparent as early as the preschool years. Early recognition can lead to interventions such as parent/teacher-administered behavior therapy, the recommended first-line treatment for preschool patients. There are few

data, however, to inform the use of second-line, pharmacotherapy options in this population. In this review, we identified recent literature on the diagnosis and treatment of ADHD in preschool children.

Methods: A PubMed and clinicaltrials.gov search was conducted for trials assessing efficacy or safety of ADHD medications in children aged <6 years. Diagnostic methods and criteria focusing on recognition of ADHD in preschool children were also surveyed.

Results: The DSM-5 describes different manifestations of ADHD in preschool versus school-aged children, but does not list separate criteria by age group. Importantly, behaviors indicative of ADHD in older children may be developmentally appropriate in preschool children. Several behavioral rating scales have been validated in children younger than 6 years of age for assessing ADHD. The Preschool ADHD Treatment Study (PATS) has provided the most extensive efficacy and safety data on methylphenidate (MPH) for ADHD in preschoolers to date, with significant improvement in ADHD symptoms observed with MPH compared with placebo, although adverse event-related discontinuation was higher in PATS compared with studies of MPH for ADHD in school-aged children. Since PATS was conducted, few studies designed to assess ADHD medication effectiveness in preschool children have been published. One article reported significant improvement in ADHD symptoms with MPH (immediate release) versus placebo, two studies showed no difference between MPH and risperidone or MPH plus risperidone in relief of ADHD symptoms, and one study demonstrated the efficacy of atomoxetine versus placebo for ADHD symptoms in preschoolers.

Conclusions: Further research is needed on pharmacotherapy for preschool children with ADHD

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J Child Adolesc Psychopharmacol. 2020 Apr;30:148-58.

COMPARATIVE EFFICACY OF METHYLPHENIDATE AND ATOMOXETINE ON SOCIAL ADJUSTMENT IN YOUTHS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Chi-Yung S, Hsien-Hsueh S, Yi-Lei P, et al.

Objective: Although methylphenidate and atomoxetine have positive effects in reducing core symptoms and emotional/behavioral problems of attention-deficit/hyperactivity disorder (ADHD), little is known about their efficacy in improving social adjustment problems among youths with ADHD.

Methods: A total of 168 drug-naive youths, 7-16 years of age, with DSM-IV-defined ADHD, were recruited and randomly assigned to osmotic-release oral system methylphenidate (n = 83) and atomoxetine (n = 85) in a 24-week, open-label, head-to-head clinical trial. Efficacy measurement was based on the parent-rated and self-rated Social Adjustment Inventory for Children and Adolescents (SAICA). Evaluation time points were set at baseline and weeks 8, 16, and 24.

Results: At week 24, methylphenidate was associated with improvement in school functions (parent report: Cohen d = -0.82; self-report: Cohen d = -0.66) and peer relationships (parent report: Cohen d = -0.50; self-report: Cohen d = -0.25); and atomoxetine was associated with improvement in school functions (parent report: Cohen d = -0.62; self-report: Cohen d = -0.34) and peer relationships (parent report: Cohen d = -0.33; self-report: Cohen d = -0.65). In terms of parent-reported and self-reported ratings, there were no significant differences between the two treatment groups in mean reduction in the severity of school dysfunctions, impaired peer relationships, and behavioral problems at home at week 24.

Conclusions: Our findings lend evidence to support that both methylphenidate and atomoxetine were comparably effective in improving social adjustment in youths with ADHD, including school functions and peer relationships

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J Child Adolesc Psychopharmacol. 2020;30:81-86.

YOUNG CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND/OR DISRUPTIVE BEHAVIOR DISORDERS ARE MORE FREQUENTLY PRESCRIBED ALPHA AGONISTS THAN STIMULANTS.

Mittal S, Boan AD, Kral MC, et al.

Objective: To examine medication prescribing patterns for preschool-aged children with diagnoses of attention-deficit/hyperactivity disorder (ADHD) and/or disruptive behavior disorder (DBD). Secondary

objectives included determining if prescription patterns varied by gender, insurance type, or comorbid diagnosis of autism spectrum disorder (ASD).

Methods: A retrospective, cross-sectional chart review was completed for children ages 2-5 years who were treated at an academic medical center between 2013 and 2016 with a diagnosis of ADHD and/or DBD. Data were analyzed by Fisher's exact and chi-square tests and Cochran-Armitage trend analysis.

Results: Of the 966 children who met inclusion criteria, 343 (35.5%) were prescribed ADHD medications. For 2-, 3-, and 4-year olds, the most commonly prescribed medication was an alpha agonist (AA), while for 5-year olds, methylphenidate (MPH) was most commonly prescribed. With advancing age, an increasing number of children were prescribed a stimulant medication and a decreasing number of children were prescribed an AA ($p < 0.001$). Children were more often prescribed an MPH formulation (48.2%) compared with amphetamine-based stimulants (26.8%). Children without ASD were more likely to be prescribed a stimulant medication (72.1%) when compared with children with ASD (37.0%, $p < 0.0001$). Children with private insurance were more likely to be prescribed an extended-release stimulant medication when compared with Medicaid patients (34.3% vs. 17.2%, $p = 0.004$).

Conclusion: Both stimulants and nonstimulants are being prescribed regularly in very young children, even before the age of four at an academic medical center. AAs were the most commonly prescribed medication for children 2, 3, and 4 years of age with diagnoses of ADHD, DBD, and ASD. Insurance type, comorbid diagnosis of ASD, and age of child were found to be significantly associated with prescribing a nonpreferred medication

J Child Adolesc Psychopharmacol. 2020 Apr;30:159-65.

EFFECTS OF DISCONTINUING METHYLPHENIDATE ON STRENGTHS AND DIFFICULTIES, QUALITY OF LIFE AND PARENTING STRESS.

Matthijssen AF, Dietrich A, Bierens M, et al.

Objectives: To study the effects of discontinuation of long-term methylphenidate use on secondary outcome measures of strengths and difficulties, quality of life (QoL), and parenting stress.

Methods: Ninety-four children and adolescents aged 8 to 18 years who had used methylphenidate for over 2 years were randomly assigned to double-blind continuation of treatment for 7 weeks (36 or 54 mg extended release methylphenidate) or to gradual withdrawal over 3 to 4 weeks placebo. We used mixed models for repeated measures to investigate effects on parent, teacher, and child ratings of hyperactivity/inattention and comorbid symptoms with the Strengths and Difficulties Questionnaire (SDQ), investigator- and teacher-rated oppositional symptoms (Conners Teacher Rating Scale-Revised: short form [CTRS-R:S]), and parent-rated aggression with the Retrospective Modified Overt Aggression Scale. QoL was assessed with the Revised Questionnaire for Children and Adolescents to record health-related quality of life and parenting stress with the Nijmegen Parental Stress Index.

Results: Hyperactivity/inattention scores from the parent- and teacher-rated SDQ (difference in mean change over time of respectively: 1.1 [95% confidence interval, CI, 2.0 to 0.3]; $p=0.01$; 2.9 [95% CI 2.9 to 0.7; $p=0.01$]) and oppositional scores of the teacher-rated CTRS-R:S (difference in mean change 1.9 95% CI [3.1 to 0.6; $p<0.01$]) deteriorated to a significantly larger extent in the discontinuation group than in the continuation group. We did not find effects on other symptom domains, aggression, QoL, and parenting stress after discontinuation of methylphenidate.

Conclusion: Our study suggests beneficial effects of long-term methylphenidate use beyond 2 years for oppositional behaviors in the school environment. Similarly, beneficial effects were found on hyperactivity-inattention symptoms as rated by parent and teacher scales, confirming our primary study on investigator ratings of attention-deficit/hyperactivity disorder. However, discontinuation of methylphenidate did not appear to have impact on other comorbid problems or aspects of the child's or parental functioning

J Child Psychol Psychiatry. 2020 Feb;61:140-47.

USE OF MEDICATION FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND RISK OF UNINTENTIONAL INJURIES IN CHILDREN AND ADOLESCENTS WITH CO-OCCURRING NEURODEVELOPMENTAL DISORDERS.

Ghirardi L, Chen Q, Chang Z, et al.

BACKGROUND: Attention-deficit/hyperactivity disorder (ADHD) is often associated with other neurodevelopmental disorders (NDs) and with risky behaviors and adverse health outcomes, including injuries. Treatment with ADHD medication has been associated with reduced risk of injuries. However, it is unknown whether the association is present in individuals with co-occurring NDs. The aim of the present study was to estimate the association between ADHD medication use and unintentional injuries in Sweden in children and adolescents with ADHD, including those with co-occurring NDs.

METHODS: Using a linkage of several national registers via the unique personal identification number, we identified individuals with a diagnosis of ADHD and of other NDs, including autism spectrum disorder, intellectual disability, communication disorders, learning disorders and motor disorders. The primary outcome was unintentional injuries. Secondary outcome was traumatic brain injury (TBI). Individuals were followed from January 1st 2006 or their 5th birthday or the date of the first unintentional injury, whichever came last, to December 31st 2013 or their 18th birthday or death, whichever came first. We compared the rate of injuries during periods on-treatment with the rate of injuries during periods off-treatment within the same individual using stratified Cox regression to calculate hazard ratio (HR) with 95% confidence intervals (CIs).

RESULTS: For children and adolescents with ADHD (N = 9,421) the rate of any unintentional injuries (HR = 0.85; 95% CI = 0.78-0.92) and TBIs (HR = 0.27; 95% CIs = 0.20-0.38) during medicated periods was lower than during non-medicated periods. Similar results were found among individuals with co-occurring NDs (N = 2,986), for unintentional injuries (HR = 0.88; 95% CI = 0.77-1.01) and for TBIs (HR = 0.27; 95% CI = 0.16-0.44).

CONCLUSIONS: Beneficial effects of ADHD medication may extend beyond reduction of ADHD core symptoms to prevention of unintentional injuries in children and adolescents, including individuals with co-occurring NDs.

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J Clin Diagn Res. 2020;14:LC01-LC04.

EFFECTIVENESS OF PLANNED TEACHING PROGRAMME IN TERMS OF KNOWLEDGE OF TEACHERS ON ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN.

Narula N, Mehta S, Patney S.

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is a neurological and psychiatric condition which mainly affects school going children, adolescent and even adults. There is a constant prototype of inattention, hyperactivity or both. Such children suffer from numerous types of behavioural problems.

Aim: To identify children (6-9 years) with symptoms of ADHD and to evaluate the effectiveness of Planned Teaching Programme (PTP) in terms of knowledge of teachers on ADHD.

Materials and Methods: A quasi experimental pre-test and post design study was conducted in the Frank Anthony Public School, Lajpat Nagar, New Delhi, India. The study duration was from December 2015 to March 2016. Total of 40 teachers and 100 children were included. A structured knowledge questionnaire and standard Diagnostic Statistical Manual (DSM)- V criteria was used for collection of data. Mean, median and standard deviation value of pre-test and post-test knowledge scores of teachers were calculated and chi-square values were obtained to find association between post-test knowledge score of teachers on ADHD and selected demographic factors. The p-value <0.05 was taken as level of significance.

Results: The prevalence of ADHD in study population was 4%. Most of the teachers (65%) were in the age group of 35 years and above with the mean age being 36.53-45.90 years. Majority (55%) of children included under study fall under the age group 8-9 years followed by 45% in the age group 6-7 years. The mean post-test knowledge scores of teachers were higher than mean pre-test knowledge score and the obtained mean difference of 9.31 was found to be statistically significant. A significant association was observed between post-test knowledge scores and professional education and years of teaching experience (p<0.05).

Conclusion: Planned teaching programme was effective in enhancing the knowledge of the teachers regarding ADHD and early identification of children presenting with symptoms of ADHD should be made as it is effective in a scenario like that of India to reduce the burden on society and health care system

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J Clin Endocrinol Metab. 2020;105.

CONTROLLED ANTENATAL THYROID SCREENING II: EFFECT OF TREATING MATERNAL SUBOPTIMAL THYROID FUNCTION ON CHILD BEHAVIOR.

Hales C, Taylor PN, Channon S, et al.

Context & Objectives: The Controlled Antenatal Thyroid Screening (CATS) study was the first randomized controlled trial to investigate effects of treating suboptimal gestational thyroid function (SGTF) on child cognition. Since observational studies indicated that SGTF may also increase symptoms of autism and attention-deficit/hyperactivity disorder (ADHD), the CATS cohort was used to investigate whether treatment of mothers affected their children's behavior.

Design & Participants: Mothers (N = 475) completed 3 questionnaires: the Strengths and Difficulties Questionnaire (SDQ), the Child ADHD Questionnaire, and the Social Communication Questionnaire (SCQ, used as a screen for autism spectrum disorder [ASD]), about their children (mean age 9.5 years). Group comparisons of total scores, numbers of children above clinical thresholds, and association between high maternal free thyroxine (FT4) (> 97.5th percentile of the UK cohort, "overtreated") and child neurodevelopment were reported.

Results: There were no differences in total scores between normal gestational thyroid function (GTF) (n = 246), treated (n = 125), and untreated (n = 104) SGTF groups. More children of treated mothers scored above clinical thresholds, particularly the overtreated. Scores were above thresholds in SDQ conduct (22% vs 7%), SCQ total scores (7% vs 1%), and ADHD hyperactivity (17% vs 5%) when comparing overtreated (n = 40) and untreated (N = 100), respectively. We identified significantly higher mean scores for SDQ conduct (adjusted mean difference [AMD] 0.74; 95% confidence interval [CI], 0.021-1.431; P = 0.040, effect size 0.018) and ADHD hyperactivity (AMD 1.60, 95% CI, 0.361-2.633; P = 0.003, effect size 0.028) comparing overtreated with normal-GTF children.

Conclusions: There was no overall association between SGTF and offspring ADHD, ASD, or behavior questionnaire scores. However, children of "overtreated" mothers displayed significantly more ADHD symptoms and behavioral difficulties than those of normal-GTF mothers. Thyroxine supplementation during pregnancy requires monitoring to avoid overtreatment

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Journal of Forensic and Legal Medicine. 2020;71.

SOCIO-LEGAL CONSEQUENCES OF TOURETTE SYNDROME AND ITS COMORBIDITIES: A CASE STUDY AND REVIEW OF THE LITERATURE.

Fatih P, Mutluer T, Shabsog M, et al.

Tourette Syndrome is a neurodevelopmental disorder that is associated with the presence of multiple motor and one or more verbal tics. In this case report, we present a 16 years old Tourette syndrome patient who was diagnosed with comorbid Attention Deficit Hyperactivity Disorder. The patient was evaluated for legal responsibility after she made untrue allegations saying that a bus driver had sexually harassed her. We summarize the case and review the current literature to assess the socio-legal aspects of Tourette syndrome

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J Intellect Disabil Res. 2020 Mar;64:185-96.

DEVELOPMENTAL STAGES AND ESTIMATED PREVALENCE OF COEXISTING MENTAL HEALTH AND NEURODEVELOPMENTAL CONDITIONS AND SERVICE USE IN YOUTH WITH INTELLECTUAL DISABILITIES, 2011–2012.
Comer HaGans D, Weller BE, Story C, et al.

Background Few studies exist on mental health and neurodevelopmental conditions and service use among youth with intellectual disabilities (IDs), which makes it difficult to develop interventions for this population. The objective of the study is to (1) estimate and compare the prevalence of mental health and neurodevelopmental conditions in youth with and without ID across three developmental stages and (2) estimate and compare mental health service use in youth with and without ID across three developmental stages.

Methods We conducted secondary data analysis using cross-sectional data collected from caregivers completing the 2011-2012 National Survey of Children's Health. The data set represents a nationally representative sample of youth (0-17 years) in the USA with one child from each household being randomly selected. Data were collected from caregivers in 50 states, Washington D.C. and the US Virgin Islands. We restricted the sample to parents of youth between 3-17 years (N = 81 510).

Results Compared with youth without ID, youth ages 3–17 with ID had a statistically significantly higher prevalence of (1) mental health and neurodevelopmental conditions and (2) mental health care use and medication use for mental health and neurodevelopmental issues (other than attention deficit disorder/attention deficit hyperactivity disorder). Clinically significant differences in coexisting conditions and service use were also found across developmental stages.

Conclusions Youth with ID are at greater risk of having coexisting mental health and neurodevelopmental conditions than youth without ID and are more likely to receive treatment. Therefore, clinicians should consider mental health and neurodevelopmental conditions and the unique needs of youth by developmental stage when tailoring interventions for youth with ID

J Mol Neurosci. 2020.

HIGH LEVELS OF GLYCOSAMINOGLYCANS IN THE URINES OF CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD).

Endreffy I, et al.

Attention-deficit/hyperactivity disorder (ADHD) is a common neurobehavioral/neurodevelopmental disorder. Some early studies indicated that increased intake of added sugars might have a role in ADHD. In the present study, we tested this possibility by evaluating the urinary excretion of oligosaccharides and glycosaminoglycans (GAGs) in ADHD and control subjects. Forty ADHD subjects matched with 34 controls were enrolled in the study. The subjects underwent a standardized dietary regimen. The urine levels of oligosaccharides and GAGs were quantified biochemically, and their covariance and association were evaluated statistically. Fructose (21/40, 52.5%), maltose (26/40, 65%), galactose (30/40, 75%), and lactose (38/40, 95%) excretions were frequently found in the urine of ADHD subjects ($p < 0.05$), an excretion which does not occur normally. Furthermore, these subjects showed a pathologic tGAG (glycosaminoglycan) excretion (40/40, 100%). The present study supports the thesis that carbohydrate metabolism differs in ADHD subjects compared with control subjects

J Neurodevelopmental Disord. 2020;12.

BOLD DIFFERENCES NORMALLY ATTRIBUTED TO INHIBITORY CONTROL PREDICT SYMPTOMS, NOT TASK-DIRECTED INHIBITORY CONTROL IN ADHD.

Chevrier A, Schachar RJ.

Background: Altered brain activity that has been observed in attention deficit hyperactivity disorder (ADHD) while performing cognitive control tasks like the stop signal task (SST) has generally been interpreted as reflecting either weak (under-active) or compensatory (over-active) versions of the same functions as in healthy controls. If so, then regional activities that correlate with the efficiency of inhibitory control (i.e. stop

signal reaction time, SSRT) in healthy subjects should also correlate with SSRT in ADHD. Here we test the alternate hypothesis that BOLD (blood-oxygen-level-dependent) differences might instead reflect the redirection of neural processing resources normally used for task-directed inhibitory control, towards actively managing symptomatic behaviour. If so, then activities that correlate with SSRT in TD should instead correlate with inattentive and hyperactive symptoms in ADHD.

Methods: We used fMRI (functional magnetic resonance imaging) in 14 typically developing (TD) and 14 ADHD adolescents performing the SST, and in a replication sample of 14 healthy adults. First, we identified significant group BOLD differences during all phases of activity in the SST (i.e. warning, response, reactive inhibition, error detection and post-error slowing). Next, we correlated these phases of activity with SSRT in TD and with SSRT, inattentive and hyperactive symptom scores in ADHD. We then identified whole brain significant correlations in regions of significant group difference in activity.

Results: Only three regions of significant group difference were correlated with SSRT in TD and replication groups (left and right inferior frontal gyri (IFG) during error detection and hypothalamus during post-error slowing). Consistent with regions of altered activity managing symptomatic behaviour instead of task-directed behaviour, left IFG correlated with greater inattentive score, right IFG correlated with lower hyperactive score and hypothalamus correlated with greater inattentive score and oppositely correlated with SSRT compared to TD.

Conclusions: Stimuli that elicit task-directed integration of neural processing in healthy subjects instead appear to be directing integrated function towards managing symptomatic behaviour in ADHD. The ability of the current approach to determine whether altered neural activities reflect comparable functions in ADHD and control groups has broad implications for the development and monitoring of therapeutic interventions

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J Psychopharmacol. 2020.

AN INNOVATIVE SMS INTERVENTION TO IMPROVE ADHERENCE TO STIMULANTS IN CHILDREN WITH ADHD: PRELIMINARY FINDINGS.

Fried R, DiSalvo M, Kelberman C, et al.

Background: Although large datasets document that stimulants decrease the risk for many adverse ADHD-associated outcomes, compliance with stimulants remains poor. Aims: This study examined the effectiveness of a novel ADHD-centric text messaging-based intervention aimed to improve adherence to stimulant medications in children with ADHD.

Methods: Subjects were 87 children aged 6-12, who were prescribed a stimulant medication for ADHD treatment. Prescribers gave permission to contact their patients for participation in the study. Subjects were primarily from the primary care setting with a subsample of psychiatrically referred subjects for comparison. Age- and sex-matched comparators were identified (3:1) from the same pool of prescriber-approved subjects that did not participate. Timely prescription refills (within 37 days) were determined from prescription dates documented in patients electronic medical record.

Results: Eighty-five percent of SMS intervention patients refilled their prescriptions in a timely manner compared with 62% of patients receiving treatment as usual (OR = 3.46, 95% CI: 1.82, 6.58; $p < 0.001$). The number needed to treat statistic was computed as five, meaning for every five patients who receive the SMS intervention, we can keep one adherent to their stimulant treatment.

Conclusions: These preliminary findings support the potential utility of a readily accessible technology to improve the poor rate of adherence to stimulant treatment in children with ADHD. To the best of our knowledge, this study is the first digital health intervention aimed at improving adherence to stimulant medication for children with ADHD. These results support the need for further examination of this technology through more definitive randomized clinical trials

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Kaohsiung J Med Sci. 2019;35:373-78.

A CROSS-SECTIONAL FOLLOW-UP STUDY OF PHYSICAL MORBIDITIES, NEUROCOGNITIVE FUNCTION, AND ATTENTION PROBLEMS IN POST-TREATMENT CHILDHOOD ACUTE LYMPHOBLASTIC LEUKEMIA SURVIVORS.

Chiou S-S, Lin P-C, Liao Y-M, et al.

Acute lymphoblastic leukemia (ALL) is the most common childhood cancer. While ALL therapies are highly effective, western studies have shown excesses late life effects of therapies in survivors. In this survey, we recruited subjects being diagnosed as ALL before the age of 18-year-old and had been in complete continuous remission for at least 3 years. Subjects were arranged to receive three cognitive tests (Wechsler intelligence test, Conners' continuous performance test, and Wisconsin card sorting test). Standardized questionnaires were used to inquiry about attention problem in real life context. Treatment outcome were compared between the standard risk and high/very high risk groups. Final survivors were 42 subjects (26 males, 16 females) with median current age of 17.8 years. Subjects were diagnosed to be with ALL at a median age of 4.8 years. The median survival time (from discontinuation of ALL treatment to the study date) was 8.4 years. Results indicated that 17 subjects (40.5%) had chronic physical conditions in need of clinical management and six subjects (14.3%) had mental condition. For the performance-based cognitive outcome, the average full scale intelligence quotient was 91.7 -13.8. Ten percent of the subjects had problem in test of attention, 20% had problem in test of impulsivity and 42.8% of the subject had problems in executive function. When judged from real life contexts, 19 subjects (42%) were with obvious attention problems. Group comparison between standard risk vs high/very high risk patients revealed no difference in neurocognitive outcomes. We hope that this information may benefit the implementation of follow-up program for Taiwanese pediatric leukemia survivors

Med Hypotheses. 2020;140.

IS IT POSSIBLE TO RECOGNIZE CHILDREN DIAGNOSED WITH ADHD FROM THEIR FACIAL ANTHROPOMETRIC MEASURES? A CASE-CONTROL STUDY.

Aktas H, Esin IS, Dursun OB.

The recent main focus of the researches on Attention-deficit Hyperactivity Disorder is on identifying behavioral phenotypes. For this purpose, neuroanatomical factors have recently become a focus. This study aimed to investigate whether the individuals diagnosed with Attention-deficit Hyperactivity Disorder differ from healthy individuals in terms of facial anthropometric measurements. Forty children, diagnosed with Attention-deficit Hyperactivity Disorder, were included in the study as the case group, and forty healthy children were included in the study as the control group. Two photographs were taken from the facial region, and anthropometric measurements were performed using the computer program Image J in the computer environment. It was found that a strong relationship between Attention-deficit Hyperactivity Disorder and nasal width, ear length and upper face debt length. The results obtained from the research support the knowledge that there is a close relationship between the forebrain development process and the facial development process during the embryonic development process

Medicina (Argentina). 2020;80:63-66.

Measurement of the theta/beta ratio with the quantified electroencephalogram in attention-deficit hyperactivity disorders.

Ortiz SP, Mulas F, Sánchez A, et al.

Theta-Beta (T / B) ratio of the quantified electroencephalogram (EEG) in patients with attention deficit hyperactivity disorder (ADHD) constitutes a characteristic EEG variable of the primary disorder with an overall accuracy of 89%. The objective of this study was to measure the T/B ratio in a sample of patients with ADHD and the effects of the treatment with psychostimulants and non-psychostimulants on the T/B ratio. The sample consisted of 85 children between 6 and 18 years (68 males and 17 females) with the diagnosis of the inattentive and combined subtype of ADHD, according to the criteria of the DSM-V. An EEG was performed with measurement of the T/B ratio before and after 6 months of treatment with psychostimulant

and non-psychostimulant drugs. Both groups were compared using the Wilcoxon signed range test for related samples. The results showed that 86% of the cases had a T/B ratio above the normal values for the age of them. The reduction in the T/B ratio was statistically significant in the group of patients treated with psychostimulants. The reduction of non-psychostimulants was not significant. In conclusion, we confirmed the high T/B ratio in patients with ADHD. Psychostimulant drugs decrease the elevated T/B ratio in patients with ADHD after 6 months of treatment

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Medicina (B Aires). 2020;80 Suppl 2:72-75.

PROGRESSION OF SYMPTOMS IN CHILDREN WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER IN TREATMENT WITH METHYLPHENIDATE.

Rodriguez Hernandez PJ, Betancort MM, Penate CW.

Attention deficit and hyperactivity disorder (ADHD) is a neurobiological disorder frequent in childhood. The main symptoms are attention disorder and/or impulsivity and/or hyperactivity. There are different subtypes of ADHD according to the degree of presence of these three symptoms. There are different therapeutic approaches with high proved effectiveness. Methylphenidate, a stimulant that acts through the dopaminergic and adrenergic pathways, is commonly used for the treatment of ADHD. The Strengths and Difficulties Questionnaire (SDQ) is a brief behavioural screening instrument internationally used for the screening of mental health problems in children and adolescents. It consists in a 25 items questionnaire with 5 different scales: emotional symptoms, conduct problems, hyperactivity / inattention, peer relationship problems and prosocial behaviours. The SDQ score was collected in a sample of ADHD patients with an age between 7 and 12 years. The score obtained before starting treatment with methylphenidate was compared before and after starting treatment, every 3-6 months and up to a period of 2 years. Statistical processing was performed using R, which is a free program for statistical and graphical analysis, that allows temporary analysis. The results indicate that hyperactivity improves throughout the first year of treatment, emotional symptoms and behavioral problems improve during the first 6 months of treatment, pro-social symptoms slowly improve over 2 years. Problems with partners do not improve in the analyzed time

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Medicine (Baltimore). 2020 Mar;99:e19423.

ADHD, SUICIDAL IDEATION, DEPRESSION, ANXIETY, SELF-ESTEEM, AND ALCOHOL PROBLEM IN KOREAN JUVENILE DELINQUENCY.

Chung YR, Hong JW, Kim BB, et al.

The purpose of this study is to evaluate the prevalence rates of externalizing symptom, ADHD, as well as internalizing symptoms, depression, anxiety, suicidal ideation, self-esteem, and alcohol problem in Korea juvenile delinquency for the first time in Korea. A case-control study design was used. It also examined the associations with ADHD, suicidal ideation, depression, anxiety, self-esteem, and alcohol problem between the Juvenile Delinquency group and the comparison group in Korea. A series of questionnaires were provided to a total of 251 participants (149 from the juvenile delinquency group and 102 from the comparison group) from October 2015 to December 2015 in Korea. All participants were evaluated using KARS, SSI, BDI, BAI, RSI, and CAGE. This study showed the relationship between ADHD, suicidal ideation, depression, anxiety, self-esteem, and alcohol problem in Korean juvenile delinquency. Also this study showed that ADHD and self-esteem were important factors in predicting juvenile delinquency. Therefore, in order to prevent juvenile delinquency, special attention, and consideration are needed for adolescents with high ADHD or low self-esteem

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N C Med J. 2020 Mar;81:122-25.

ADHD IN NORTH CAROLINA: PREVALENCE, TREATMENT, AND LOOKING TO THE FUTURE.

Canu W.

At present, data suggests that attention-deficit/hyperactivity disorder may be more prevalent in North Carolina than other states, but whether we are properly identifying and treating cases, in childhood and adulthood, is murky. Much innovative work to this end is being done in North Carolina, but more is needed

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Neuropsychiatr Dis Treat. 2020;16:691-702.

DIFFERENTIATING BOYS WITH ADHD FROM THOSE WITH TYPICAL DEVELOPMENT BASED ON WHOLE-BRAIN FUNCTIONAL CONNECTIONS USING A MACHINE LEARNING APPROACH.

Sun Y, Zhao L, Lan Z, et al.

Purpose: In recent years, machine learning techniques have received increasing attention as a promising approach to differentiating patients from healthy subjects. Therefore, some resting-state functional magnetic resonance neuroimaging (R-fMRI) studies have used interregional functional connections as discriminative features. The aim of this study was to investigate ADHD-related spatially distributed discriminative features derived from whole-brain resting-state functional connectivity patterns using machine learning.

Patients and Methods: We measured the interregional functional connections of the R-fMRI data from 40 ADHD patients and 28 matched typically developing controls. Machine learning was used to discriminate ADHD patients from controls. Classification performance was assessed by permutation tests.

Results: The results from the model with the highest classification accuracy showed that 85.3% of participants were correctly identified using leave-one-out cross-validation (LOOV) with support vector machine (SVM). The majority of the most discriminative functional connections were located within or between the cerebellum, default mode network (DMN) and frontoparietal regions. Approximately half of the most discriminative connections were associated with the cerebellum. The cerebellum, right superior orbitofrontal cortex, left olfactory cortex, left gyrus rectus, right superior temporal pole, right calcarine gyrus and bilateral inferior occipital cortex showed the highest discriminative power in classification. Regarding the brain-behaviour relationships, some functional connections between the cerebellum and DMN regions were significantly correlated with behavioural symptoms in ADHD ($P < 0.05$).

Conclusion: This study indicated that whole-brain resting-state functional connections might provide potential neuroimaging-based information for clinically assisting the diagnosis of ADHD

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Neurosci Lett. 2020;724.

ESTIMATING INDIVIDUAL SCORES OF INATTENTION AND IMPULSIVITY BASED ON DYNAMIC FEATURES OF INTRINSIC CONNECTIVITY NETWORK.

Wang X-H, Xu J, Li L.

Inattention and impulsivity are the two most important indices for evaluations of ADHD. Currently, inattention and impulsivity were evaluated by clinical scales. The intelligent evaluation of the two indices using machine learning remains largely unexplored. This paper aimed to build regression modes for inattention and impulsivity based on resting state fMRI and additional measures, and discover the associating features for the two indices. To achieve these goals, a cohort of 95 children with ADHD as well as 105 healthy controls were selected from the ADHD-200 database. The raw features were consisted of univariate dynamic estimators of intrinsic connectivity network (ICNs), head motion, and additional measures. The regression models were solved using support vector regression (SVR). The performance of the regression models was evaluated by cross-validations. The performance of regression models based on ICNs outperformed that based on regional measures. The estimated clinical scores were significantly correlated to inattention ($r = 0.4 - 0.02$, $p < 0.01$) and impulsivity ($r = 0.31 - 0.02$, $p < 0.01$). The most associating ICNs are sensorimotor

network (SMN) for inattention and executive control network (ECN) for impulsivity. The results suggested that inattention and impulsivity could be estimated using machine learning, and the intra-ICN dynamics could be supplementary features for regression models of clinical scores of ADHD

Paediatr Anaesth. 2020.

PEDIATRIC OBSTRUCTIVE SLEEP APNEA: PREOPERATIVE AND NEUROCOGNITIVE CONSIDERATIONS FOR PERIOPERATIVE MANAGEMENT.

Chandrakantan A, Musso MF, Floyd T, et al.

Obstructive sleep apnea (OSA) affects up to 7.5% of the pediatric population and is associated with a variety of behavioral and neurocognitive sequelae. Prompt diagnosis and treatment is critical to halting and potentially reversing these changes. Depending on the severity of the OSA and comorbid conditions, different treatment paradigms can be pursued, each of which has its own unique risk: benefit ratio. Adenotonsillectomy is first-line recommended surgical treatment for pediatric OSA. However, it carries its own perioperative risks and the decision regarding surgical timing is therefore made in the context of procedural risk versus patient benefit. This article presents the seminal perioperative and neurocognitive risks from pediatric OSA to aid with perioperative management

Paediatr Perinat Epidemiol. 2020.

SIMPLE TWIST OF FATE: IN UTERO EXPOSURE TO ACETAMINOPHEN AND RISK OF CHILDHOOD ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Damkier P.

Paediatr Perinat Epidemiol. 2020.

INCREASED RISK OF ADHD AT SHORT AND LONG INTERPREGNANCY INTERVALS IN A NATIONAL BIRTH COHORT.

Cheslack-Postava K, Sourander A, Suominen A, et al.

Background: Short or long interpregnancy interval (IPI) may adversely impact conditions for foetal development. Whether attention deficit hyperactivity disorder (ADHD) is related to IPI has been largely unexplored.

Objectives: To examine the association between IPI and ADHD in a large, population-based Finnish study.

Methods: All children born in Finland between 1991 and 2005 and diagnosed with ADHD (ICD-9 314x or ICD-10 F90.x) from 1995 to 2011 were identified using data from linked national registers. Each subject with ADHD was matched to 4 controls based on sex, date of birth, and place of birth. A total of 9564 subjects with ADHD and 34,479 matched controls were included in analyses. IPI was calculated as the time interval between sibling birth dates minus the gestational age of the second sibling. The association between IPI and ADHD was determined using conditional logistic regression and adjusted for potential confounders.

Results: Relative to births with an IPI of 24 to 59 months, those with the shortest IPI (<6 months) had an increased risk of ADHD (odds ratio [OR] 1.30, 95% confidence interval (CI) 1.12, 1.51) and the ORs for the longer IPI births (60-119-åmonths and 120-åmonths) were 1.12 (95% CI 1.02, 1.24) and 1.25 (95% CI 1.08, 1.45), respectively. The association of longer IPI with ADHD was attenuated by adjustment for maternal age at the preceding birth, and comorbid autism spectrum disorders did not explain the associations with ADHD.

Conclusions: The risk of ADHD is higher among children born following short or long IPIs although further studies are needed to explain this association

Paediatr Child Health. 2020.

CHILDREN'S ATTACHMENTS.

Rees C.

Children depend on relationships to progress to safe independence. Their earliest experiences of attachment are fundamentally important to their success in doing so. These establish preconceptions of relationships which are moulded, rather than replaced, by subsequent experience. Attachment, which is a binding emotional closeness, develops through parents' recognition of and response to their infants' needs. This establishes the foundations of communication, gives meaning to feelings and body signals, builds self-awareness and builds expectations of the value, reliability and safety of relationships. Its role in programming stress mechanisms has life-long implications for adjustment, behaviour and physical and psychological health. Suboptimal attachment ranges from mildly insecure to profoundly dysfunctional. Quality of attachment is relevant to symptom presentation, illness behaviour and service use. It is a crucial consideration in safeguarding decisions and their implementation. Unsatisfactory childhood attachment underlies intergenerational parenting problems. Adequate parental attachment is a priority for every child, and an overriding concern for children in foster and adoptive homes. Working from first principles through informed observation enables attachment to be integral to paediatric practice. This article discusses what is known about how attachment develops, offers advice about how to promote optimal attachment and how poor attachment may manifest itself in clinical practice

Pakistan Paediatric Journal. 2020;44:36-42.

A COMPARATIVE STUDY OF COGNITIVE FUNCTIONING IN CHILDREN WITH ADHD, AUTISM AND NORMAL CONTROLS.

Yazdani NB, Gul I, Naz S, et al.

Objective: The present study was conducted to assess and compare cognitive functioning of Children with Autism, ADHD and Healthy controls.

Study Design: Cross sectional comparative study.

Place and Duration of the Study: Special Education and local schools located in Rawalpindi and Islamabad. Duration was from July 2017 to August 2018.

Materials and Methods: A sample of 60 children (8-12 years) with autism, ADHD and healthy controls (20 each) was selected after matching for similar IQ (>75). The symptom severity of autism and ADHD was assessed with Gilliam Autism Rating Scale 2 (GARS 2) and Strengths and Weakness of the ADHD-Symptoms and Normal-Behavior (SWAN) respectively. Cognitive functioning was assessed with NEPSY 1.

Results: Analysis indicated a significant difference in all domains of cognitive functioning such as executive functioning (F=7.9; p=0.001), visuospatial processing (F=4.0; p=0.02), immediate memory (F=70.7; p=0.001), delayed memory (F=68.0 p=0.001) and sensorimotor functioning (F=4.1; p=0.02). Post-hoc analysis revealed that cognitive functioning of autistic children was more impaired as compared to ADHD and control group.

Conclusion: The study highlighted the importance of cognitive assessment of children with developmental disorders for rehabilitation and management programs

Pathogens and Global Health. 2020.

Toxoplasma gondii infection and risk of attention-deficit hyperactivity disorder: a systematic review and meta-analysis.

Nayeri T, Sarvi S, Moosazadeh M, et al.

Toxoplasma gondii (*T. gondii*), as an opportunistic neurotropic parasite of the Apicomplexa family, was firstly described in 1908. As attention-deficit hyperactivity disorder (ADHD) is one of the most common neuropsychiatric disorders in children and adolescents and often persists into adulthood, the purpose of this systematic review and meta-analysis was to investigate the relationship between *T. gondii* infection and ADHD. The data were systematically collected from seven electronic databases up to May 1st 2019 with no language restriction. This study was registered at the International Prospective Register of Systematic

Reviews (PROSPERO; code: CRD42020149353). Odds ratios (ORs) and 95% confidence intervals (CI) were estimated using a random effects model. Seven studies involving five cross-sectional and two case-control studies were included in this meta-analysis.

Results indicated that there was a statistically non-significant association between exposure to *T. gondii* infection and increased risk of ADHD based on the detection of immunoglobulin G (IgG) antibody (2.02 [95% CI: 0.97-4.20]; I²=58.7%). However, obtained results of Egger's tests for anti-*T. gondii* IgG antibody showed publication bias (P=0.014). Sensitivity analysis revealed stable results for the association between anti-*T. gondii* IgG antibody with ADHD. Given the small number of studies in this field and the obtained results, it cannot be conclusively stated that *T. gondii* is a risk factor for ADHD. It is important to have reliable information about the relationship between *T. gondii* and ADHD around the world; as it may lead to better insight to elucidate the possible association of toxoplasmosis and the pathogenesis of ADHD

Pediatr Ann. 2020 Mar;49:e140-e146.

ATOPIC DERMATITIS: UPDATE ON PATHOGENESIS AND THERAPY.
de IOE, Sidbury R.

Atopic dermatitis (AD) is the most common inflammatory skin condition in pediatric patients. AD has long been associated with comorbidities including food allergies, asthma, and allergic rhinitis, but recent literature has expanded this list to include attention-deficit/hyperactivity disorder and depression. AD has tremendous impact on quality of life for both affected children and their families. Improved understanding of AD pathogenesis, particularly regarding skin barrier dysfunction, the role of the cutaneous microbiome, and immune dysregulation, has spawned exciting new therapeutic directions. Although good skin care and appropriate use of topical corticosteroids remain first-line treatment, more precisely targeted treatments hold great promise. A recently approved topical phosphodiesterase inhibitor, crisaborole, and a subcutaneously administered interleukin-4/interleukin-13 blocker, dupilumab, are the first of what will likely be many new treatment options for patients with AD

PLoS ONE. 2020;15.

ADHD SYMPTOMS AND THEIR NEURODEVELOPMENTAL CORRELATES IN CHILDREN BORN VERY PRETERM.

Montagna A, Karolis V, Batalle D, et al.

This study investigated the association between attention-deficit/hyperactivity disorder (ADHD) symptomatology in preschool-aged children who were born very preterm (33 weeks) and cognitive outcomes, clinical risk and socio-demographic characteristics. 119 very preterm children who participated in the Evaluation of Preterm Imaging Study at term-equivalent age were assessed at a mean age of 4.5 years. Parents completed the ADHD Rating Scale IV, a norm-referenced checklist that evaluates ADHD symptomatology according to diagnostic criteria, and the Behavior Rating Inventory of Executive Function-Preschool version. Children completed the Wechsler Preschool and Primary Scales of Intelligence and the Forward Digit Span task. Longitudinal data including perinatal clinical, qualitative MRI classification, socio-demographic variables and neurodevelopmental disabilities were investigated in relation to ADHD symptomatology. All results were corrected for multiple comparisons using false discovery rate. Results showed that although the proportion of very preterm children with clinically significant ADHD did not differ from normative data after excluding those with neurodevelopmental disabilities, 32.7% met criteria for subthreshold ADHD inattentive type and 33.6% for combined type, which was higher than the expected 20% in normative samples. Higher ADHD symptom scores (all) were associated with greater executive dysfunction (inhibitory self-control, flexibility, and emergent metacognition, corrected $p < 0.001$ for all tests). Higher inattentive ADHD symptom scores were associated with lower IQ ($\beta = -0.245$, $p = 0.011$) and higher perinatal clinical risk (more days on mechanical ventilation ($\beta = 0.196$, $p = 0.032$) and more days on parenteral nutrition ($\beta = 0.222$, $p = 0.015$)). Higher hyperactive ADHD symptom scores instead were associated with lower socioeconomic status ($\beta = 0.259$, $p = 0.004$). These results highlight the importance of monitoring and supporting the development of very preterm children throughout the school years, as

subthreshold ADHD symptoms represent risk factors for psychosocial problems and for receiving a future clinical diagnosis of ADHD

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PLoS ONE. 2020;15.

A QUALITATIVE PHOTO ELICITATION RESEARCH STUDY TO ELICIT THE PERCEPTION OF YOUNG CHILDREN WITH DEVELOPMENTAL DISABILITIES SUCH AS ADHD AND/OR DCD AND/OR ASD ON THEIR PARTICIPATION.

Coussens M, Destoop B, de BS, et al.

Participation, defined as involvement in life situations according to the World Health Organisation, is a well-recognized concept and critical indicator of quality of life. In addition it has become an important outcome measure in child rehabilitation. However, little is known about the level of participation of young children with Developmental Disabilities. The aim of this study was to capture their subjective experiences of participation. An adapted informed consent based on a comic strip was used to get the children's assent. A Photo Elicitation study was used, in which photographs were taken by the children when they were involved in meaningful activities. The photographs were then used to facilitate communication with the children and to initiate in depth-interviews. Forty-seven interviews with 16 children between five and nine years were conducted based on their photographs. This method generated rich data, confirming that young children with Developmental Disabilities were able to inform us accurately on their experiences of participation. Data was analysed by means of an inductive thematic analysis. Results showed that children perceived their participation as satisfying when they can play, learn and join in family gatherings resulting in feelings of inclusion, recognition and belonging. When there are on occasions-moments that their participation was obstructed, the children used two strategies to resolve it. Or they walked away from it and choose not to participate, or when autonomously motivated for the activity, they relied primarily on their context (i.e. mothers) as enabling their participation. Related to the data, children discussed themes related to their person, activities, connections and mediators between those themes. These themes fit well within earlier and current research on the subject of participation

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Psychiatry Res. 2020;286.

TRAIT AND STATE BOREDOM: ASSOCIATIONS WITH ATTENTION FAILURE IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Hsu C-F, Eastwood JD, Toplak ME, et al.

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Psychol Med. 2020 Mar;50:616-24.

MATERNAL POLYCYSTIC OVARY SYNDROME AND RISK OF NEUROPSYCHIATRIC DISORDERS IN OFFSPRING: PRENATAL ANDROGEN EXPOSURE OR GENETIC CONFOUNDING?

Cesta CE, et al.

This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

Background Maternal polycystic ovary syndrome (PCOS) has been proposed as a model for investigating the role of prenatal androgen exposure in the development of neuropsychiatric disorders. However, women with PCOS are at higher risk of developing psychiatric conditions and previous studies are likely confounded by genetic influences.

hods A Swedish nationwide register-based cohort study was conducted to disentangle the influence of prenatal androgen exposure from familial confounding in the association between maternal PCOS and offspring attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders (ASD), and Tourette's disorder and chronic tic disorders (TD/CTD). PCOS-exposed offspring (n = 21 280) were compared with

unrelated PCOS-unexposed offspring (n = 200 816) and PCOS-unexposed cousins (n = 17 295). Associations were estimated with stratified Cox regression models.

Results PCOS-exposed offspring had increased risk of being diagnosed with ADHD, ASD, and TD/CTD compared with unrelated PCOS-unexposed offspring. Associations were stronger in girls for ADHD and ASD but not TD/CTD [ADHD: adjusted hazard ratio (aHR) = 1.61 (95% confidence interval (CI) 1.31-1.99), ASD: aHR = 2.02 (95% CI 1.45-2.82)] than boys [ADHD: aHR = 1.37 (95% CI 1.19-1.57), ASD: aHR = 1.46 (95% CI 1.21-1.76)]. For ADHD and ASD, aHRs for girls were stronger when compared with PCOS-unexposed cousins, but slightly attenuated for boys.

Conclusions Estimates were similar when accounting for familial confounding (i.e. genetics and environmental factors shared by cousins) and stronger in girls for ADHD and ASD, potentially indicating a differential influence of prenatal androgen exposure v. genetic factors. These results strengthen evidence for a potential causal influence of prenatal androgen exposure on the development of male-predominant neuropsychiatric disorders in female offspring of women with PCOS

Psychol Med. 2020 Mar;50:607-15.

DO YOUNG ADOLESCENTS WITH FIRST-EPISEDE PSYCHOSIS OR ADHD SHOW SENSORIMOTOR GATING DEFICITS?

Rydkjaer J, et al.

Background Early identification is important for patients with early-onset schizophrenia (SZ). Assessment of (candidate) endophenotypic markers for SZ, such as prepulse inhibition of the startle reflex (PPI), may help distinguish between the early-onset SZ and other psychiatric disorders. We explored whether PPI deficits usually seen in adult-onset SZ are present in young adolescents with either early-onset psychosis or attention deficit/hyperactivity disorder (ADHD).

Methods Twenty-five adolescents with first-episode, non-affective psychosis (FEP), 28 adolescents with ADHD and 43 healthy controls (HC), aged 12-17 years, were assessed with an auditory PPI paradigm.

Results No significant group differences were found in PPI. However, when the FEP group was divided into those already diagnosed with SZ (n = 13) and those without (N-SZ) (n = 12), and all four groups (SZ, N-SZ, ADHD and HC) were compared on percentage PPI in the 85/60 trials, significantly less PPI was found in patients with SZ than in the HC as well as the ADHD group. No significant group differences were found in explorative analyses on the other trial types. Additionally, startle magnitude was significantly higher in SZ than in N-SZ patients.

Conclusion Young adolescents with SZ showed sensorimotor gating deficits similar to those usually found in adults with SZ and had larger startle magnitude than patients with other types of non-affective early-onset psychosis. No sensorimotor gating deficits were found in adolescents with ADHD. Our findings support the theory that deficient PPI is endophenotypic for SZ

QJM. 2018;111:i72.

SEROTONERGIC 5-HT1B RECEPTOR GENE POLYMORPHISM IN A SAMPLE OF EGYPTIAN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVE DISORDER.

EIBaz MF, Mostafa KT, Mohamed YA, et al.

Background: Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental disorder that affects approximately 5% to 10% of young people worldwide. Although still controversial, genetic factors have been suggested as the underlying etiology.

Aim: To study the association between the Serotonergic gene 5- HT1B polymorphism G861C allele and the development of ADHD in a sample of Egyptian children. We also aimed to perform a genotype- phenotype correlation among the ADHD spectrum disorder.

Methods: This case-control study included fifty patients with ADHD who were recruited from the Child an Adolescent, Psychiatry clinic, Children hospital - Ain Shams University, Cairo, Egypt. In addition to fifty controls of matched age and sex. Children with ADHD fulfilled DSM (V) criteria for ADHD syndrome and were further evaluated by Conner's parent rating scale. All patients and controls underwent thorough history taking,

complete physical examination, IQ assessment using the Arabic version of Wechsler intelligence scale for children (WISC) and Genotyping to detect 5-HT1B the allelic polymorphism G861C.

Results: There was a tendency of G allele to segregate in homozygosity (58%) than C allele (4%) with more prevalence of G allele among patients group (75%). Similarly, in the control group, there was a tendency of G allele to segregate in homozygosity (60%). The C allele appeared only in heterozygous state (20%) with more prevalence of G allele (80%). These mild differences between patients and control did not reach statistical significance ($p>0.05$). Also, there was no statistically significant difference between the homozygous and heterozygous ADHD patients, nor the ADHD patients with privilege of either C or G alleles in relation to the ADHD phenotypes as regard the inattentive, hyperactive-impulsive or total ADHD index phenotype of when measured by the Conner's parents rating scale or as regards the Wechsler intelligence scale.

Conclusion: This study revealed that the association between 5HT1B polymorphic locus G861C and this particular sample of Egyptian ADHD patients did not reach statistically significant values. And there was also no genotype-phenotype statistically significant correlations regarding the severity of symptoms. Larger studies are needed to reach a definitive Conclusion

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Res Dev Disabil. 2020;100.

OVERT PLANNING BEHAVIORS DURING WRITING IN SCHOOL-AGE CHILDREN WITH AUTISM SPECTRUM DISORDER AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Zajic MC, Solari EJ, McIntyre NS, et al.

Background: The planning behaviors of children with autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) during writing remain overlooked. Targeted examination of planning behaviors may help to better understand their heterogeneous writing skills.

Aims: This study examined overt planning behaviors of three groups of school-age children (ASD, ADHD, and typically developing [TD]) during the planning stage of a standardized narrative writing assessment. Aims explored group differences in time spent planning, between- and within-group differences in overt planning behaviors, and relationships between planning behaviors and writing performance as well as age, cognitive skills, and diagnostic symptom severity.

Methods and procedures: This study included 121 9-17-year-old children (60 ASD, 32 ADHD, and 29 TD). Video recordings captured overt planning behaviors during a two-minute prewriting planning stage.

Outcomes and results: Not all participants planned, but group membership overwhelmingly did not influence planning likelihood. Groups differed in time spent engaging with the outline (29 %-70 %), with the TD group spending the most time. Groups spent similar amounts of time looking away from the task (< 10 %) and looking at the task picture (20 %-33 %). The TD and ASD groups demonstrated more similar within-group-level differences in planning behaviors, while the ADHD group appeared more variable. The ADHD and TD groups but not the ASD group showed stronger associations between planning behaviors and writing performance.

Conclusions and implications: Children with ASD and ADHD differed relative to each other and to TD peers in specific planning behaviors. Implications are discussed regarding instructional practices and needed future research to examine planning during writing in children with developmental disabilities

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Res Dev Disabil. 2020;100.

SENSORY PROCESSING PATTERNS IN DEVELOPMENTAL COORDINATION DISORDER, ATTENTION DEFICIT HYPERACTIVITY DISORDER AND TYPICAL DEVELOPMENT.

Delgado-Lobete L, et al.

Background: Sensory processing difficulties (SPD) are present in children with Developmental Coordination Disorder (DCD) and Attention Deficit and Hyperactivity Disorder (ADHD). However, little is known about sensory processing variability in these disorders.

Objective: The purpose of this study was to explore SPD among children with DCD, ADHD and co-occurring symptoms in comparison to children with typical development (TD) and to determine how potential social confounders may influence these associations.

Methods: The study involved 452 children aged 6-12 years. The Short Sensory Profile-2 was used to assess sensory processing patterns. Multiple linear regressions were utilized to investigate the relationship between DCD, ADHD and co-occurring symptoms and sensory processing patterns, adjusting for social covariates.

Results: Children with DCD and ADHD symptoms showed greater variability of atypical sensory processing patterns compared with TD children. Low registration and sensory sensibility issues were more prevalent in the DCD group. ADHD children showed higher rates of low registration, sensory sensibility and sensory seeking, and all children in the co-occurring symptoms group presented sensory sensibility.

Conclusion: This study reports significant variability in sensory processing among children with DCD, ADHD and co-occurring symptoms using a population-based sample. These differences can contribute to understand how neurological and social factors correlates across diagnoses

Rev Neurol. 2020;70:127-33.

FACIAL EMOTION RECOGNITION IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Buongiorno M, Vaucheret E, Giacchino M, et al.

Introduction. There are difficulties in relationships that are attributed to a commitment in facial emotions recognition skills in subjects with attention-deficit/hyperactivity disorder (ADHD). The studies carried out did not always take into account the nature of the stimulus selected in pediatrics, which is important because the familiarity in faces, in terms of their physiognomic characteristics, makes it easier the recognition of the expressions.

Aim. To identify the profile of recognition of emotions in pediatric subjects with ADHD, using as a stimulus photos of boys and girls. **Subjects and methods.** Analytical cross-sectional study of cases and controls. We analyzed the results obtained from 54 participants between 7 and 13 years divided into two groups: 26 in control group and 28 in ADHD group. They conducted an assessment with the Wechsler Intelligence Scale for Children (WISC-V), Conners' Continuous Performance Test II (CPT-II), and Child Affective Facial Expression set (CAFE).

Results. The ADHD group showed a lower performance in recognition of emotions in general, with greater difficulty in the recognition of anger, surprise and neutral expression in particular. No relationship was found between the recognition of emotions and age, sex, total intelligence quotient or CPT-II care variables.

Conclusions. The subjects with ADHD present deficits in the recognition of emotions, especially in the recognition of anger, surprise and neutral expression, which could explain the difficulties in the interaction and that should be treated within the therapeutic framework

The Lancet Digital Health. 2020;2:e168-e178.

A NOVEL DIGITAL INTERVENTION FOR ACTIVELY REDUCING SEVERITY OF PAEDIATRIC ADHD (STARS-ADHD): A RANDOMISED CONTROLLED TRIAL.

Kollins SH, DeLoss DJ, et al.

Background: Attention-deficit hyperactivity disorder (ADHD) is a common paediatric neurodevelopmental disorder with substantial effect on families and society. Alternatives to traditional care, including novel digital therapeutics, have shown promise to remediate cognitive deficits associated with this disorder and may address barriers to standard therapies, such as pharmacological interventions and behavioural therapy. AKL-T01 is an investigational digital therapeutic designed to target attention and cognitive control delivered through a video game-like interface via at-home play for 25 min per day, 5 days per week for 4 weeks. This study aimed to assess whether AKL-T01 improved attentional performance in paediatric patients with ADHD.

Methods: The Software Treatment for Actively Reducing Severity of ADHD (STARS-ADHD) was a randomised, double-blind, parallel-group, controlled trial of paediatric patients (aged 8-12 years, without

disorder-related medications) with confirmed ADHD and Test of Variables of Attention (TOVA) Attention Performance Index (API) scores of 1-8 and below done by 20 research institutions in the USA. Patients were randomly assigned 1:1 to AKL-T01 or a digital control intervention. The primary outcome was mean change in TOVA API from pre-intervention to post-intervention. Safety, tolerability, and compliance were also assessed. Analyses were done in the intention-to-treat population. This trial is registered with ClinicalTrials.gov, NCT02674633 and is completed.

Findings: Between July 15, 2016, and Nov 30, 2017, 857 patients were evaluated and 348 were randomly assigned to receive AKL-T01 or control. Among patients who received AKL-T01 (n=180 [52%]; mean [SD] age, 9-Å7 [1-3] years) or control (n=168 [48%]; mean [SD] age, 9-6 [1-3] years), the non-parametric estimate of the population median change from baseline TOVA API was 0-88 (95% CI 0-24 1-49; p=0-0060). The mean (SD) change from baseline on the TOVA API was 0-93 (3-15) in the AKL-T01 group and 0-À03 (3-À16) in the control group. There were no serious adverse events or discontinuations. Treatment-related adverse events were mild and included frustration (5 [3%] of 180) and headache (3 [2%] of 180). Patient compliance was a mean of 83 (83%) of 100 expected sessions played (SD, 29-2 sessions).

Interpretation: Although future research is needed for this digital intervention, this study provides evidence that AKL-T01 might be used to improve objectively measured inattention in paediatric patients with ADHD, while presenting minimal adverse events. Funding: Sponsored by Akili Interactive Labs

Tijdschr Psychiatr. 2019;61:845-53.

EFFECTIVENESS OF GUANFACIN ON COMORBID DISORDERS IN CHILDREN AND ADOLESCENTS WITH ADHD: A SYSTEMATIC LITERATURE REVIEW.

de GC, De La Marche W, Danckaerts M.

BACKGROUND: Attention-deficit/hyperactivity disorder (ADHD) is a frequently occurring problem in child and adolescent psychiatry. Most prevalent comorbid disorders are oppositional defiant behavior, tics, autism spectrum disorder, anxiety and depression. Stimulants are the first pharmacological choice. Recently, long-acting guanfacin became available in Belgium and the Netherlands.

AIM: To investigate the efficacy of guanfacin on comorbid symptoms in ADHD.

METHOD: A systematic search in Medline and Cochrane databases for randomized controlled trials in which the effect of guanfacin on comorbid symptoms is evaluated.

RESULTS: Guanfacin had an effect on autism symptoms, oppositional defiant symptoms and possibly on tics in children and adolescents with adhd. On anxiety symptoms, no effect was reported. The effect on depression needs to be further investigated. The side effects of guanfacin are similar in comorbid disorders and pure ADHD.

CONCLUSION: Guanfacin is a treatment option for ADHD in children and adolescents with comorbid autism or behavioural symptoms and possibly also tics, as it has a demonstrated effect on these comorbid features. Further research is necessary in order to decide on the preference for a particular medication in ADHD with these various comorbid disorders

Transl Psychiatry. 2020;10.

SHARED AND DISTINCT RESTING FUNCTIONAL CONNECTIVITY IN CHILDREN AND ADULTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Guo X, Yao D, Cao Q, et al.

Attention-deficit/hyperactivity disorder (ADHD) often persists into adulthood, with a shift of symptoms including less hyperactivity/impulsivity and more co-morbidity of affective disorders in ADHDadult. Many studies have questioned the stability in diagnosing of ADHD from childhood to adulthood, and the shared and distinct aberrant functional connectivities (FCs) between ADHDchild and ADHDadult remain unidentified. We aim to explore shared and distinct FC patterns in ADHDchild and ADHDadult, and further investigated the cross-cohort predictability using the identified FCs. After investigating the ADHD-discriminative FCs from healthy controls (HCs) in both child (34 ADHDchild, 28 HCs) and adult (112 ADHDadult, 77 HCs) cohorts, we

identified both shared and distinct aberrant FC patterns between cohorts and their association with clinical symptoms. Moreover, the cross-cohort predictability using the identified FCs were tested. The ADHD-HC classification accuracies were 84.4% and 81.0% for children and male adults, respectively. The ADHD-discriminative FCs shared in children and adults lie in the intra-network within default mode network (DMN) and the inter-network between DMN and ventral attention network, positively correlated with total scores of ADHD symptoms. Particularly, inter-network FC between somatomotor network and dorsal attention network was uniquely impaired in ADHDchild, positively correlated with hyperactivity index; whereas the aberrant inter-network FC between DMN and limbic network exhibited more adult-specific ADHD dysfunction. And their cross-cohort predictions were 70.4% and 75.6% between each other. This work provided imaging evidence for symptomatic changes and pathophysiological continuity in ADHD from childhood to adulthood, suggesting that FCs may serve as potential biomarkers for ADHD diagnosis

Transl Psychiatry. 2020;10.

LARGE EPIGENOME-WIDE ASSOCIATION STUDY OF CHILDHOOD ADHD IDENTIFIES PERIPHERAL DNA METHYLATION ASSOCIATED WITH DISEASE AND POLYGENIC RISK BURDEN.

Mooney MA, Ryabinin P, Wilmot B, et al.

Epigenetic variation in peripheral tissues is being widely studied as a molecular biomarker of complex disease and disease-related exposures. To date, few studies have examined differences in DNA methylation associated with attention-deficit hyperactivity disorder (ADHD). In this study, we profiled genetic and methylomic variation across the genome in saliva samples from children (age 7-12 years) with clinically established ADHD (N = 391) and nonpsychiatric controls (N = 213). We tested for differentially methylated positions (DMPs) associated with both ADHD diagnosis and ADHD polygenic risk score, by using linear regression models including smoking, medication effects, and other potential confounders in our statistical models. Our results support previously reported associations between ADHD and DNA methylation levels at sites annotated to VIPR2, and identify several novel disease-associated DMPs ($p < 1e-5$), although none of them were genome-wide significant. The two top-ranked, ADHD-associated DMPs (cg17478313 annotated to SLC7A8 and cg21609804 annotated to MARK2) are also significantly associated with nearby SNPs ($p = 1.2e-46$ and $p = 2.07e-59$), providing evidence that disease-associated DMPs are under genetic control. We also report a genome-wide significant association between ADHD polygenic risk and variable DNA methylation at a site annotated to the promoter of GART and SON ($p = 6.71E-8$). Finally, we show that ADHD-associated SNPs colocalize with SNPs associated with methylation levels in saliva. This is the first large-scale study of DNA methylation in children with ADHD. Our results represent novel epigenetic biomarkers for ADHD that may be useful for patient stratification, reinforce the importance of genetic effects on DNA methylation, and provide plausible molecular mechanisms for ADHD risk variants

Transl Psychiatry. 2020;10.

ADHD AND ASD: DISTINCT BRAIN PATTERNS OF INHIBITION-RELATED ACTIVATION?

Albajara SA, Septier M, Van SP, et al.

Attention-deficit/hyperactivity (ADHD) and autism spectrum (ASD) disorders often co-occur. In both cases, response inhibition deficits and inhibition-related atypical brain activation have been reported, although less consistently in ASD. Research exploring the overlap/distinctiveness between ADHD and ASD has significantly increased in recent years, but direct comparison of the inhibition-related neuronal correlates between these disorders are scarce in the literature. This study aimed at disentangling the shared and specific inhibitory brain dysfunctions in ASD and ADHD. Using functional magnetic resonance imaging (fMRI), brain activity was compared between children with ADHD, ASD and typically developing (TD) children aged 8-12 years during an inhibition stop-signal task, using stringent inclusion criteria. At the behavioural level, only children with ADHD exhibited inhibition deficits when compared with the TD group. Distinct patterns of brain activity were observed during successful inhibition. In children with ADHD, motor inhibition was associated with right inferior parietal activation, whereas right frontal regions were activated in children

with ASD. Between-group comparisons disclosed higher middle frontal activation in the ASD group compared with the ADHD and the TD groups. Our results evidence different patterns of activation during inhibition in these two disorders, recruiting different regions of the fronto-parietal network associated to inhibition. Besides brain activity differences, behavioural inhibition deficits found only in children with ADHD further suggest that reactive inhibition is one of the core deficits in ADHD, but not in ASD. Our findings provide further evidence contributing to disentangle the shared and specific inhibitory dysfunctions in ASD and ADHD

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Turkish Journal of Physiotherapy and Rehabilitation. 2019;30:S80.

AN INVESTIGATION OF BILATERAL MOTOR COORDINATION AND VISUAL PERCEPTION SKILLS IN TYPICAL DEVELOPMENT CHILDREN AND ATTENTION DEFICIT HYPERACTIVITY DISORDER AND PRESENCE OTHER DISORDER CHILD.

Atasavun US, et al.

Purpose: This study was planned to examine bilateral motor coordination and visual perception evaluations in school age children between typical development (TD) and attention deficit hyperactivity disorder (ADHD) and attention deficit hiperactivity disorder with oppositional defiant disorder (ODD).

Methods: We evaluated 20 children with ADHD and 19 children with ADHD+ODD diagnosed by Hacettepe University Department of Child and Adolescent Mental Health, between ages 6-10 years, boy and right hand dominant and 23 age-matched as TD. Bilateral motor coordination were evulated with Bruininks-Oseretsky for the Motor Proficiency Test 2 of the short form of sub-test and Motor-Free Visual Perception Test-3 was used for visual perception assessment.

Results: The mean age of the ADHD group was 88.95-11.33 months, the ADHD+ODD was 93.14-11.45 months and the TD was 105.35-18.15 months. At bilateral motor coordination, from constancy and visual closure of visual perception test score; while there was no statistical difference between ADHD and ADHD+ODD groups, the TD peers were statistically significantly higher ($p < 0.017$). At total score of visual perception test, there were only statistical differences ($p < 0.017$) between ADHD and TD children, the TD peers were statistically significantly higher.

Conclusion: Disorders in motor skills and visual perception cause problems at self-confidence, academic success and social performance at school age. Eventually we found that both ADHD and ADHD+ODD groups have both motor and visual perception skills behind their peers. So it would be useful to consider these parameters in the evaluation and treatment plans of children with ADHD and comorbid diagnosis by physiotherapists

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Vertex. 2019 Jan;XXX:52-63.

PHARMACOLOGICAL INTERVENTIONS FOR INTELLECTUAL DISABILITY AND AUTISM.

Cukier S, Barrios N.

No medication has been proven effective in treating core characteristics of intellectual disability or autism. Psychotropic medications are frequently used to target psychiatric symptoms in children, adolescents and adults with developmental conditions, despite the little evidence for their efficacy. This article aimed to summarize current evidence on efficacy of pharmacological interventions for the most frequent symptoms and disorders associated to autism and to intellectual disability. And also, novel molecules being studied for core symptoms of these conditions. Electronic databases were searched and supplemented with a hand search. Data were described narratively prioritizing meta-analysis and randomized controlled trials but considering also open label trials and preliminary studies. The main conclusions were that only few drugs showed efficacy for reducing psychiatric symptoms associated to these developmental conditions, mainly risperidone and aripiprazole to treat irritability and methylphenidate and atomoxetine for hyperactivity and attention deficit. Evidence is inconclusive regarding the effectiveness of other drug groups. Novel therapeutic agents showed mixed results and quality of evidence is low; some of these agents aim at biologically targeted

pharmacotherapy, which may lead to successful individualized treatment options in the future. To this day, clinicians should use pharmacotherapy with caution, carefully weighing risks and benefits, and as a part of a comprehensive personalized approach

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Vision Research. 2020;169:6-11.

EYE VERGENCE RESPONSES IN CHILDREN WITH AND WITHOUT READING DIFFICULTIES DURING A WORD DETECTION TASK.

Jimnez EC, Romeo A, et al.

Vergence eye movements are movements of both eyes in opposite directions. Vergence is known to have a role in binocular vision. However recent studies link vergence eye movements also to attention and attention disorders. As attention may be involved in dyslexia, it is sensible to guess that the presence of reading difficulties can be associated with specific patterns in vergence responses. Data from school children performing a word-reading task have been analysed. In the task, children had to distinguish words from non-words (scrambled words or row of X's), while their eye positions were recorded. Our findings show that after stimulus presentation eyes briefly converge. These vergence responses depend on the stimulus type and age of the child, and are different for children with reading difficulties. Our findings support the idea of a role of attention in word reading and offer an explanation of altered attention in dyslexia

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Zhonghua Er Ke Za Zhi. 2020 Mar;58:188-93.

CONSENSUS ON PEDIATRIC CLINICAL PRACTICE OF EARLY IDENTIFICATION, STANDARDIZED DIAGNOSIS AND TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Anon.

of Public Health, and information about the attention-deficit hyperactivity disorder diagnoses obtained from the Norwegian Patient Registry

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Developmental trajectories of childhood symptoms of hyperactivity/inattention and suicidal behavior during adolescence

Alberto Forte¹ · Massimiliano Orri^{2,3} · Cédric Galera³ · Maurizio Pompili¹ · Gustavo Turecki² · Michel Boivin⁴ · Richard E. Tremblay^{5,6} · Sylvana M. Côté^{3,7}

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Abstract

Hyperactive/inattentive symptoms (ADHD symptoms) are associated with suicidal behavior in clinical studies, but there is still a lack of population-based longitudinal investigations on the developmental aspects of this association. Additionally, it is unclear whether the association is similar for boys and girls. The objectives of the study were to test the association between the ADHD symptoms during childhood and suicidal ideation and attempt during adolescence, and to investigate sex differences. 1407 children from the Québec Longitudinal Study of Child Development were followed up from 5 months to 17 years of age. We used teacher-reports of ADHD symptoms from 6 to 12 years, and self-report of suicidal ideation and attempt at 13, 15, and 17 years. We identified three ADHD symptoms trajectories: low (boys: 32.2%, girls: 48.7%), moderate (boys: 44.6%; girls: 42.2%) and high (boys: 23.2%; girls: 9.1%). Compared to boys on a low trajectory, boys on a moderate trajectory were at higher risk for suicidal ideation (OR 4.2, 95% CI 1.2–14.8), and boys on a high trajectory were at higher risk for suicide attempts (OR 4.5, 95% CI 1.1–17.9). Girls on moderate or high ADHD symptoms trajectories were not at higher risk for suicidal ideation or attempts than girls on low trajectories. For boys, but not for girls, moderate-to-high ADHD symptoms increased the suicidal risk in adolescence. Interventions with boys showing ADHD symptoms should include a suicide prevention component.

Keywords Hyperactivity · Inattention · Suicidal behavior · Developmental trajectories

Alberto Forte and Massimiliano Orri contributed equally to this work.

✉ Sylvana M. Côté
sylvana.cote.1@umontreal.ca

- ¹ Department of Neurosciences, Mental Health and Sensory Organs, Suicide Prevention Center, Sant'Andrea Hospital, Sapienza University, Rome, Italy
- ² McGill Group for Suicide Studies, Douglas Mental Health University Institute, Department of Psychiatry, McGill University, Montreal, Canada
- ³ Bordeaux Population Health Research Centre, Inserm U1219, Université de Bordeaux, Bordeaux, France
- ⁴ School of Psychology, Laval University, Quebec, QC, Canada
- ⁵ Departments of Pediatrics and Psychology, University of Montreal, Montreal, Canada
- ⁶ School of Public Health, Physiotherapy and Population Science, University College Dublin, Dublin, Ireland
- ⁷ Department of Social and Preventive Medicine, University of Montreal, Montreal, QC, Canada

Introduction

Suicidal behavior is most prevalent during adolescence (lifetime prevalence of suicide ideation, plans, and attempts is 12.1%, 4.0%, and 4.1%, respectively) [1], and main risk factors for suicide mortality—the second leading cause of death among adolescents [2]. Attention deficit hyperactivity disorder (ADHD), a common disorder affecting 5.3% of children and adolescents [3], is associated with several adult negative outcomes including suicide mortality, suicide attempt and suicidal ideation (SB) [4]. Despite a few reports, there is still a lack of longitudinal investigations on the association between the course of ADHD symptoms during childhood and SB in adolescents at the population level. Indeed, hyperactive and inattentive symptoms were associated with increased risk for SB in some clinical and population-based samples [5–7]. However, only a few longitudinal population-based studies investigated the specific association between hyperactivity/inattention and SB [8–10]. Hurtig et al. conducted a population-based study on a Finnish birth cohort

and showed an association between a diagnosis of ADHD and suicidal ideation and deliberate self-harm; however, they took into account only clinically relevant ADHD diagnosis without including developmental traits of hyperactivity and inattention throughout childhood. Sourander et al. [8] investigated the association between psychopathology at the age of 8 years and later suicide mortality, but did not focus specifically on the association between the development of hyperactivity/inattention and SB. Finally, Galera et al. found that the association between ADHD and SB held only for males [9], but there seem to be not clear consensus regarding sex differences since another study reported opposite results [10]. Given the importance of individualized preventive intervention taking into account sex differences in adolescent SB [11], it is relevant to clarify the extent to which sex differences play a role in SB of children showing hyperactive/inattentive symptoms. The objective of this study was to clarify the predictive association between childhood symptoms of hyperactivity/impulsivity and inattention (ADHD symptoms) and suicidal ideation and attempt in adolescence. Especially, we investigated whether this association is different among girls and boys. We relied on longitudinal data based on a population sample from Québec, Canada, using person-centered methods allowing us to identify children with atypically high ADHD symptoms over the course of childhood, and teacher-assessment of children behaviors.

Methods

Sample

Participants were drawn from the Quebec Longitudinal Study of Child Development (QLSCD), a representative sample of 2120 infants born in Québec, Canada, in 1997/98 and followed up between 5 months and 17 years. Random selection of the initial representative sample was made through the birth registry and following a procedure based on living area and birth rate. Mothers giving birth after 24 weeks of gestation and speaking French or English were eligible to participate in the study. Data were collected annually or bi-yearly from 1998 through 2015. We used teacher-reports of ADHD symptoms from 6 to 12 years, and self-report of suicidal ideation and attempt from 13 to 17 years. The final sample comprised of $N = 1407$ participants for which data were available on SB (Table 1).

Ethical consideration

Ethical approval was given by the Quebec Statistics Institute and the St-Justine Hospital Research Centre. Written informed consent was obtained from all participants and their parents at each assessment. All adolescents and their parents were provided with a list of resources in case of needing help.

Table 1 Socio-demographic characteristics of the sample

	Attempt ($N=80$)	Ideation ($N=89$)	No attempt/idea- tion ($N=1238$)	<i>p</i> value
Child characteristics				
Sex male, N (%)	19 (23.7)	29 (32.6)	617 (49.8)	0.000
Depressive/anxiety symptoms	2.4 (1.4)	2.1 (1.6)	2.1 (1.6)	0.255
ADHD medication use, N (%)	15 (18.7)	14 (15.7)	152 (12.2)	0.121
Opposition	3.8 (1.5)	3.5 (1.5)	3.6 (1.5)	0.363
Low birth weight (<2500 g), N (%)	3 (3.7)	1 (1.1)	40 (3.2)	0.515
Parents and family characteristics				
Low socioeconomic status, N (%)	28 (35.9)	21 (23.6)	265 (21.5)	0.013
Maternal age at child birth	28.5 (5.5)	30.0 (5.3)	29.3 (5.1)	0.191
Paternal age at child birth	31.6 (5.5)	32.9 (4.7)	32.2 (5.5)	0.315
Family dysfunction	2.0 (1.5)	1.7 (1.4)	1.7 (1.4)	0.115
Family structure non-intact, N (%)	22 (37.5)	13 (14.6)	215 (17.4)	0.053
Smoking during pregnancy, N (%)	24 (30.7)	18 (20.2)	299 (24.2)	0.276
Parental mental health				
Maternal suicide attempt, N (%)	3 (3.8)	2 (2.2)	19 (1.5)	0.387
Maternal depression	1.6 (1.1)	1.4 (1.1)	1.4 (1.1)	0.207

The table provides basic socio-demographic characteristics of the sample. Descriptive statistics are mean (standard deviations) if not otherwise indicated. *p* values are based on ANOVA (continuous variables) or Chi squares (categorical variables). Data were compiled from the final master file of the Québec Longitudinal Study of Child Development (1998–2015), Québec Government, Québec Statistic Institute

Measures

Outcome: past-year suicidal ideation and suicide attempt Suicidal ideation was assessed at 13, 15, and 17 years using the question: “in the past 12 months, did you ever seriously think of attempting suicide” (yes coded 1, no coded 0; answering “don’t know” or refusal was coded as missing). If they answered affirmatively, they were asked: “in the past 12 months, how many times did you attempt suicide”, dichotomized as 0 versus ≥ 1 . As in our previous publications [12, 13] the following variables were derived: lifetime suicidal ideation (i.e., reporting ≥ 1 suicide ideation at 13 or 15 or 17 years but never suicide attempt) and lifetime suicide attempt (i.e., reporting ≥ 1 suicide attempt at 13 or 15 or 17 years).

Exposure: ADHD symptoms during childhood ADHD symptoms were rated by schoolteachers when participants were 6, 7, 8, 10, and 12 years of age. Items were derived from the Behavior Questionnaire created for the Canadian National Longitudinal Study of Children and Youth, which incorporates items from the Child Behavior Checklist [14], the Ontario Child Health Study Scales [15], and the Preschool Behavior Questionnaire [16]. The following items were used and summed-up to obtain the hyperactivity/inattention score at each year (range 0–18; Cronbach’s α range 0.74–0.79), for hyperactivity-impulsivity: (1) could not sit still, was restless and hyperactive; (2) was impulsive, acted without thinking; (3) had difficulty waiting for his/her turn in games; (4) could not settle down to do anything for more than a few moments; For inattention: (1) was unable to concentrate, could not pay attention for long, (2) was easily distracted, had trouble sticking to any activity, (3) was inattentive. Each year, a different teacher rated the frequency of these behaviors in the past 6 months (0 = never, 1 = sometimes, 2 = often).

Covariates We used a parsimonious set of covariates for our multiple regression models, all measured before the exposure variable (i.e. age 6 years). Variables were selected on the basis of the literature [9, 17, 18] and previous studies on the same sample [12, 19, 20]: maternal depressive symptoms, assessed using a short version of the Centre for Epidemiological Study Depression Scale [21]; children depression-anxiety symptoms, assessed by teachers at age 6 and measured with five items (3 for anxiety, e.g., “was too fearful or anxious” and 2 for depression, e.g., “seemed to be unhappy or sad;”); family socioeconomic status (SES) at 5 months, an aggregate index of annual gross income, parental education level, and occupational prestige, based on Willms and Shields (range -3 = low SES to 3 = high SES, centered at zero) and dichotomized into low (i.e., 0–25th percentile) vs non-low (25th–75th percentile). [22]. All questionnaires are available online (<http://www.jesuisjese.rai.stat.gouv.qc.ca>).

Statistical analyses

First, we estimated the developmental trajectories of ADHD symptoms among girls and boys, using Group-based trajectory modeling [23]. This approach is based on semiparametric mixture models, and allows us clustering children according to the similarities of their developmental pattern of ADHD symptoms from 6 to 12 years. Both the best number of trajectories and the polynomial order of the trajectories (i.e., intercept only, linear or quadratic; determining the shape of the trajectory) were defined by comparing multiple models on the Bayesian Information Criterion [23].

Second, we used binary logistic regressions to test the predictive association between trajectory membership and suicidal ideation and attempt. We estimated unadjusted models as well as models adjusted for the influence of the selected covariates. Missing data on these covariates were handled using multiple imputations by chained equation: the models were estimated on 50 complete datasets, and the results were pooled. Data analysis was performed using Stata version 14, and the trajectories were estimated using the traj procedure.

Results

Prevalence of suicidal ideation and suicide attempt

At 13, 15, and 17 years, respectively, 23 (1.9%), 43 (3.3%), and 51 (4.3%) adolescents reported suicidal ideation in the past year, while at those same ages, respectively, 28 (2.4%), 37 (2.8%), and 28 (2.4%) adolescents reported suicide attempt in the past year. In total, 29 boys (4.3%) and 60 girls (8.1%) reported suicidal ideation at least at one assessment (i.e., lifetime suicidal ideation), while 19 boys (2.8%) and 61 girls (8.2%) reported suicide attempt at least at 1 assessment (i.e., lifetime suicide attempt; Table 2).

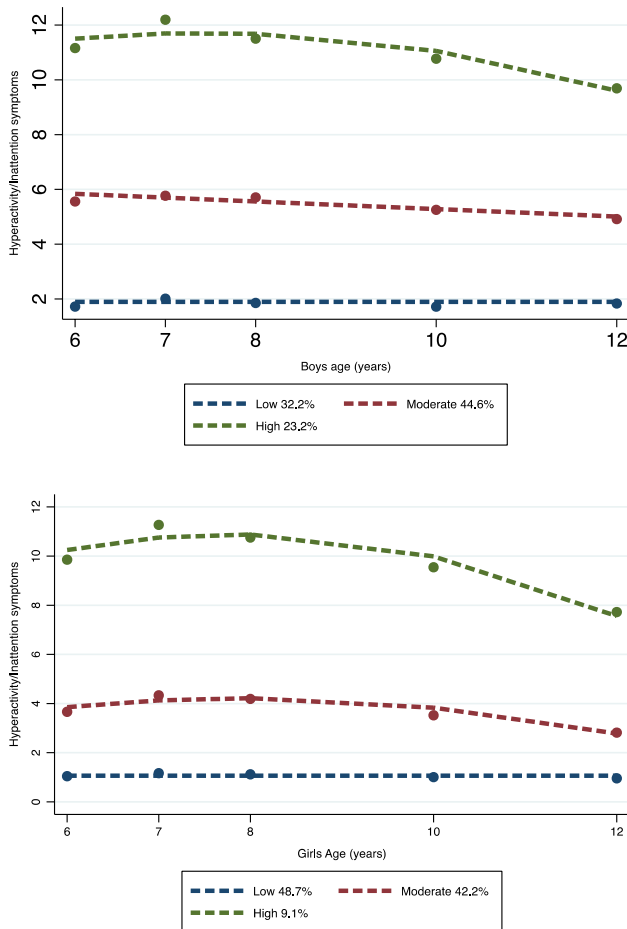
Developmental trajectories of ADHD symptoms

For both boys and girls, we identified a three-group model as having the best fit (Fig. 1): low trajectory (boys: 32.2%, girls: 48.7%), moderate trajectory (boys: 44.6%; girls: 42.2%), high trajectory (boys: 23.2%; girls: 9.1%). The trajectories showed similar developmental patterns for boys and girls. However, boys on the high trajectory had higher ADHD symptoms scores than girls on the high trajectory. Additionally, the proportion of children within each trajectory was different, with the high trajectory being larger for boys than for girls, and the low trajectory being larger for girls than for boys.

Table 2 Prevalence of suicidal ideation and attempt by trajectory and sex

	Suicidal behavior entire sample		Suicidal behavior by trajectory					
	Boys <i>n</i> = 665	Girls <i>n</i> = 742	Low trajectory		Moderate trajectory		High trajectory	
			Boys <i>n</i> = 211	Girls <i>n</i> = 367	Boys <i>n</i> = 303	Girls <i>n</i> = 312	Boys <i>n</i> = 151	Girls <i>n</i> = 63
Ideation	29 (4.3)	60 (8.1)	3 (1.4)	30 (8.1)	18 (5.9)	23 (7.3)	8 (5.3)	7 (11.1)
Attempt	19 (2.8)	61 (8.2)	4 (1.9)	19 (5.1)	8 (2.6)	31 (9.9)	7 (4.6)	11 (17.4)

The table provides count (*N*) and percentage (%) of adolescents reporting suicide ideation and attempt at 13–17 years for each trajectory and by sex

**Fig. 1** Trajectories of ADHD symptoms among boys and girls

Association between ADHD symptoms trajectories and suicidal ideation

Prevalence of suicidal ideation and attempt in each trajectory are shown in Table 2. For girls, the highest prevalence of suicidal ideation was found in the high trajectory (11.1%), while girls in the moderate and low trajectories had a slightly lower suicide ideation rate (7.3% and 8.1%, respectively). Logistic regression analyses (Table 3) showed that, girls

in the low, moderate, and high trajectories were at similar risk of suicidal ideation (moderate vs low, OR 0.9, 95% CI 0.5–1.5; high vs low, OR 1.4, 95% CI 0.6–3.3), even after adjustment for the selected covariates (moderate vs low, OR 1.0, 95% CI 0.5–1.7; high vs low, OR 1.8, 95% CI 0.7–5.0).

Boys in the high and moderate trajectories had a similar suicidal ideation rate (5.3% and 5.9%, respectively), which was higher than that of boys in the low trajectory (1.4%). Consistently, logistic regression analysis showed that boys in the moderate and high trajectories had a fourfold increased risk of suicide ideation compared to boys in the low trajectory (moderate, OR 4.4, 95% CI 1.3–15.1; high, OR 3.9, 95% CI 1.0–14.9). Odds ratios remained similar after adjustment for the selected covariables, although below the significance threshold for the high trajectory (moderate, OR 4.2, 95% CI 1.2–14.8; high, OR 3.6, 95% CI 0.8–15.1).

Association between ADHD symptoms trajectories and suicide attempt

There was a dose–response pattern indicating that the higher the ADHD symptoms, the higher the rate of suicide attempts (girls: 5.1%, 9.9%, 17.4%; boys: 1.9%, 2.6%, 4.6%, respectively for the low, moderate, and high trajectories; Table 2). Logistic regression (Table 3) showed that girls in both high (OR 3.9, 95% CI 1.7–8.6) and moderate trajectory (OR 2.0, 95% CI 1.1–3.6) had a higher crude risk for attempting suicide compared to girls in the low trajectory. However, those risks decreased and became non-significant after adjustment for the covariates (moderate, OR 1.6, 95% CI 0.8–3.0; high, OR 2.3, 95% CI 0.9–5.8).

A different pattern was observed for boys. Compared to boys in the low trajectory, boys in the moderate and high trajectories had, respectively, 1.4-fold (OR 1.4, 95% CI 0.4–4.7) and 2.5-fold (OR 2.5, 95% CI 0.7–8.7) increased risk for suicide attempt. After accounting for the confounding role of the covariates, the risk became statistically significant for the boys in the high trajectory (OR 4.5, 95% CI 1.1–17.9), but not for the boys in the moderate trajectory (OR 1.8, 95% CI 0.5–6.3).

Table 3 Logistic regression models predicting suicidal ideation and suicide attempt at 13–17 years

ADHD symptoms trajectory	Suicidal ideation		Suicide attempt	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ^a	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ^a
Boys (665)				
Low ADHD symptoms	1 [reference]	1 [reference]	1 [reference]	1 [reference]
Moderate ADHD symptoms	4.4 (1.3–15.1)	4.2 (1.2–14.8)	1.4 (0.4–4.7)	1.8 (0.5–6.3)
High ADHD symptoms	3.9 (1.0–14.9)	3.6 (0.8–15.1)	2.5 (0.7–8.7)	4.5 (1.1–17.9)
Girls (742)				
Low ADHD symptoms	1 [reference]	1 [reference]	1 [reference]	1 [reference]
Moderate ADHD symptoms	0.9 (0.5–1.5)	1.0 (0.5–1.7)	2.0 (1.1–3.6)	1.6 (0.8–3.0)
High ADHD symptoms	1.4 (0.6–3.3)	1.8 (0.7–5.0)	3.9 (1.7–8.6)	2.3 (0.9–5.8)

^aOdds ratios adjusted for child depressive symptoms, socioeconomic status, and maternal depression

Discussion

The objectives of this population-based study were to test the predictive association between childhood ADHD symptoms and suicide ideation and attempts in adolescence, and to test whether the suicidal risk differed by sex. Our analyses showed that moderate to high levels of ADHD symptoms did not convey the same suicidal risk for boys and girls. We found that boys following moderate and high ADHD symptoms trajectories during the course of childhood (6–12 years) had a higher risk of suicidal ideation in adolescence (13–17 years), compared to boys following a low ADHD symptoms trajectory. In contrast, girls following a moderate or high ADHD symptoms trajectory did not have a heightened risk for suicidal ideation, compared to girls following a low ADHD symptoms trajectory. These associations were of similar magnitude after taking into account the confounding effects of childhood depressive symptoms, socioeconomic status, and maternal depression.

For suicide attempts, only boys following a high ADHD symptoms trajectory showed an increased (4.5 times higher) risk of suicide attempt compared to boys following a low trajectory. The risk of suicide attempts was not higher for girls on the high ADHD symptoms trajectory compared to girls on the low trajectory.

Our results are consistent with previous studies suggesting that ADHD symptoms might be considered early risk factors for suicide attempts during adolescence, especially among boys [8, 9]. Our findings also extend prior knowledge in several ways. First, to our knowledge, this is the first population-based study to investigate the association between ADHD symptoms and SB using group-based trajectory modeling [23]. Given the developmental origins of suicidal behavior, it is important to identify the developmental aspects of ADHD symptoms and its longitudinal association with suicidal behavior using statistical techniques that account for population heterogeneity in the long term development of ADHD symptoms [7–9]. Specifically, such

techniques rely on a data driven approach that allows one to identify homogeneous group of children with typical and atypically high levels of symptoms without using arbitrary classifications. Second, previous studies were mainly based on cross-sectional designs and focused on clinical populations [6, 7, 10]. Third, as previous studies mainly documented the association between ADHD symptoms and suicide mortality or serious attempts (i.e., requiring hospitalization) [8] in boys, our findings extend previous reports by showing that the association also holds for self-reported suicidal ideation and self-reported attempt. This is important because suicidal ideation precede suicide attempt in most cases. Only one previous population-based study found a positive association between childhood ADHD symptoms and SB among boys, although it was not based on a birth cohort [8, 9].

The underlying mechanisms of the sex difference in the association between ADHD symptoms and SB are still unclear, but they might be related to the type of ADHD symptoms that boys and girls experience. Boys with ADHD are more likely than girls with ADHD to display hyperactive-impulsive symptoms and less likely to experience inattentive symptoms [24]. Previous studies indicated that impulsivity is one of the pathway to suicidal behaviors, both in boys and girls [25–27], and a recent study also highlighted that different domains of impulsivity are connected to suicidal ideation and suicide attempt (respectively, Pervasive Influence of Feelings and Feelings Trigger Action) [28]. Thus, boys' higher levels of ADHD symptoms may explain why the association between hyperactivity-inattention and suicidal outcomes holds mainly for boys [28, 29]. Moreover, the same level of suicidal ideation may convert more easily into the acting out of suicide attempts in boys than in girls being facilitated by higher levels of hyperactivity-impulsivity, as previously suggested [12, 30–32]. Previous studies distinguishing the role of impulsivity and inattention show that those symptoms have different long term effect on educational and mental health outcome [20, 33] but to our

knowledge no study investigated suicidal outcomes. Therefore, studies distinguishing the role of inattention from that of hyperactive/impulsive symptoms in boys and girls are needed to clarify the origin of the sex difference that we observed. The lack of risk awareness which can be part of ADHD itself might also explain the finding that ADHD symptoms are risk factors for suicide attempt and ideation among boys [4, 9], as these symptoms may confer to adolescents a higher risk of acting without considering the consequences of their acts. However, further studies are needed to clarify the underlying mechanisms of this association.

Our findings have clear clinical and preventive implications: boys presenting with moderate or high levels of ADHD symptoms throughout elementary school, might be considered more at risk for suicidal ideation and attempt later in life. These findings may guide clinicians to a more focused detection and prevention of SB in adolescents who manifested these symptoms throughout elementary school.

To our knowledge this is the first population-based study using trajectory modeling to clarify the association between ADHD symptoms during childhood and suicidal behavior during adolescence, with a focus on sex differences. Strengths of the study include: the use of a population-based sample followed up from birth to 17 years; the yearly or bi-yearly assessments of hyperactivity/impulsivity and inattention by five different teachers providing independent assessments by adults with a good sense of normative behaviors in a group context [34], and the assessment of suicidality at three time points during adolescence.

However, caution in interpreting the results is warranted in light of the following limitations. First, attrition (e.g., emigration, loss to follow-up, and refusal) is a limitation of all longitudinal cohort studies including this one. To limit the loss of data, we used multiple imputations to deal with missing on the covariates. Moreover, as the participants with the more severe mental health symptoms tended to drop out, our models are likely to provide conservative estimate of the association between ADHD symptoms and suicidality in the population. Second, we focused on symptoms of hyperactivity/impulsivity and inattention, as the prevalence of ADHD diagnoses is low in population-based samples and we did not obtain clinical mental health evaluation during childhood.

This population-based study showed that boys with high and moderate levels of ADHD symptoms during childhood are at higher risk for later suicidal behavior. In particular, boys with moderate and high level of ADHD symptoms exhibited a higher risk for suicidal ideation, and a 4.5 times higher risk of suicide attempts in adolescence compared to those with low levels of ADHD symptoms. Interventions with pre-adolescent and adolescent boys showing ADHD symptoms should include a suicide prevention component. Population level suicide prevention for adolescents should particularly target boys with a history of ADHD problems.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interest.

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Isolamento e ADHD

In questa situazione, i bambini con l'ADHD e le loro famiglie possono sperimentare stress e difficoltà aggiuntive.

L'emergenza ha improvvisamente e radicalmente modificato la nostra quotidianità e i cambiamenti sono in continua evoluzione; in questa situazione è stato ed è tuttora complicato garantire giornate strutturate e prevedibili, che sappiamo aiutare i bambini ad autoregolare le proprie emozioni e i propri comportamenti. Inoltre, l'isolamento ha da una parte ridotto gli stimoli intellettuali, emotivi e sociali, le attività sportive e ricreative di cui questi bimbi hanno tanto bisogno e dall'altra reso più accessibili alcuni stimoli ed attività, come lo smartphone e i videogiochi, che possono aumentare l'irritabilità dei ragazzi e sono difficili da limitare.

I genitori potrebbero dunque assistere ad un incremento della sintomatologia dell'ADHD e dei comportamenti problematici.

Seguono alcuni spunti di prevenzione e gestione delle problematiche che potrebbero emergere:

- **Mantenere l'assunzione farmacologica.** Il farmaco aiuta i bambini a controllarsi; in un periodo di cambiamento i bambini possono sentire minore senso di controllo sul proprio ambiente. Continuare il farmaco alle dosi abituali è consigliato per aiutare i bambini ad affrontare questi cambiamenti e sentirsi maggiormente in controllo del proprio corpo ed emozioni, oltre che aiutarli a far fronte alle richieste scolastiche. Contatta il tuo neuropsichiatra di riferimento prima di prendere decisioni spontanee sulla sospensione del farmaco o per un confronto su eventuali dubbi.
- **Stabilire una routine,** soprattutto in questo periodo di incertezza, è importante perché fa sentire più sicuri, aumentando il senso di controllo. A scuola i bambini spesso usano agende visive, che scandiscono il tempo e le transizioni fra un'attività e l'altra. Crea simili

programmazioni all'inizio di ciascuna giornata; l'agenda dovrebbe prevedere un tempo per la scuola e i compiti, uno per il gioco e lo svago, insieme e da soli, davanti allo schermo e offline. Ricorda che per questi bimbi le pause sono importanti e che è necessario scomporre le attività che richiedono sforzo mentale, alternandole ad attività rilassanti.

Insieme potete inoltre concordare e scrivere alcune semplici regole, definite come patti per stare bene insieme. Ricorda che devono essere poche ed espresse in positivo, affinché tuo figlio possa viverle come aspettative di comportamento e non come divieti.

- **Se tuo figlio rifiuta di fare i compiti o rispettare le regole**, può essere molto utile impostare una token economy per fornirgli una motivazione estrinseca ed aiutarlo a controllarsi e ad attivare e mantenere l'impegno sulle attività. Concordate insieme le condizioni, i premi e quando li riceverà. È sempre più funzionale e positivo per la vostra relazione premiare comportamenti adeguati e non premiare quelli che non lo sono, piuttosto che adottare punizioni.
- **Scrivi insieme a tuo figlio una lista di attività offline** che possono essere svolte all'interno del contesto domestico; le attività devono naturalmente suscitare il suo interesse (lettura, giochi in scatola, disegnare, cucinare, semplici esercizi fisici, feste danzanti in famiglia ecc.). "Ritorna agli anni 80" e recupera nella tua memoria quali erano le tue attività preferite prima dell'arrivo dei computer.
Attualmente, inoltre, le passeggiate in prossimità della propria abitazione non sono vietate, pur essendo sconsigliate. Per i peculiari bisogni dei nostri utenti, possiamo rilasciare un certificato che ne giustifichi la necessità. Ricorda infine che durante la giornata, sono inevitabili anche spazi di inattività e spazi di semplice connessione familiare.
- **Utilizza il telefono o alcune piattaforme on line per permettere ai bimbi di mantenere contatti sociali** con i propri compagni e amici e ricevere supporto. Soprattutto se tuo figlio è adolescente, l'interruzione dei rapporti con i pari è molto frustrante. Ascolta e legittima i suoi sentimenti ed aiutalo a trovare nuovi modi di rimanere in contatto con gli altri. Ad esempio, allenta le regole sul tempo speso sui social network.

- **Cerca di monitorare quello che tuo figlio guarda e svolge on line.** Sebbene in questa situazione tu possa concederti di allentare alcune regole, spiegando a tuo figlio che è un'eccezione e che verranno ristabilite quando la vita tornerà alla normalità, mantieni alcuni limiti importanti. Stabilisci per quanto tempo tuo figlio può utilizzare i mezzi elettronici e non concedere grandi spostamenti negli orari del sonno. I bambini con ADHD faticano a rappresentare mentalmente il tempo e hanno bisogno che questa informazione venga esplicitata. Utilizza un timer oppure una sveglia.
- **Se ne hai la possibilità, oltre ai tempi struttura gli spazi, definendo uno spazio per studiare e uno per lo svago.** Individua per lo studio una postazione stabile, che sia il più possibile libera da stimoli e fonti di distrazione. Se ne hai la possibilità riserva alcuni **mezzi elettronici** allo studio ed altri allo svago. Questi ultimi possono continuare ad essere utilizzati come premi e rinforzi per il rispetto delle regole e l'esecuzione delle consegne scolastiche.
- **Interrogati su come si sente tuo figlio.** I bambini possono rispondere allo stress in modi diversi, come essere più agitati, insistenti, ritirati, arrabbiati. I comportamenti problematici, oppositivi e provocatori e l'aumento della collera potrebbero indicare che tuo figlio si sente ansioso.

Scegli un momento tranquillo per domandare con gentilezza come si sente e assicurati di rispondere ai suoi sfoghi in modo calmo e accogliente.
- **Sii gentile con te stesso.** Tutti vogliono essere bravi genitori, ma in questa situazione è più che mai possibile mettere da parte quell'immagine di perfezione e accettare con soddisfazione e gentilezza di essere, citando Winnicott, "madri e padri sufficientemente buoni". Capiterà di arrabbiarsi, perdere il controllo oppure concedere permessi insoliti e va bene così. Troverai l'opportunità di "riparare". Ricorda che puoi chiedere aiuto anche per te stesso quando ne hai bisogno.

**Valeria Tessarollo
Ilaria Costantino**

Centro Regionale di Riferimento ADHD
ASST Santi Paolo Carlo presidio San Paolo
valeria.tessarollo@asst-santipaolocarlo.it

Per ricevere la newsletter iscriversi al seguente indirizzo:
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IRCCS ISTITUTO DI RICERCHE FARMACOLOGICHE MARIO NEGRI

DIPARTIMENTO DI SALUTE PUBBLICA

Laboratorio per la Salute Materno Infantile

Via Mario Negri, 2 - 20156 Milano MI - Italia - www.marionegri.it

tel +39 02 39014.511 - mother_child@marionegri.it