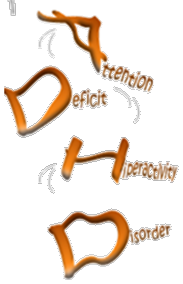
NEWSLETTER



INDICE:

ISTITUTO DI RICERCHE FARMACOLOGICHE MARIO NEGRI IRCCS

BIBLIOGRAFIA ADHD febbraio 2016

ADHD Atten Deficit Hyperact Disord. 2014;6:111-20.
ADHERENCE TO STIMULANTS IN ADULT ADHD.
O'Callaghan P.
Although stimulant medication can reduce symptoms and lessen the degree of functional impairment associated with attention deficit hyperactivity disorder (ADHD), the adherence rate in adults diagnosed with ADHD is reportedly <12 %. The article explores the contexts that influence stimulant medication adherence in adults diagnosed with ADHD. Using a mixed-method design, data on ADHD-related quality of life and stimulant adherence were collected from 67 adults with ADHD. Next, 18 of those adults, based on adherence/quality of life, completed semi-structured interviews. Qualitative data were analyzed using thematic narrative inquiry, based on the Health Belief Model. Findings revealed no direct relation between stimulant adherence and quality of life. Instead, the doctor/patient relationship was a strong predictor of a person's quality of life. Physicians treating adults with ADHD must be aware of individual variation in stimulant response, seek to understand the functional limitations of their patients and strive to communicate effectively

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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.

ADHD Atten Deficit Hyperact Disord. 2016;1-15.

ADHD IN COLLEGE: A QUALITATIVE ANALYSIS.

Lefler EK, Sacchetti GM, Del Carlo DI.

Attention-deficit/hyperactivity disorder (ADHD) affects many adults and is particularly impairing for emerging adults enrolled in college. Research has shown substantial academic impairment for these individuals. However, research on ADHD impairment has largely been quantitative and focused on children. Therefore, the current study employed Interpretative Phenomenological Analysis to explore the lived experience of college students with ADHD with the following two research questions: (1) What is it like to be a college student with ADHD? and (2) What resources are utilized by college students with ADHD? Thirty-six college students with ADHD were interviewed in focus group settings. Our participants reported a complex and mixed experience living with ADHD in college and varied use of treatments and other accommodations. Specifically, three Constructs emerged in the current study: Consequences of Diagnosis, Impairment, and Treatment Management. Implications for professionals working with these students and future directions for researchers are discussed

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Alcohol Clin Exp Res. 2016;40:348-58.

THE INFLUENCE OF EXTRINSIC REINFORCEMENT ON CHILDREN WITH HEAVY PRENATAL ALCOHOL EXPOSURE.

Graham DM, Glass L, Mattson SN.

Background: Prenatal alcohol exposure affects inhibitory control and other aspects of attention and executive function. However, the efficacy of extrinsic reinforcement on these behaviors has not been tested.
Methods: Alcohol-exposed children (AE; n = 34), children with attention-deficit/hyperactivity disorder (ADHD; n = 23), and controls (CON; n = 31) completed a flanker task with 4 reward conditions (no reward, reward, reward+occasional response cost, equal probability of reward+response cost). Inhibitory control was tested in the no reward conditions using a 3(group) × 2(flanker type) ANCOVA. Response to reinforcement was tested using 3(group) × 4(reward condition) × 4(flanker type) analysis of covariance (ANCOVA). Response time (RT) and accuracy were tested independently.
Results: Groups did not differ on demographic variables. The flanker task was successful in taxing interference control, an aspect of executive attention (i.e., responses to incongruent stimuli were slower than to congruent stimuli) and the AE group demonstrated impaired executive control over the other groups. Overall, the AE group had significantly slower RTs compared to the CON and ADHD groups, which did not differ. However, reinforcement improved RT in all groups. While occasional response cost had the greatest benefit in the CON group, the type of reinforcement did not differentially affect the AE and ADHD groups. Accuracy across reward conditions did not differ by group, but was dependent on flanker type and reward condition.
Conclusions: Alcohol-exposed children, but not children with ADHD, had impaired interference control in comparison with controls, supporting a differential neurobehavioral profile in these 2 groups. Both clinical groups were equally affected by introduction of reinforcement, although the type of reinforcement did not differentially affect performance as it did in the control group, suggesting that reward or response cost could be used interchangeably to result in the same benefit

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Arch Dis Child. 2016;101:161-65.

SERVICE USE IN CHILDREN AGED 6-8 YEARS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Efron D, Moisuc O, McKenzie V, et al.

Objective This study investigated prevalence, types and predictors of professional service use in families of children identified with attention deficit hyperactivity disorder (ADHD) in the community.
Design Setting: children with ADHD were identified through 43 schools using parent and teacher screening questionnaires (Conners 3 ADHD Index) followed by case confirmation using the Diagnostic Interview Schedule for Children Version IV. Parents completed a survey about professional service use in the last 12 months.

Main outcome measures: data on variables potentially associated with service use were collected from parents (interview and questionnaires), teachers (questionnaires) and children (direct assessment). Logistic regression was used to examine predictors of service use in univariate and multivariable analyses.
Results The sample comprised 179 children aged 6-8 years with ADHD. Over one-third (37%) had not received professional services in the last 12 months. The strongest predictors of service use were older child age (adjusted OR=3.0, 95% CI 1.0 to 8.9, p=0.05), and the degree to which the child's behaviour impacted on the family (adjusted OR=2.0, 95% CI 1.3 to 3.3, p=0.007), after controlling for ADHD subtype and severity, externalising comorbidities, academic achievement and parent-reported impairment.
Conclusions A substantial proportion of children with ADHD are not accessing professional services. Our findings suggest that the child's age and the impact of the child's behaviour on the family are the strongest predictors of service use. Given the demonstrated benefits from various interventions in ADHD, there is a need to improve case identification and referral for services

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Biol Psychol. 2016.
CORRIGENDUM TO "REDUCED INTRASUBJECT VARIABILITY WITH REINFORCEMENT IN BOYS, BUT NOT GIRLS, WITH ADHD: ASSOCIATIONS WITH PREFRONTAL ANATOMY" [BIOL. PSYCHOL. 110 (2015) 12-23].
Rosch KS, Dirlikov B, Mostofsky SH.

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BMC Pediatr. 2016.
A LONGITUDINAL STUDY OF RISK AND PROTECTIVE FACTORS ASSOCIATED WITH SUCCESSFUL TRANSITION TO SECONDARY SCHOOL IN YOUTH WITH ADHD: PROSPECTIVE COHORT STUDY PROTOCOL.
Zendarski N, Sciberras E, Mensah F, et al.
Background: Attention-Deficit/Hyperactivity Disorder (ADHD) has a significant impact on child and adolescent development, especially in relation to school functioning and academic outcomes. Despite the transition to high school being a potentially critical period for children with ADHD, most research in this period has focused on academic outcomes. This study aims to extend previous research by describing academic, school engagement, behaviour and social-emotional outcomes for young people with ADHD in the first and third years of high school and to identify risk and protective factors predictive of differing outcomes across these four domains.
Methods and design: The Moving Up study is a longitudinal, prospective cohort study of children with ADHD as they transition and adjust to high school (age 12-15 years). Data are collected through direct assessment and child, parent and teacher surveys. The primary outcome is academic achievement, obtained by linking to standardised test results. Secondary outcomes include measures of behaviour, ADHD symptoms, school engagement (attitudes and attendance), and social and emotional functioning, including depressive symptoms. The mean performance of the study cohort on each outcome measure will be compared to the population mean for same aged children, using t-tests. Risk and protective factors to be examined using multiple regression include a child, family and school factors know to impact academic and school functioning.
Discussion: The Moving up study is the first Australian study prospectively designed to measure a broad range of student outcomes for children with ADHD during the high school transition period. Examining both current (cross sectional) and earlier childhood (longitudinal) factors gives us the potential to learn more about risk and protective factors associated with school functioning in young people with ADHD. The richness and depth of this information could lead to more targeted and effective interventions that may alter academic and wellbeing trajectories for young people at risk of poor outcomes

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Brain & Development. 2016 Jan;38:145-48.

ADHD-LIKE BEHAVIOR IN A PATIENT WITH HYPOTHALAMIC HAMARTOMA.

Katayama K, Yamashita Y, Yatsuga S, et al.

We report a male patient with hypothalamic hamartoma (HH) who manifested central precocious puberty (CPP) at 4years of age. Gonadotropin-releasing hormone (GnRH) analogue treatment was started at 6years of age and his pubertal signs were suppressed. At 9years of age, the patient was emotionally unstable, aggressive, and antisocial. He had severe attention deficit hyperactivity disorder (ADHD)-like behavior and conduct disorder. No seizure activity was observed. GnRH analogue treatment was discontinued for 8months from 9years and 4months of age due to his mother's illness. During this period sexual urges were observed. Treatment with daily methylphenidate markedly improved his behavioral problems. However, his sexual urges were not suppressed until 3months after the GnRH analogue treatment was restarted. The present case is unique because the patient's behavioral problems were observed despite the parahypothalamic type of HH and absence of seizures. This case is also rare because behavioral problems were observed without seizures, and no ADHD cases with hamartoma have been reported previously. Recently, clinical studies have described an association between psychiatric morbidity, including ADHD, and hyperandrogenism disorders. Our patient's ADHD-like symptoms might be due to hyperandrogenism. In such cases, GnRH analogue with methylphenidate could be effective for improving ADHD-like symptoms

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Brain Dev. 2014;36:778-85.

A CLINICAL STUDY OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN PRESCHOOL CHILDREN-PREVALENCE AND DIFFERENTIAL DIAGNOSES.

Nomura K, Okada K, Noujima Y, et al.

Objective: We aimed to examine (1) the prevalence and characteristics of ADHD in preschool children, and (2) differential diagnoses among children who display symptoms of inattention and hyperactivity-impulsivity in early childhood.

Methods: The participants were children living in Kanie-cho, in Japan's Aichi Prefecture, who underwent their age 5 exams at the municipal health center between April 2009 and March 2011. We first extracted children who were observed to be inattentive or hyperactive-impulsive during their age 5 exams and considered as possibly having ADHD. We conducted follow-ups with these children using post-examination consultations, visits to preschools, and group rehabilitation. The results of the age 5 exams were combined with behavior observations and interview content obtained during subsequent follow-ups. A child psychiatrist and several clinical psychologists discussed these cases and made a diagnosis in accordance with the DSM-IV-TR.

Results: 91 (15.6%) of the 583 children selected were considered as possibly having ADHD; we were able to conduct follow-ups with 83 of the 91 children. Follow-up results showed that 34 children (5.8% of all participants) remained eligible for a diagnosis of ADHD.

Diagnoses for the remaining children included: pervasive developmental disorders (six children, or 6.6% of suspected ADHD children), intellectual comprehension problems (four children, or 4.4%), anxiety disorders (seven children, or 7.7%), problems related to abuse or neglect (four children, or 4.4%), a suspended diagnosis for one child (1.1%), and unclear diagnoses for 29 children (31.9%).

Conclusions: ADHD tendencies in preschool children vary with changing situations and development, and the present study provides prevalence estimates that should prove useful in establishing a diagnostic baseline

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Brain Res. 2016 Feb;1632:42-50.

BEHAVIORAL AND ELECTROPHYSIOLOGICAL INDICATORS OF AUDITORY DISTRACTIBILITY IN CHILDREN WITH ADHD AND COMORBID ODD.

Oja L, Huotilainen M, Nikkanen E, et al.

Involuntary switching of attention to distracting sounds was studied by measuring effects of these events on auditory discrimination performance and event-related brain potentials (ERPs) in 6–11-year-old boys with Attention Deficit—Hyperactivity Disorder (ADHD) and comorbid Oppositional Defiant Disorder (ODD) and in age-matched controls. The children were instructed to differentiate between two animal calls by pressing one response button, for example, to a dog bark and another button to a cat mew. These task-relevant sounds were presented from one of two loudspeakers in front of the child, and there were occasional task-irrelevant changes in the sound location, that is, the loudspeaker. In addition, novel sounds (e.g., a sound of hammer, rain, or car horn) unrelated to the task were presented from a loudspeaker behind the child. The percentage of correct responses was lower for target sounds preceded by a novel sound than for targets not preceded by such sound in the ADHD group, but not in the control group. In both groups, a biphasic positive P3a response was observed in ERPs to the novel sounds. The later part of the P3a appeared to continue longer over the frontal scalp areas in the ADHD group than in the controls presumably because a reorienting negativity (RON) ERP response following the P3a was smaller in the ADHD group than in the control group. This suggests that the children with ADHD had problems in reorienting their attention to the current task after a distracting novel sound leading to deterioration of performance in this task. The present study also indicates that children with ADHD and comorbid ODD show same kind of distractibility as found in previous studies for children with ADHD without systematic comorbid ODD.

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Canadian Journal of Occupational Therapy / Revue Canadienne D'Ergothérapie. 2016 Feb;83:14-26.

SOCIAL NETWORKS AND PARTICIPATION WITH OTHERS FOR YOUTH WITH LEARNING, ATTENTION, AND AUTISM SPECTRUM DISORDERS.

Kreider CM, Bendixen RM, Young ME, et al.

Background: Social participation involves activities and roles providing interactions with others, including those within their social networks.

Purpose: This study sought to characterize social networks and participation with others for 36 youth, ages 11 to 16 years, with (n = 19) and without (n = 17) learning disability, attention disorder, or high-functioning autism.

Method: Social networks were measured using methods of personal network analysis. The Children's Assessment of Participation and Enjoyment With Whom dimension scores were used to measure participation with others. Youth from the clinical group were interviewed regarding their experiences within their social networks.

Findings: Group differences were observed for six social network variables and in the proportion of overall, physical, recreational, social, and informal activities engaged with family and/or friends. Qualitative findings explicated strategies used in building, shaping, and maintaining social networks. Implications. Social network factors should be considered when seeking to understand social participation

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Child Health Care. 2016;45:67-83.

IMPACT OF OCCUPATIONAL, PHYSICAL, AND SPEECH AND LANGUAGE THERAPY IN PRESCHOOLERS WITH HYPERACTIVE/INATTENTIVE SYMPTOMS: A NATURALISTIC 2-YEAR FOLLOW-UP STUDY.

Mlodnicka AE, Oneill S, Marks DJ, et al.

Objective: Impact of speech and language therapy (ST) and occupational/physical therapy (OT/PT) on language and motor skills was examined in hyperactive/inattentive children.

Methods: Preschoolers were divided into those receiving and not receiving ST or OT/PT.

Results: Children receiving ST showed no gains in language functioning relative to those not receiving ST. OT/PT yielded similar results for motor functions. Hours of a service did not predict improvement. However, children who received ST showed improvement in social skills.
Discussion: The apparent lack of benefit suggests the need for further investigation into efficacy of these treatments in hyperactive/inattentive preschool children

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Clin Neurophysiol. 2016;127:1351-57.
AN ERP SOURCE IMAGING STUDY OF THE ODDBALL TASK IN CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER.
Janssen TWP, Gelad+® K, Van Mourik R, et al.
Objective: Children with ADHD have difficulties attending to task-relevant events, which has been consistently associated with reductions in the amplitude of the P3b event-related potential (ERP) component. However, the underlying neural networks involved in this P3b reduction remain elusive. Therefore, this study explored source localization of P3b alterations in children with ADHD, aiming at a more detailed account of attentional difficulties.
Methods: Dense array ERPs were obtained for 36 children with ADHD and 49 typically developing children (TD) using an auditory oddball task. The P3b component (310-410 ms) was individually localized with the LAURA distributed linear inverse solution method and compared between groups.
Results: The ADHD group showed reduced P3b amplitudes in response to targets compared to the TD group. Differences were located primarily in frontopolar (cinguloopercular network, BA10) and temporoparietal regions (ventral attention network, BA39 and 19) in the left hemisphere. Reductions in P3b amplitudes were related to more inattention and hyperactivity/impulsivity problems in the ADHD group.
Conclusions: The results show alterations in both top-down and bottom-up attention-related brain areas, which may underlie P3b amplitude reductions in children with ADHD.
Significance: This study provides novel data on both temporal and spatial aspects of dysfunctional attention processes in ADHD

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Clin Neurophysiol. 2016 Feb;127:1321-30.
THE VARIABILITY OF EEG FUNCTIONAL CONNECTIVITY OF YOUNG ADHD SUBJECTS IN DIFFERENT RESTING STATES.
Alba G, Pereda E, Mañas S, et al.
Objective: To assess ADHD from global measures of EEG functional connectivity and their temporal variability in different resting states.
Methods: EEGs from sixteen cortical regions were recorded at rest during eyes-closed (EC) and eyes-open (EO) in 10 male combined-type ADHD subjects and 12 healthy male controls. The mean global connectivity (CM) of each region and its temporal variability (CV) were estimated from a number of EEG segments recorded in both states. Connectivity indices between regions were calculated using the magnitude squared coherence (Coh) in the delta(d)/theta(?)/alpha(a)/beta(ß) frequency bands and the nonlinear index (L) of generalized synchronization.
Results: The CM did not present between-group differences in any region or state. However, the CV exhibited state-independent differences between both groups (ADHD > controls) mainly in frontal and parieto-occipital regions for all indices except Coh(a). Within group, only the CV-Coh(?) of the centro-temporal region increased significantly for the ADHD subjects from EC to EO ($p < 0.001$) and was greater than controls in EO ($p < 0.001$).
Conclusions: The CV of index-L and of Coh(?) seem to be the best state-independent and -dependent measurements, respectively, to discriminate ADHDs from control subjects using resting state EEG data.
Significance: The underlying neural dysfunctions producing the ADHD seem better reflected by the CV measurements

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Clin Psychol Rev. 2016;44:94-111.

THE INTERACTION BETWEEN REINFORCEMENT AND INHIBITORY CONTROL IN ADHD: A REVIEW AND RESEARCH GUIDELINES.

Ma I, van Duijvenvoorde A, Scheres A.

The majority of studies which have aimed to identify cognitive and motivational factors at play in ADHD have investigated cognitive-control processes and reinforcement effects in isolation. Notably, in recent years, the interaction between these two processes has been increasingly examined. Here, we aimed to provide a comprehensive and critical review of the behavioral and functional neuroimaging studies that have investigated reinforcement effects on inhibitory control in ADHD. The findings of our meta-analyses show that reinforcement can normalize inhibitory control in children and adolescents with ADHD to the baseline level of controls. Furthermore, the data suggests that inhibitory control may improve to a larger extent in youth with ADHD compared with controls, as a function of reinforcement. Based on (1) this review and meta-analyses, (2) functional neuroimaging studies in healthy populations, and (3) existing ADHD and neurobiological models of dual processes, we propose specific guidelines for future research, which are anticipated to further elucidate processes underlying impulsive behavior associated with ADHD

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Clin Ther. 2016.

SEASONAL PATTERNS OF MEDICATIONS FOR TREATING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: COMPARISON OF METHYLPHENIDATE AND ATOMOXETINE.

Shyu YC, Lee SY, Yuan SS, et al.

Purpose: Medication is a first-line effective treatment for attention-deficit/hyperactivity disorder (ADHD). Currently, immediate-release methylphenidate (IR-MPH), the osmotic, controlled-release formulation of methylphenidate (OROS-MPH), and atomoxetine (ATX) are the only 3 medications approved in Taiwan for the treatment of ADHD. Short-term discontinuation of ADHD treatment is often seen among patients undergoing drug therapy. The goal of this study was to evaluate potential seasonal patterns in ADHD prescriptions and compare the seasonal changes of IR-MPH, OROS-MPH, and ATX use.

Methods: Taiwan's National Health Insurance database was used to gather information on patients diagnosed with ADHD (N = 145,269) from January 2000 to December 2011. The monthly data regarding person-days and receipt of treatment with IR-MPH, OROS-MPH, and ATX were analyzed. Time series analyses and autoregressive integrated moving average models were used to examine the seasonal patterns in person-days receiving ADHD pharmacotherapy. A general linear model with a post hoc test was used to determine the differences in monthly consumption of ADHD medications.

Findings: This study comprised 145,269 patients (mean age: 7.7 years; 78.6% were boys) diagnosed with ADHD. The prescriptions of IR-MPH (seasonal autoregressive: estimate [SE], 0.92 [0.04], t = 22.87, P < 0.001) and OROS-MPH (estimate [SE], 0.84 [0.09], t = 9.41, P < 0.001) both showed significant seasonal pa. tterns, but ATX prescriptions did not (estimate [SE], 0.50 [0.55]; t = 0.90; P = 0.373). IR-MPH and OROS-MPH prescriptions shared similar seasonal trends. The mean person-days of consumption in July were lower than in other months, with the exception of February and August. Meanwhile, for ATX, the person-days of consumption in February were the lowest. The mean person-days in February were significantly lower than in March and May but did not differ from those in other months.

Implications: The seasonal patterns of IR-MPH and OROS-MPH use coincide with school holidays. These findings suggest that discontinuing a drug during the holiday period may be popular for people undergoing ADHD pharmacotherapy, especially with regard to methylphenidate prescriptions. However, additional research is necessary to determine whether temporary discontinuation of drug therapy is related to patient outcomes

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Cortex: A Journal Devoted to the Study of the Nervous System and Behavior. 2016 Jan;74:370-82.

POSTNATAL ARSENIC EXPOSURE AND ATTENTION IMPAIRMENT IN SCHOOL CHILDREN.

Rodríguez-Barranco M, Gil F, Hernández AF, et al.

Over the last few decades there has been an increased concern about the health risks from exposure to metallic trace elements, including arsenic, because of their potential neurotoxic effects on the developing brain. This study assessed whether urinary arsenic (UA) levels are associated with attention performance and Attention-Deficit/Hyperactivity Disorder (ADHD) in children living in an area with high industrial and mining activities in Southwestern Spain. A cross-sectional study was conducted on 261 children aged 6–9 years. Arsenic levels were determined in urine samples. Attention was measured by using 4 independent tools: a) tests from the Behavioral Assessment and Research System (BARS) designed to measure attention function: Simple Reaction Time Test (RTT), Continuous Performance Test (CPT) and Selective Attention Test (SAT); b) AULA Test, a virtual reality (VR)-based test that evaluates children's response to several stimuli in an environment simulating a classroom; c) Child Behavior Checklist (CBCL), administered to parents; and d) Teacher's Report Form (TRF), administered to teachers. Multivariate linear and logistic regression models, adjusted for potential confounders, were used to estimate the magnitude of the association between UA levels and attention performance scores. Higher UA levels were associated with an increased latency of response in RTT (ß = 12.3; 95% confidence interval (CI): 3.5–21.1) and SAT (ß = 3.6; 95% CI: .4–6.8) as well as with worse performance on selective and focalized attention in the AULA test (ß for impulsivity = .6; 95% CI: .1–1.1; ß for inattention = .5; 95% CI: .03–1.0). A dose–response relationship was observed between UA levels and inattention and impulsivity scores. In contrast, results from the CBCL and TRF tests failed to show a significant association with UA levels. In conclusion, UA levels were associated with impaired attention/cognitive function, even at levels considered safe. These results provide additional evidence that postnatal arsenic exposure impairs neurological function in children

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Dev Psychopathol. 2016 Feb;28:1-14.

EARLY-ADULT CORRELATES OF MALTREATMENT IN GIRLS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: INCREASED RISK FOR INTERNALIZING SYMPTOMS AND SUICIDALITY.

Guendelman MD, Owens EB, Galán C, et al.

We examined whether maltreatment experienced in childhood and/or adolescence prospectively predicts young adult functioning in a diverse and well-characterized sample of females with childhood-diagnosed attention-deficit/hyperactivity disorder (N = 140). Participants were part of a longitudinal study and carefully evaluated in childhood, adolescence, and young adulthood (Mage = 9.6, 14.3, and 19.7 years, respectively), with high retention rates across time. A thorough review of multisource data reliably established maltreatment status for each participant (M? = 0.78). Thirty-two (22.9%) participants experienced at least one maltreatment type (physical abuse, sexual abuse, or neglect). Criterion variables included a broad array of young adult measures of functioning gleaned from multiple-source, multiple-informant instruments. With stringent statistical control of demographic, prenatal, and family status characteristics as well as baseline levels of the criterion variable in question, maltreated participants were significantly more impaired than nonmaltreated participants with respect to self-harm (suicide attempts), internalizing symptomatology (anxiety and depression), eating disorder symptomatology, and well-being (lower overall self-worth). Effect sizes were medium. Comprising the first longitudinal evidence linking maltreatment with key young adult life impairments among a carefully diagnosed and followed sample of females with attention-deficit/hyperactivity disorder, these findings underscore the clinical importance of trauma experiences within this population.

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Dev Cognitive Neurosci. 2015;15:83-93.

SHORT-TERM TEST-RETEST RELIABILITY OF RESTING STATE FMRI METRICS IN CHILDREN WITH AND WITHOUT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Somandepalli K, Kelly C, Reiss PT, et al.

To date, only one study has examined test-retest reliability of resting state fMRI (R-fMRI) in children, none in clinical developing groups. Here, we assessed short-term test-retest reliability in a sample of 46 children (11-17.9 years) with attention-deficit/hyperactivity disorder (ADHD) and 57 typically developing children (TDC). Our primary test-retest reliability measure was the intraclass correlation coefficient (ICC), quantified for a range of R-fMRI metrics. We aimed to (1) survey reliability within and across diagnostic groups, and (2) compare voxel-wise ICC between groups. We found moderate-to-high ICC across all children and within groups, with higher-order functional networks showing greater ICC. Nearly all R-fMRI metrics exhibited significantly higher ICC in TDC than in children with ADHD for one or more regions. In particular, posterior cingulate and ventral precuneus exhibited group differences in ICC across multiple measures. In the context of overall moderate-to-high test-retest reliability in children, regional differences in ICC related to diagnostic groups likely reflect the underlying pathophysiology for ADHD. Our currently limited understanding of the factors contributing to inter- and intra-subject variability in ADHD underscores the need for large initiatives aimed at examining their impact on test-retest reliability in both clinical and developing populations

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Drug Alcohol Depend. 2015;156:e166.

ADHD AND THE RISK OF INITIATION OF MARIJUANA USE AMONG A NATIONAL SAMPLE OF YOUTH 10-18 YEARS OF AGE.

Okafor C, Lasopa SO, Striley CW, et al.

Aims: To examine the effect of self-reported Attention Deficit Hyperactivity Disorder (ADHD) on risk of initiation of marijuana use.

Methods: Data from the National Monitoring of Adolescent Prescription Stimulants Study (N-MAPSS), which included 11,048 10-18 year olds, were analyzed. The primary predictor, history of self-reported ADHD, was a participant's response to the question: ΓÇ£has a doctor ever told you or your parents that you have ADHD? (Yes/no). The primary outcome, age of initiation of marijuana use, was defined as the age a participant reported that they first used marijuana. A cox-proportional hazard model was used to estimate hazards of initiation of marijuana use as a function of ADHD status. Model was adjusted for socio-demographics, academic performance, tobacco use, peer and environmental influence.

Results: Among participants in this sample, 47.8% were male, 13.8% self-reported a history of ADHD and 29.3% reported having ever used marijuana. Participants who reported a history of ADHD were significantly more likely to be male (59%) and white (55%). The hazard of initiation of marijuana use peaked at age 18 years for both groups; however the hazard rate at 18 years was 25% vs. 16% for those with and without a history of ADHD, respectively. In adjusted analysis, participants with a history of ADHD, as compared to those without, had increased hazards of initiation of marijuana use [hazard ratio (HR) = 1.15, 95% confidence interval (CI) = 1.05-1.27].

Conclusions: In this national sample of youth, those with selfreportedADHDhad an increased hazard of initiating marijuana use

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Drug Alcohol Depend. 2015;156:e7.

METHYLPHENIDATE FOR METHAMPHETAMINE USE DISORDERS IN PARTICIPANTS WITH AND WITHOUT ADHD.

Ang A, Hillhouse M, Jenkins J, et al.

Aims: Methylphenidate (MPH) is a stimulant that is widely used to treat ADHD in adolescents and adults. Previous studies show that MPH provided to stimulant abusers with ADHD results in improvement in ADHD symptoms and reduces illicit drug use. A recently completed NIDA-funded study investigated the effectiveness of MPH for the treatment of methamphetamine (MA) use disorder. This secondary analysis examines the association between ADHD and treatment outcome.

Methods: 110 methamphetamine-dependent participants in Honolulu and Los Angeles were randomized to MPH (n = 55) or placebo (n = 55) for 10 weeks of double-blind medication followed by a 4-week return-to-baseline period in which all participants received placebo. Twice weekly clinic visits included observed dosing, urine collection for drug screens (UDS), take-home meds, psychosocial assessments, and motivational incentives for MAnegative UDS. Participants were also provided with weekly CBT. The Connors Adult ADHD scale was used at baseline to assess adult and childhood symptoms of ADHD to determine adult ADHD status. MA use at week 10 was measured by self-report and UDS.
Results: At baseline, the ADHD group reported more MA use days in the past 30 days compared to the non-ADHD group (p = 0.04). For the MPH treatment condition only, after adjusting for baseline differences at week 10, MA use was significantly less for those without ADHD (n = 37) compared to the ADHD group (n = 18) (p = 0.045). No difference was found in MA use between the MPH and Placebo treatment conditions for those with ADHD. For retention, ADHD participants were less likely to complete the study compared to the group withoutADHD(p = 0.002), however no difference in treatment completion was found between treatment conditions for only those with ADHD (p = 0.79).
Conclusions: Those with ADHD reported more MA use at baseline, and had poorer treatment outcome regardless of the treatment they received. These results suggest that, although MPHmaybe safe for the treatment of MA-dependent individuals with ADHD, it may not be effective in reducing MA use for this group

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Drug Alcohol Depend. 2015;156:e18.

SUBSTANCE USE OUTCOMES OF GIRLS WITH ADHD IN A 10-YEAR FOLLOW-UP OF A PROSPECTIVE LONGITUDINAL STUDY.

Belendiuk K, Hinshaw S.

Aims: To compare differences in substance use among young women with different patterns of attention-deficit/hyperactivity disorder (ADHD) in a 10-year prospective follow-up.
Methods: A diverse childhood-ascertained sample of girls with (n = 124) and without (n = 86) ADHD was followed 10 years later (ages 17-24 years; 95% retention rate). ChildhoodADHDstatus was measured via structured interview; adult hyperactive/impulsive (HI) symptom severity was measured by self- and maternalreport on a validated rating scale. Substance use was measured by clinician-assisted administration of the Substance Use Questionnaire, assessing onset, frequency, and quantity of substances (alcohol, nicotine, marijuana, other illicit drugs, misuse of prescription drugs) used in the last 12 months.
Results: Girls with childhood ADHD were more likely than girls without to try smoking cigarettes ($p < 0.01$), to smoke more cigarettes when they smoke ($p < 0.05$), to have been daily smokers ($p < 0.01$) and to have seriously tried to quit cigarettes ($p < 0.05$). Girls with persistent ADHD were more likely to be daily cigarette smokers ($p < 0.01$), smoke more often ($p < 0.01$), and smoke more cigarettes ($p < 0.05$). In addition, girls with ADHD showing higher levels of adult HI symptoms consumed a more alcohol per drinking occasion ($p = 0.05$), drank alcohol more frequently ($p < 0.05$), binge drank more frequently ($p < 0.05$), were more likely to be drunk ($p < 0.05$) and were drunk more often ($p < 0.05$) than girls with lower HI symptoms. HI was also associated with earlier age of first marijuana use ($p < 0.05$), lifetime cocaine use ($p < 0.05$), selling stimulant medication ($p < 0.05$), using narcotics without a prescription ($p < 0.05$), and seeking drug treatment ($p < 0.05$).
Conclusions: Childhood ADHD and persistent ADHD are associated with smoking behaviors in girls; HI severity is associated with more severe substance use in girls. Future studies should examine symptom persistence and severity to identify young women who may be susceptible to negative substance use outcomes

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Drug Alcohol Depend. 2015;156:e152.

METHODS FOR ASSOCIATING TRAJECTORIES OF COMORBIDITIES: ADHD AND SUBSTANCE USE .

Mikulich-Gilbertson SK, Wagner BD, Riggs PD, et al.

Aims: Does marijuana abate symptoms of ADHD as some suggest or induce attention problems as other data suggest? Does cigarette smoking decrease as an indirect result of treatment for marijuana use or increase in compensation for reduced marijuana use? Trajectories of comorbidities over time are often nonlinear or based on outcomes with different distributions. Our R01 is developing methods to evaluate associations among them to address hypotheses in adolescents with ADHD and substance use: (1) Changes in ADHD and marijuana use are interrelated and their association differs between those who respond to ADHD treatment (RESP) and non-responders (non-RESP). (2) Associations between rates of cigarette and marijuana use differ between RESP and non- RESP.

Methods: Using data from the Clinical Trials Network study of ADHD and substance use in adolescents (CTN28), we estimated latent stochastic trajectory parameters (e.g. slopes) in RESP and non-RESP by joint models of weekly ADHD score (continuous) and daily marijuana use (count) and by joint models of marijuana and cigarette use (counts). We estimated correlations (r) and partial correlations (ra) and compared them between RESP and non-RESP with various methods: Wald-type t-tests, likelihood ratio tests, Fisher's Z transformation.

Results: Change in ADHD scores and in rate of joints smoked are associated ($r = 0.38$; $p < 0.001$) but not different between groups, unless adjusted for baseline: RESP n = 28, ra = 0.68 vs. non-RESP n = 64, ra = 0.11; $p < .005$. In regular users of both, correlation between rates of joints and cigarettes smoked is greater in RESP (n = 21, r = 0.57) than non-RESP (n = 44, r = 0.04); the difference is amplified by adjusting for baseline (RESP ra = .83; non-RESP ra = .03; $p < 0.001$). Modelling issues (e.g. restrictions on random effects, which test to use) will be discussed.

Conclusions: Trajectories of comorbidity outcomes can be associated and compared as latent stochastic parameters within multivariate generalized linear mixed models. Different modelling and testing methods mostly converge and show stronger positive associations among those whose ADHD responds to treatment

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Drug Alcohol Depend. 2016.

THE IMPACT OF ADHD PERSISTENCE, RECENT CANNABIS USE, AND AGE OF REGULAR CANNABIS USE ONSET ON SUBCORTICAL VOLUME AND CORTICAL THICKNESS IN YOUNG ADULTS.

Lisdahl KM, Tamm L, Epstein JN, et al.

Background: Both Attention Deficit Hyperactivity Disorder (ADHD) and chronic cannabis (CAN) use have been associated with brain structural abnormalities, although little is known about the effects of both in young adults.

Methods: **Participants included**: those with a childhood diagnosis of ADHD who were CAN users (ADHD_CAN; n = 37) and non-users (NU) (ADHD_NU; n = 44) and a local normative comparison group (LNCG) who did (LNCG_CAN; n = 18) and did not (LNCG_NU; n = 21) use CAN regularly. Multiple regressions and MANCOVAs were used to examine the independent and interactive effects of a childhood ADHD diagnosis and CAN group status and age of onset (CUO) on subcortical volumes and cortical thickness.

Results: After controlling for age, gender, total brain volume, nicotine use, and past-year binge drinking, childhood ADHD diagnosis did not predict brain structure; however, persistence of ADHD was associated with smaller left precentral/postcentral cortical thickness. Compared to all non-users, CAN users had decreased cortical thickness in right hemisphere superior frontal sulcus, anterior cingulate, and isthmus of cingulate gyrus regions and left hemisphere superior frontal sulcus and precentral gyrus regions. Early cannabis use age of onset (CUO) in those with ADHD predicted greater right hemisphere superior frontal and postcentral cortical thickness.

Discussion: Young adults with persistent ADHD demonstrated brain structure abnormalities in regions underlying motor control, working memory and inhibitory control. Further, CAN use was linked with abnormal

brain structure in regions with high concentrations of cannabinoid receptors. Additional large-scale longitudinal studies are needed to clarify how substance use impacts neurodevelopment in youth with and without ADHD

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Educational Psychology. 2016 Jan;36:138-58.

COGNITIVE AND ACADEMIC ABILITIES ASSOCIATED WITH SYMPTOMS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A COMPARISON BETWEEN SUBTYPES IN A GREEK NON-CLINICAL SAMPLE.

Papaioannou S, Mouzaki A, Sideridis GD, et al.

The study assessed cognitive and academic performance of children demonstrating teacher-rated ADHD-related symptoms (Inattention [IA] and/or Hyperactivity/Impulsivity [H/I]) in a representative sample of, largely untreated, Greek elementary school students (N = 923). A battery of tests assessing short-term memory (STM), sustained attention, executive functions (EFs), reading and math skills were administered. Significant deficits in EFs and STM were restricted to the groups of students displaying inattention symptoms and were only marginally elevated among students showing hyperactivity/impulsivity symptoms alone, in comparison to their non-symptomatic peers. A similar pattern of group differences was observed on tests assessing word- and text-level reading skills. Impaired performance on sustained attention tasks was less evident. Among students who manifested inattention symptoms, those who also showed impaired reading skills presented more severe EFs deficits than typically achieving students. Results demonstrated a close link between EFs, other than inhibition and set-shifting, everyday symptoms of inattention, and achievement in math and word-level reading skills

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Emot Behav Difficulties. 2016;21:61-82.

THE EXPERIENCES OF AND ATTITUDES TOWARD NON-PHARMACOLOGICAL INTERVENTIONS FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER USED IN SCHOOL SETTINGS: A SYSTEMATIC REVIEW AND SYNTHESIS OF QUALITATIVE RESEARCH.

Moore DA, Gwernan-Jones R, Richardson M, et al.

School-based non-pharmacological interventions are an important part of the treatment of attention-deficit/hyperactivity disorder (ADHD). We aimed to systematically review qualitative literature relating to the experience of and attitudes towards school-based non-pharmacological interventions for ADHD. Systematic searches of 20 electronic databases were undertaken. Reviewers screened titles, abstracts and full reports of studies, before extracting data and critically appraising 33 included papers. Studies were synthesised using meta-ethnographic methods. Four-key interrelated themes were identified: (1) individualising interventions, (2) structure of interventions, (3) barriers to effectiveness, (4) perceived moderators and impact of interventions. The perceived effectiveness of interventions used in school settings is reported to vary. Therefore, flexible, tailored interventions ought to hold potential. However, highly individualised interventions may negatively affect children with ADHD. Findings point to the need for school-based interventions to take into account the wider school context, as well as core symptoms of ADHD

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European Journal of Developmental Psychology. 2016 Jan;13:40-51.

THE DIRECT WAY MAY NOT BE THE BEST WAY: CHILDREN WITH ADHD AND THEIR UNDERSTANDING OF SELF-PRESENTATION IN SOCIAL INTERACTIONS.

Kloo D, Kain W.

Knowledge and use of self-presentational tactics is an important social skill. We examined understanding of the function of three different self-presentational tactics (self-promotion, ingratiation and blasting) in 11 8–12-year-old boys with attention-deficit/hyperactivity disorder (ADHD) and 11 matched comparison children. Children were given six different self-presentation stories, two for each one of the three different tactics. After each story, they were asked to evaluate the effects of the self-presentational tactic used. Children with ADHD

rated self-promotion and blasting as more positive and more effective—and ingratiation as less positive and less effective—than children in the control group. This implicates that children with ADHD prefer simple and direct self-presentational strategies (like self-promotion), and, therefore, may not as easily understand more subtle strategies (like ingratiation). They also seem to be more inclined to use negatively connoted strategies (like blasting). We suggest that this limited understanding of self-presentational strategies in children with ADHD may explain some of their problems in social interactions. Therefore, social skill interventions in children with ADHD should incorporate elements focusing on use and understanding of different self-presentational strategies

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Eur J Pediatr. 2016;1-10.

SLEEP IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) BEFORE AND AFTER 6-MONTH TREATMENT WITH METHYLPHENIDATE: A PILOT STUDY.

Vigliano P, Galloni GB, Bagnasco I, et al.

Children with ADHD may present with sleep disturbances that add to the impairment of the disorder. The long-term sleep effects of the first-line pharmacological treatment for ADHD, i.e., psychostimulants, are unclear. In this pilot study, we compared polysomnographic variables in children with ADHD (n = 11, aged 6-15 years), before pharmacological treatment, and in children without ADHD (n = 22, aged 5-14 years); we also assessed polysomnographic changes in children with ADHD (n = 7) after a 6-month treatment with methylphenidate immediate-release (once or twice daily). Compared to children without ADHD, those with ADHD at baseline presented with significantly increased duration of awakenings (p = 0.02), reduction in sleep efficiency (p = 0.03), and increase in stage I (N1) (p < 0.01) and reduction in stage II (N2) (p = 0.02) and stage III-IV (N3) percentages. Methylphenidate treatment did not significantly change any parameter of sleep architecture.

Conclusion: Preliminary evidence from this pilot study shows that, compared to children without ADHD, those with ADHD presented a more fragmented and less effective sleep at baseline and that the 6-month methylphenidate treatment did not further negatively impact on sleep architecture.

What is known:

- Children with ADHD may present with subjectively reported and/or objectively confirmed disturbances of sleep.
- The long-term effects on sleep of the first-line pharmacological treatment for ADHD, i.e., psychostimulants, are not clear.

What is new:

- Our study showed that the 6-month continuous treatment with methylphenidate did not further negatively impact on sleep architecture in children with ADHD

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Food Drug Law J. 2015;70:573-91, ii.

SPERM BANKING AS A STRATEGY TO REDUCE HARMS ASSOCIATED WITH ADVANCING PATERNAL AGE.

Hudson WC.

Medical studies increasingly link paternal age with disorders in offspring. Associated disorders include autism, bipolar disorder, schizophrenia, and ADHD. Banking one's sperm earlier in life, thereby reducing the effective paternal age at conception, would therefore seem to be a successful strategy for reducing risk to one's eventual offspring. But could a cryopreservation equipment manufacturer or a sperm bank lawfully claim that cryopreservation does more than preserve fertility--that it also prevents disease? This article considers arguments for and against FDA's jurisdiction over such claims, and then makes recommendations for how the agency and Congress should respond

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Genes Brain Behav. 2015;14:565-72.

MONOAMINE OXIDASE A POLYMORPHISM MODERATES STABILITY OF ATTENTION PROBLEMS AND SUSCEPTIBILITY TO LIFE STRESS DURING ADOLESCENCE.

Zohsel K, Bianchi V, Mascheretti S, et al.

Attention problems affect a substantial number of children and adolescents and are predictive of academic underachievement and lower global adaptive functioning. Considerable variability has been observed with regard to the individual development of attention problems over time. In particular, the period of adolescence is characterized by substantial maturation of executive functioning including attentional processing, with the influence of genetic and environmental factors on individual trajectories not yet well understood. In the present investigation, we evaluated whether the monoamine oxidase A functional promoter polymorphism, MAOA-LPR, plays a role in determining continuity of parent-rated attention problems during adolescence. At the same time, a potential effect of severe life events (SLEs) was taken into account. A multi-group path analysis was used in a sample of 234 adolescents (149 males, 85 females) who took part in an epidemiological cohort study at the ages of 11 and 15 years. Attention problems during early adolescence were found to be a strong predictor of attention problems in middle adolescence. However, in carriers of the MAOA-LPR low-activity variant (MAOA-L), stability was found to be significantly higher than in carriers of the high-activity variant (MAOA-H). Additionally, only in MAOA-L carriers did SLEs during adolescence significantly impact on attention problems at the age of 15 years, implying a possible gene +ù environment interaction. To conclude, we found evidence that attention problems during adolescence in carriers of the MAOA-L allele are particularly stable and malleable to life stressors. The present results underline the usefulness of applying a more dynamic GxE perspective

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Homeopathy. 2016.

A COMPARATIVE CONSECUTIVE CASE SERIES OF 20 CHILDREN WITH A DIAGNOSIS OF ADHD RECEIVING HOMEOPATHIC TREATMENT, COMPARED WITH 10 CHILDREN RECEIVING USUAL CARE.

Fibert P, Relton C, Heirs M, et al.

20 consecutively enrolled children age 5–16 with Attention Deficit Hyperactivity Disorder (ADHD) received treatment by a homeopath (8 consultations and individualized remedies) for one year. Ten subsequently enrolled children received similar time and attention for 4 months. The study explored optimum treatment protocols; the effectiveness, deliverability and acceptability of treatment; and the feasibility of outcome measurement and recruitment. Parents completed Conners' Parent Rating Scale, Revised Long Version (CPRS-R:L) every 4 months, from which DSMIV total scores were extracted; and Measure Your Own Medical Outcome Profile (MYMOP) every consultation. An interaction between time (baseline/4 months) and group (treatment/non-treatment) was found .756 F (1,28) = 9.06, p = 0.005. The intervention was associated with statistically significant improvements in treated children over the year: CPRS-R:L (t (18) = 4.529, p ≤ 0.000); MYMOP (t (18) = 6.938, p ≤ 0.000). Mean DSMIV total t scores decreased at each time point: baseline: 85 (SD 5.1); 4 months 76.2 (SD 10.9); and 12 months 71.5 (SD 12.77). Recruitment of control participants was problematic. Recruitment to treatment was feasible via ADHD support groups, charities, police support agencies and social services, not schools or NHS services. Attending appointments was problematic for some participants, but home visits did not improve uptake. The best venue was a familiar clinic. Some participants took medicines inappropriately, but generally taking homeopathic remedies was acceptable and well implemented. CPRS-R:L (80 items) was problematic for some parents. MYMOP was preferred by parents but not acceptable to stakeholders. In this small consecutive sample the intervention was associated with improvements in criminality, anger and children with a concomitant diagnosis of Autism Spectrum Disorder ASD. Treatment by a homeopath was associated with sustained, increasing improvements and the intervention was acceptable to participants. More methodically rigorous research is warranted. “We recommend that future research in this area uses comparative effectiveness randomised controlled trial designs. We also recommend that these trials measure outcomes of relevance to stakeholder needs – the people and services who care for those with ADHD – parents, teachers and social workers and the criminal justice system”.

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Isr Med Assoc J. 2015 Dec;17:731-34.

INTERNET ADDICTION AND ATTENTION DEFICIT HYPERACTIVITY DISORDER AMONG SCHOOLCHILDREN.

Weinstein A, Yaacov Y, Manning M, et al.

BACKGROUND: Use of the internet and videogames by children and adolescents has risen dramatically over the last decade. Increasing evidence of internet and videogame addiction among children is causing concern due to its harmful physical, emotional and social consequences. There is also emerging evidence for an association between computer and videogame addiction and attention deficit/hyperactivity disorder (ADHD).

OBJECTIVES: To investigate the relationship between ADHD and internet addiction.

METHODS: We compared 50 male schoolchildren, mean age 13 years, diagnosed with ADHD to 50 male schoolchildren without ADHD on measures of internet addiction, internet use and sleep patterns.

RESULTS: Children with ADHD had higher scores on the Internet Addiction Test (IAT), used the internet for longer hours, and went to sleep later than those without ADHD.

CONCLUSIONS: These findings indicate an association of ADHD, sleep disorders and internet/videogame addiction

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J Miss State Med Assoc. 2015 Nov;56:346-47.

PSYCHOSTIMULANTS: CONCERNS OVER LONG-TERM ADVERSE SIDE EFFECTS.

Adams JG.

The personal rewards are substantial for the healthcare provider who can make teachers and parents happy. There are evolving, alternative methods of dealing with ADHD, but PS are relatively cheap and quick when they work (roughly 70% of the time) and readily accessible. We have no social or educational structures currently to deal with the extreme ADHD cases. In cases of less dramatic, attention problems, poor grades, where PS boost attention, physicians are unlikely to abandon their patients willingly, unless compelled to sacrifice short-term goals over the unanswered questions about what is best in the long run. How can we know if it's the child and not the educational system that needs diagnosis and treatment? Psychiatric literature consistently suggests the prevalence of attention deficit in children is roughly 5% of the child population. Do 5% of our children need to take PS? This is where risks versus benefits enters the decision making process, and this is where this article aims to intentionally plant a healthy dose of scientific scrutiny. Ultimately, the doctor in charge makes a decision ... sometimes based on intangibles that cannot be legislated or defined by even the best scientific studies. It is not clear or scientifically established that the use of PS, especially in young, developing minds of children, is safe or meaningfully beneficial in the long run. There is much information in human and animal studies to question the wishful thinking that using mind altering drugs in children is the right thing to do. There are risks, and there are benefits. In this case, the risks are less obvious, cloaked in the inadequacy of our current state of knowledge, potentially threatening the quality of the lives we seek to enhance

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JAMA Pediatr. 2016;170:109-10.

RETHINKING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Christakis DA.

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J Abnorm Child Psychol. 2016 Jan;44:167-78.

DOES CHILD TEMPERAMENT PLAY A ROLE IN THE ASSOCIATION BETWEEN PARENTING PRACTICES AND CHILD ATTENTION DEFICIT/HYPERACTIVITY DISORDER?

Ullsperger JM, Nigg JT, Nikolas MA.

Ineffective parenting practices may maintain or exacerbate attention deficit/hyperactivity disorder (ADHD) symptoms and shape subsequent development of disruptive behavior disorders (DBD's) in youth with ADHD.

Recent theoretical models have suggested that parenting may exert effects on ADHD via its role in child temperament. The current study aimed to evaluate the indirect effects of parenting dimensions on child ADHD symptoms via child temperament. Youth ages 6–17 years (N = 498; 50.4 % ADHD, 55 % male) completed a multi-stage, multi-informant assessment that included parent, child, and teacher report measures of parenting practices, child temperament, and ADHD symptoms. Statistical models examined the direct and indirect effects of maternal and paternal involvement, poor supervision, and inconsistent discipline on inattention and hyperactivity-impulsivity via child temperament and personality traits. Results indicated differential patterns of effect for negative and positive parenting dimensions. First, inconsistent discipline exerted indirect effects on both ADHD symptom dimensions via child conscientiousness, such that higher levels of inconsistency predicted lower levels of conscientiousness, which in turn, predicted greater ADHD symptomatology. Similarly, poor supervision also exerted indirect effects on inattention via child conscientiousness as well as significant indirect effects on hyperactivity-impulsivity via its impact on both child reactive control and conscientiousness. In contrast, primarily direct effects of positive parenting (i.e., involvement) on ADHD emerged. Secondary checks revealed that similar pathways may also emerge for comorbid disruptive behavior disorders. Current findings extend upon past work by examining how parenting practices influence child ADHD via with-in child mechanisms and provide support for multi-pathway models accounting for heterogeneity in the disorder

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J Abnorm Child Psychol. 2016 Jan;44:155-66.

CHILDHOOD ATTENTION-DEFICIT/HYPERACTIVITY DISORDER PREDICTS INTIMATE PARTNER VICTIMIZATION IN YOUNG WOMEN.

Guendelman MD, Ahmad S, Meza JI, et al.

Attention-deficit/hyperactivity disorder (ADHD) is associated with interpersonal dysfunction during childhood and adolescence, yet little is known about the romantic relationships of young women with childhood ADHD. In the present study, we draw from a longitudinal sample of girls followed prospectively into young adulthood, comparing those with (n = 114) and without (n = 79; comparisons) childhood ADHD in terms of their risk for physical victimization by an intimate partner (physical IPV; e.g., slapping, punching) by 17–24 years of age. We examined ADHD both diagnostically and dimensionally, at the same time establishing reliable indicators of young adult physical IPV. Externalizing and internalizing problems, and academic achievement during adolescence, were tested as potential mediators. Overall, participants with a childhood diagnosis of ADHD experienced more physical IPV than did comparisons (30.7 % vs. 6.3 %). In parallel, IPV was associated with higher levels of childhood ADHD symptomatology (d = 0.73). Young women with persistent ADHD stood the highest risk of experiencing IPV (37.3 %), followed by those with transient ADHD (19.0 %) and those never-diagnosed (5.9 %). Academic achievement measured during adolescence was a significant partial mediator of the childhood ADHD symptomatology-young adult IPV relationship, even with control of sociodemographic, psychiatric, and cognitive factors, including childhood reading and math disorders. Findings indicate that in young women, childhood ADHD is a specific and important predictor of physically violent victimization in their intimate relationships. This vulnerable population requires IPV prevention and intervention, with academic empowerment as a key target

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J Abnorm Child Psychol. 2016 Feb;44:323-34.

RESPONSE INHIBITION, PEER PREFERENCE AND VICTIMIZATION, AND SELF-HARM: LONGITUDINAL ASSOCIATIONS IN YOUNG ADULT WOMEN WITH AND WITHOUT ADHD.

Meza JI, Owens EB, Hinshaw SP.

Self-harm (suicidal ideation and attempts; non-suicidal self-injuries behavior) peaks in adolescence and early-adulthood, with rates higher for women than men. Young women with childhood psychiatric diagnoses appear to be at particular risk, yet more remains to be learned about the key predictors or mediators of self-harm outcomes. Our aims were to examine, with respect to self-harm-related outcomes in early adulthood, the predictive validity of childhood response inhibition, a cardinal trait of attention-deficit hyperactivity disorder

(ADHD), as well as the potential mediating effects of social preference and peer victimization, ascertained in early adolescence. Participants were an ethnically and socioeconomically diverse sample of 228 girls with and without ADHD, an enriched sample for deficits in response inhibition. Childhood response inhibition (RI) predicted young-adult suicide ideation (SI), suicide attempts (SA), and non-suicidal self-injury (NSSI), over and above full-scale IQ, mother's education, household income, and age. Importantly, teacher-rated social preference in adolescence was a partial mediator of the RI-SI/SA linkages; self-reported peer victimization in adolescence emerged as a significant partial mediator of the RI-NSSI linkage. We discuss implications for conceptual models of self-harm and for needed clinical services designed to detect and reduce self-harm

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J Abnorm Child Psychol. 2016 Feb;44:335-45.

THE GENETIC OVERLAP OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND AUTISTIC-LIKE TRAITS: AN INVESTIGATION OF INDIVIDUAL SYMPTOM SCALES AND COGNITIVE MARKERS.

Pinto R, Rijsdijk F, Ronald A, et al.

Attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASDs) frequently co-occur. However, due to previous exclusionary diagnostic criteria, little is known about the underlying causes of this covariation. Twin studies assessing ADHD symptoms and autistic-like traits (ALTs) suggest substantial genetic overlap, but have largely failed to take into account the genetic heterogeneity of symptom subscales. This study aimed to clarify the phenotypic and genetic relations between ADHD and ASD by distinguishing between symptom subscales that characterise the two disorders. Moreover, we aimed to investigate whether ADHD-related cognitive impairments show a relationship with ALT symptom subscales; and whether potential shared cognitive impairments underlie the genetic risk shared between the ADHD and ALT symptoms. Multivariate structural equation modelling was conducted on a population-based sample of 1312 twins aged 7–10. Social-communication ALTs correlated moderately with both ADHD symptom domains (phenotypic correlations around 0.30) and showed substantial genetic overlap with both inattention and hyperactivity-impulsivity (genetic correlation = 0.52 and 0.44, respectively). In addition to previously reported associations with ADHD traits, reaction time variability (RTV) showed significant phenotypic (0.18) and genetic (0.32) association with social-communication ALTs. RTV captured a significant proportion (24 %) of the genetic influences shared between inattention and social-communication ALTs. Our findings suggest that social-communication ALTs underlie the previously observed phenotypic and genetic covariation between ALTs and ADHD symptoms. RTV is not specific to ADHD symptoms, but is also associated with social-communication ALTs and can, in part, contribute to an explanation of the co-occurrence of ASD and ADHD.

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J Abnorm Child Psychol. 2016 Feb;44:347-55.

RECALLED INITIATION AND DURATION OF MATERNAL BREASTFEEDING AMONG CHILDREN WITH AND WITHOUT ADHD IN A WELL CHARACTERIZED CASE–CONTROL SAMPLE.

Stadler DD, Musser ED, Holton KF, et al.

Early environmental influences are increasingly of interest in understanding ADHD as a neurodevelopmental condition, particularly in light of recognition that gene by environment interplay are likely involved in this condition. Breastfeeding duration predicts cognitive development, as well as development of brain white matter connectivity, in areas similar to those seen in ADHD. Prior studies show an association between breastfeeding and ADHD but without adequate evaluation of ADHD. A case control cohort of 474 children aged 7–13 years was examined, 291 with wellcharacterized ADHD (71.5 % male) and the rest typically developing controls (51.9 % male). Mothers retrospectively reported on breast feeding initiation and duration. Initiation of breastfeeding was not associated with child ADHD, but shorter duration of breastfeeding was associated with child ADHD with a medium effect size ($d = 0.40$, $p < 0.05$); this effect held after covarying a broad set of potential confounders, including child oppositional defiant and conduct problems and including maternal and paternal ADHD symptoms. Effects were replicated across both parent and teacher ratings of child ADHD symptoms. Shorter duration of breastfeeding is among several risk factors in early life associated with future ADHD, or else longer duration is protective. The direction of this effect is unknown, however. It

may be that some children are more difficult to breastfeed or that breastfeeding provides nutrients or other benefits that reduce future chance of ADHD

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J Abnorm Child Psychol. 2016 Jan;44:141-54.

COGNITIVE LOAD DIFFERENTIALLY IMPACTS RESPONSE CONTROL IN GIRLS AND BOYS WITH ADHD.

Seymour KE, Mostofsky SH, Rosch KS .

Children with attention-deficit hyperactivity disorder (ADHD) consistently show impaired response control, including deficits in response inhibition and increased intrasubject variability (ISV) compared to typically-developing (TD) children. However, significantly less research has examined factors that may influence response control in individuals with ADHD, such as task or participant characteristics. The current study extends the literature by examining the impact of increasing cognitive demands on response control in a large sample of 81children with ADHD (40 girls) and 100 TD children (47 girls), ages 8–12 years. Participants completed a simple Go/No-Go (GNG) task with minimal cognitive demands, and a complex GNG task with increased cognitive load. Results showed that increasing cognitive load differentially impacted response control (commission error rate and tau, an ex-Gaussian measure of ISV) for girls, but not boys, with ADHD compared to same-sex TD children. Specifically, a sexually dimorphic pattern emerged such that boys with ADHD demonstrated higher commission error rate and tau on both the simple and complex GNG tasks as compared to TD boys, whereas girls with ADHD did not differ from TD girls on the simple GNG task, but showed higher commission error rate and tau on the complex GNG task. These findings suggest that task complexity influences response control in children with ADHD in a sexually dimorphic manner. The findings have substantive implications for the pathophysiology of ADHD in boys versus girls with ADHD

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J Abnorm Psychol. 2016 Feb;125:182-95.

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER DEVELOPMENTAL TRAJECTORIES RELATED TO PARENTAL EXPRESSED EMOTION.

Musser ED, Karalunas SL, Dieckmann N, et al.

In the transition from childhood to adolescence, attention-deficit/hyperactivity disorder (ADHD) developmental trajectories diverge. Family environment, as indexed by parental expressed emotion, may moderate these trajectories. 388 children with ADHD and 127 controls were assessed using multi-informant, multimethod diagnostic procedures at up to 3 time points 1 year apart in an accelerated longitudinal design spanning ages 7–13 years. Latent-class growth analysis was used to identify developmental trajectories for parent- and teacher-rated ADHD and oppositional-defiant disorder (ODD) symptoms within the ADHD sample. Parental expressed emotion, criticism, and emotional overinvolvement were coded from a 5-min speech sample at 2 time points, 1 year apart, for 208 of these children and compared among ADHD trajectory groups.

Results: Parent-rated hyperactivity yielded a 4-class trajectory solution in latent-class growth analysis; teacher-rated inattention yielded a 3-trajectory solution. Teacher-rated ODD also yielded 3-trajectory solution. A parent-rated high persistent hyperactive group was more likely than the other ADHD groups to have parents with stable high criticism (34.6%, $p < .001$), with ODD symptoms controlled. A teacher-identified high ODD-worsening group was more likely to experience high criticism, particularly the initial time point; (87.5%, $p < .001$), with hyperactivity controlled. Parental criticism, an index of the family environment, is uniquely associated with divergent developmental trajectories among children with ADHD in addition to those associated with ODD symptoms.

Lay summary: For many children, ADHD symptoms decrease as they transition to adolescence. Family environmental factors, such as parental criticism, may help explain for whom symptom remission is less likely

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J Abnorm Psychol. 2016 Feb;125:233-47.

PROGRESSION OF IMPAIRMENT IN ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER THROUGH THE TRANSITION OUT OF HIGH SCHOOL: CONTRIBUTIONS OF PARENT INVOLVEMENT AND COLLEGE ATTENDANCE.

Howard AL, Strickland NJ, Murray DW, et al.

Long-term, prospective follow-up studies of children diagnosed with attention-deficit/hyperactivity disorder (ADHD) show that symptoms tend to decline with age, but impairments in daily life functioning often persist into adulthood. We examined the developmental progression of impairments before and after the transition out of high school in relation to parent involvement during adolescence, parent support during adulthood, and college attendance, using 8 waves of data from the prospective 16-year follow-up of the Multimodal Treatment of ADHD (MTA) study. Participants were 548 proband children diagnosed with Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM–IV; American Psychiatric Association, 2000) ADHD Combined Type and 258 age- and sex-matched comparison children (Local Normative Comparison Group; LNCG) randomly sampled from probands' schools. Impairment was assessed consistently by parent report from childhood through adulthood. Results showed that impairment worsens over time both before and after the transition to adulthood for those with ADHD histories, in contrast to non-ADHD peers, whose impairments remained stably low over time. However, impairment stabilized after leaving high school for young adults with ADHD histories who attended college. Involved parenting in adolescence was associated with less impairment overall. Attending college was associated with a stable post-high school trajectory of impairment regardless of parents' involvement during adolescence, but young adults with histories of involved parenting and who attended college were the least impaired overall

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J Abnorm Psychol. 2016 Feb;125:168-81.

PREDICTORS OF ADOLESCENT OUTCOMES AMONG 4–6-YEAR-OLD CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Lahey BB, Lee SS, Sibley MH, et al.

Children who met Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) criteria for attention-deficit/hyperactivity disorder (ADHD) with functional impairment in at least one setting at 4–6 years of age were followed prospectively through age 18 years. On average, the 125 children (107 boys) with ADHD at baseline improved over time, but still continued to exhibit more symptoms, functional impairment, and risky behavior through adolescence than demographically matched healthy comparison children. These findings support the predictive validity of the diagnosis of ADHD at younger ages by demonstrating that the symptoms and impairment are enduring. Nonetheless, there were marked variations in developmental outcomes. Among children with ADHD, higher numbers of inattention and hyperactivity-impulsivity symptoms and higher number of concurrent symptoms (oppositional, conduct disorder, anxiety, and depression) measured at baseline each predicted higher future levels of the same dimension of symptoms. In addition, higher baseline levels of inattention, oppositional, conduct disorder, and anxiety symptoms predicted greater future functional impairment. Among children with ADHD, girls and children from families with lower family incomes had relatively poorer outcomes. Although outcomes varied along a continuum, approximately 10% of the children with ADHD at 4–6 years could be classified as functioning in the normative range on multiple measures during 15–18 years. Although this finding awaits replication, lower levels of hyperactivity-impulsivity symptoms at 4–6 years predicted more normative functioning during adolescence. These findings suggest that ADHD identified in early childhood predicts an increased likelihood of functional impairment through adolescence for most, but not all, children

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J Abnorm Psychol. 2016 Feb;125:154-67.

EARLY DEVELOPMENT OF COMORBIDITY BETWEEN SYMPTOMS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) AND OPPOSITIONAL DEFIANT DISORDER (ODD).

Harvey EA, Breaux RP, Lugo-Candelas CI.

Attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD) are among the most common childhood disorders and frequently co-occur. The present study sought to advance our understanding of how comorbidity between ADHD and ODD develops during the preschool years by testing a cross-lagged model that integrates 2 prominent models: the developmental precursor model and the correlated risk factors model. Participants were 199 children (107 boys) who took part in a longitudinal study of preschoolers with behavior problems. Parent reports of ADHD and ODD symptoms were collected annually from ages 3 to 6 and a family history interview was administered at age 3. In support of the developmental precursors model, ADHD symptoms predicted later argumentative/defiant symptoms. In support of the correlated risk factors model, family histories of ADHD and ODD/CD symptoms were correlated risk factors that uniquely predicted ADHD and anger/irritable symptoms in children. Results suggest that the correlated risk factors model may best explain the development of comorbidity between symptoms of ADHD and anger/irritability, whereas the developmental precursors model may better explain the development of comorbidity between symptoms of ADHD and argumentative/defiance

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J Abnorm Psychol. 2016 Feb;125:196-206.

TEMPERAMENT, EXECUTIVE CONTROL, AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER ACROSS EARLY DEVELOPMENT.

Rabinovitz BB, O'Neill S, Rajendran K, et al.

Research examining factors linking early temperament and later attention-deficit/ hyperactivity disorder (ADHD) is limited by cross-sectional approaches and having the same informant rate both temperament and psychopathology. The authors used multiinformant/multimethod longitudinal data to test the hypothesis that negative emotionality during preschool is positively associated with ADHD symptom severity in middle childhood, but developing executive control mediates this relation. Children (N = 161) with and without ADHD were evaluated 3 times: parent and teacher temperament ratings and NEPSY visual attention at ages 3–4 years; Wechsler Intelligence Scale for Children-4th edition Working Memory Index and NEPSY Response Set at age 6 years; and ADHD symptoms using the Kiddie-SADS at age 7 years. Parent and teacher ratings of preschoolers' temperament were combined to form an anger/frustration composite. Similarly, an executive functioning composite was derived from age 6 measures. Bootstrapping was used to determine whether age 6 executive functioning mediated the relation between early anger/frustration and later ADHD symptom severity, while controlling for early executive functioning. Preschoolers' anger/frustration was significantly associated with later ADHD symptoms, with this relation partially mediated by age 6 executive functioning. Developing executive control mediates the relation between early anger/frustration and later ADHD symptom severity, suggesting that anger/frustration influences ADHD symptom severity through its impact on developing executive control. Early interventions targeting the harmful influences of negative emotionality or enhancing executive functioning may diminish later ADHD severity

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J Abnorm Psychol. 2016 Feb;125:207-19.

DEVELOPMENTAL TRAJECTORIES OF CLINICALLY SIGNIFICANT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) SYMPTOMS FROM GRADE 3 THROUGH 12 IN A HIGH-RISK SAMPLE: PREDICTORS AND OUTCOMES.

Sasser TR, Kalvin CB, Bierman KL.

Developmental trajectories of clinically significant attention-deficit/hyperactivity (ADHD) symptoms were explored in a sample of 413 children identified as high risk because of elevated kindergarten conduct problems. Symptoms of inattention and hyperactivity-impulsivity were modeled simultaneously in a longitudinal latent class analyses, using parent reports collected in Grades 3, 6, 9, and 12. Three developmental trajectories emerged: (1) low levels of inattention and hyperactivity (low), (2) initially high but

then declining symptoms (declining), and (3) continuously high symptoms that featured hyperactivity in childhood and early adolescence and inattention in adolescence (high). Multinomial logistic regressions examined child characteristics and family risk factors as predictors of ADHD trajectories. Relative to the low class, children in the high and declining classes displayed similar elevations of inattention and hyperactivity in early childhood. The high class was distinguished from the declining class by higher rates of aggression and hyperactivity at school and emotion dysregulation at home. In contrast, the declining class displayed more social isolation at home and school, relative to the low class. Families of children in both high and declining trajectory classes experienced elevated life stressors, and parents of children in the high class were also more inconsistent in their discipline practices relative to the low class. By late adolescence, children in the high class were significantly more antisocial than those in the low class, with higher rates of arrests, school dropout, and unemployment, whereas children in the declining class did not differ from those in the low trajectory class. The developmental and clinical implications of these findings are discussed

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J Abnorm Psychol. 2016 Feb;125:220-32.

CHILDHOOD CONDUCT PROBLEMS AND YOUNG ADULT OUTCOMES AMONG WOMEN WITH CHILDHOOD ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD).

Owens EB, Hinshaw SP.

We tested whether conduct problems predicted young adult functioning and psychiatric symptoms among women diagnosed with attention-deficit/hyperactivity disorder (ADHD) during childhood, in the context of 3 potential adolescent mediators: internalizing problems, peer rejection, and school failure and disciplinary problems. We controlled for childhood ADHD severity, IQ, and demographic factors, and in the mediational tests, for adolescent conduct problems. Data came from 140 participants in the Berkeley Girls With ADHD Longitudinal Study. We used bootstrapping methods to assess indirect effects (mediators). Both childhood, $F(1, 118)$ change = 9.00, $p = .003$, R^2 change = .069, and adolescent, $F(1, 109)$ change = 10.41, $p = .002$, R^2 change = .083, conduct problems were associated with worse overall functioning during young adulthood, controlling for initial ADHD severity, child IQ, and demographics. Results were similar when predicting psychiatric symptoms. Adolescent school failure and disciplinary problems mediated the relations between childhood conduct problems and both young adult functioning and externalizing problems; adolescent internalizing problems and peer conflict mediated the relation between childhood conduct problems and young adult internalizing problems. As is true for boys, childhood and adolescent conduct problems are associated with poor adult outcomes among girls with ADHD, with school failure and disciplinary problems, internalizing problems, and peer conflict functioning as mediators of these relations

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Journal of Child and Family Studies. 2015 Dec;24:3595-609.

RELATIONSHIP BETWEEN DIAGNOSIS OF ADHD IN OFFSPRING AND CURRENT AND RETROSPECTIVE SELF-REPORTS OF PARENTAL ADHD.

Karakas S, Bakar EE, Dinçer ED, et al.

This study aimed to discover the relationship between parental self-reports of ADHD symptoms and the diagnosis of ADHD in offspring, to demonstrate the extent to which parental ADHD symptoms predict ADHD diagnosis in offspring, to examine the contribution of adult ADHD scales to ADHD diagnosis, and to provide findings on the psychometric utility of adult ADHD scales. The sample consisted of 6–12-year-old boys diagnosed with ADHD (n = 149), boys in the control group (n = 47) and both parents (n = 392). Amongst the many exclusion criteria was the comorbidity of neurological and psychiatric disorders. Parental self-reports of current ADHD symptoms were obtained using the Adult Attention Deficit Hyperactivity Disorder Scale (ADD/ADHD Scale), and past symptoms were retrospectively obtained using the Wender-Utah Rating Scale (WUR Scale). For children diagnosed with ADHD, the frequency of parents with ADHD symptoms was higher than the parents without ADHD symptoms; the significance was derived from the group in which both parents displayed ADHD symptoms. The ADHD symptom scores of the parents led to a high accuracy level when predicting ADHD in children (sensitivity) but led to a low accuracy level when classifying children without any

diagnosis in the control group (specificity). The study disclosed the psychometric strengths and weaknesses of the ADD/ADHD and WUR scales for measuring parental ADHD symptoms and provided original findings on their psychometric properties

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Journal of Child and Family Studies. 2015 Dec;24:3711-22.

ATTACHMENT STYLE AND RELATIONSHIP DIFFICULTIES IN PARENTS OF CHILDREN WITH ADHD.

Sochos A, Yahya F.

Previous studies report that parents of children with ADHD often experience difficulties in their couple relationship. The present study investigated the role of adult attachment style in relation to problems with dyadic adjustment and conflict communication. A cross-sectional design was employed, involving 98 parents of children and adolescents with ADHD and 153 parents of offspring without the disorder (age range in 3–19). Participants completed the following: Experiences in Close Relationships Questionnaire-R, Communications Pattern Questionnaire, Dyadic Adjustment Scale, and Conner's Parent Rating Scale–48. According to the findings, the two parental groups differed regarding relationship difficulties only when attachment style was controlled for. Moreover, attachment avoidance moderated the impact of having a child with ADHD on dyadic adjustment while attachment anxiety moderated such an impact on conflict communication. Also, parents of children with less severe ADHD symptoms were more likely to experience relationship problems, while having a child with ADHD moderated the effects of gender on the roles taken in demand-withdraw communication. Considering adult attachment style may provide useful insights into how parents of children with ADHD relate to each other and may inform supportive interventions

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J Child Neurol. 2016 Feb;31:131-33.

ASSOCIATION OF ATTENTION DEFICIT DISORDER WITH BEDSIDE ANTI-SACCADES IN SURVIVORS OF CHILDHOOD LEUKEMIA.

Khan RB, Hudson MM, Ness KK, et al.

Impaired attention is well recognized in childhood cancer survivors. We prospectively evaluated 162 long-term survivors of childhood acute lymphoblastic leukemia to study an association between presence of neurologic soft signs as measured by Zurich Neuromotor Scale, bedside evaluation of anti-saccades, and attention deficit disorder. Attention deficit disorder was recognized in 10.5% of the study cohort. We did not find an association of attention deficit with presence of any soft sign. However, there was an association between presence of abnormal anti-saccades and attention deficit (P = .04). These results will require further validation and if confirmed may introduce a quick bedside method of assessing impaired attention in cancer survivors

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Journal of Child Psychology and Psychiatry. 2016 Feb;57:132-40.

ATTENTION PROBLEMS IN VERY PRETERM CHILDREN FROM CHILDHOOD TO ADULTHOOD: THE BAVARIAN LONGITUDINAL STUDY.

Breeman LD, Jaekel J, Baumann N, et al.

Background: Very preterm (VP; gestational age <32 weeks) and very low birth weight (VLBW; <1500 grams) is related to attention problems in childhood and adulthood. The stability of these problems into adulthood is not known.

Methods: The Bavarian Longitudinal Study is a prospective cohort study that followed 260 VP/VLBW and 229 term-born individuals from birth to adulthood. Data on attention were collected at 6, 8, and 26 years of age, using parent reports, expert behavior observations, and clinical ADHD diagnoses.

Results: At each assessment, VP/VLBW individuals had significantly more attention problems, shorter attention span, and were more frequently diagnosed with ADHD than term-born comparisons. In both VP/VLBW and term-born individuals, overall, attention span increased and attention problems decreased

from childhood to adulthood. Attention problems and attention span were more stable over time for VP/VLBW than term-born individuals. Similarly, ADHD diagnoses showed moderate stability from childhood to adulthood in VP/VLBW, but not in term-born individuals. However, when those with severe disabilities were excluded, differences between VP/VLBW and term-born individuals reduced.
Conclusions: Despite improvement in attention regulation from childhood to adulthood, children born very preterm remained at increased risk for attention problems in adulthood. In contrast, term-born children with clinical attention problems outgrew these by adulthood. As inattentive behavior of VP/VLBW children may be overlooked by teachers, it may be necessary to raise awareness for school intervention programs that reduce attention problems in VP/VLBW children

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Journal of Child Psychology and Psychiatry. 2016 Feb;57:152-60.
METHYLOMIC ANALYSIS OF SALIVARY DNA IN CHILDHOOD ADHD IDENTIFIES ALTERED DNA METHYLATION IN VIPR2.
Wilmot B, Fry R, Smeester L, et al.
Background: Peripheral epigenetic marks hold promise for understanding psychiatric illness and may represent fingerprints of gene–environment interactions. We conducted an initial examination of CpG methylation variation in children with or without attention-deficit/hyperactivity disorder (ADHD).
Methods: Children age 7–12 were recruited, screened, evaluated and assigned to ADHD or non-ADHD groups by defined research criteria. Two independent age-matched samples were examined, a discovery set (n = 92, all boys, half control, half ADHD) and a confirmation set (n = 20, half ADHD, all boys). 5-methylcytosine levels were quantified in salivary DNA using the Illumina 450 K HumanMethylation array. Genes for which multiple probes were nominally significant and had a beta difference of at least 2% were evaluated for biological relevance and prioritized for confirmation and sequence validation. Gene pathways were explored and described.
Results: Two genes met the criteria for confirmation testing, VIPR2 and MYT1L; both had multiple probes meeting cutoffs and strong biological relevance. Probes on VIPR2 passed FDR correction in the confirmation set and were confirmed through bisulfite sequencing. Enrichment analysis suggested involvement of gene sets or pathways related to inflammatory processes and modulation of monoamine and cholinergic neurotransmission.
Conclusions: Although it is unknown to what extent CpG methylation seen in peripheral tissue reflect transcriptomic changes in the brain, these initial results indicate that peripheral DNA methylation markers in ADHD may be promising and suggest targeted hypotheses for future study in larger samples

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Journal of Child Psychology and Psychiatry. 2016 Feb;57:141-48.
RISKY BICYCLING BEHAVIOR AMONG YOUTH WITH AND WITHOUT ATTENTION-DEFICIT HYPERACTIVITY DISORDER.
Nikolas MA, Elmore AL, Franzen L, et al.
Background: Injury risk from car–bicycle collisions is particularly high among youth with attention-deficit hyperactivity disorder (ADHD). Here, we capitalized on advances in virtual environment technology to safely and systematically examine road-crossing behavior among child cyclists with and without ADHD.
Methods: Sixty-three youth (26 with ADHD, 37 non-ADHD controls) ages 10–14 years crossed 12 intersections with continuous cross-traffic while riding a high-fidelity bicycling simulator. Traffic density (i.e., temporal gaps between vehicles) was manipulated to examine the impact of varying traffic density on behavioral indices of road crossing, including gap selection, timing of entry into the roadway, time to spare when exiting the roadway, and close calls with oncoming cars. In addition, parents filled out questionnaires assessing their child's ADHD symptomatology, temperamental characteristics, bicycling experience, and injury history.
Results: ADHD youth largely chose the same size gaps as non-ADHD youth, although ADHD youth were more likely to select smaller gap sizes following exposure to high-density traffic. In addition, youth with ADHD demonstrated poorer movement timing when entering the intersection, resulting in less time to spare when

exiting the roadway. Hyperactivity–impulsivity symptoms were specifically associated with selection of smaller gaps, whereas timing deficits were specifically associated with inattention and inhibitory control.
Conclusion: Findings highlight two related yet potentially dissociable mechanisms that may influence injury risk among youth with ADHD and provide a foundation for development of injury prevention strategies

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Journal of Child Psychology and Psychiatry. 2016 Feb;57:188-95.

PARENTING STYLE INFLUENCES BULLYING: A LONGITUDINAL STUDY COMPARING CHILDREN WITH AND WITHOUT BEHAVIORAL PROBLEMS.

Rajendran K, Kruszewski E, Halperin JM.

Background: More optimal parenting has been linked with lower rates of bullying. However, it is not clear whether parenting can alter the trajectories of bullying among children diagnosed with ADHD or ODD as well as those who are not so diagnosed. This study examined whether parenting at age 4–5 years was associated with changes in bullying over the next 4 years among children with Attention-deficit/Hyperactivity Disorder (ADHD) with and without comorbid Oppositional Defiant Disorder (ODD) relative to children without these disorders.
Method: Children from the New York metropolitan area (n = 162) were prospectively studied over six annual assessment points between preschool and 9 years of age. Parenting was assessed by laboratory observations of the parent and child; teachers rated child bullying, and parents reported on children's diagnostic status (Neither ADHD nor ODD, ADHD but not ODD, both ADHD and ODD).
Results: Children with comorbid ADHD and ODD were more likely to bully than the other two groups. Hierarchical linear modeling revealed a fall in bullying over five years. Diagnostic status was significantly associated with initial levels of bullying. Irrespective of diagnostic group, children receiving more parent support for child autonomy at age 4 to 5 years showed a significantly greater decline in bullying than those provided with little support for autonomy. There was no longitudinal link between parent negative affect, emotionally supportive parenting and quality of parent–child interactions with bullying.
Conclusions: Greater parent support for child autonomy at age 4–5 years is related to reduced bullying. Interventions that encourage parent support for child autonomy at the time of entry into school may reduce bullying during early school years

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J Clin Exp Neuropsychol. 2016 Feb;38:183-96.

EVIDENCE OF MOTOR-CONTROL DIFFICULTIES IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER, EXPLORED THROUGH A HIERARCHICAL MOTOR-SYSTEMS PERSPECTIVE.

Macoun SJ, Kerns KA.

Introduction: Attention deficit hyperactivity disorder (ADHD) may reflect a disorder of neural systems that regulate motor control. The current study investigates motor dysfunction in children with ADHD using a hierarchical motor-systems perspective where frontal–striatal/"medial" brain systems are viewed as regulating parietal/"lateral" brain systems in a top down manner, to inhibit automatic environmentally driven responses in favor of goal-directed behavior. It was hypothesized that due to frontal–striatal hypoactivation, children with ADHD would have difficulty with higher order motor control tasks felt to be dependent on these systems, yet have preserved general motor function.
Method: A total of 63 children—ADHD and matched controls—completed experimental motor tasks that required maintenance of internal motor representations and the ability to inhibit visually driven responses. Children also completed a measure of motor inhibition, and a portion of the sample completed general motor function tasks.
Results: On motor tasks that required them to maintain internal motor representations and to inhibit automatic motor responses, children with ADHD had significantly greater difficulty than controls, yet on measures of general motor dexterity, their performance was comparable. Children with ADHD displayed significantly greater intraindividual (subject) variability than controls. Intraindividual variability (IIV) contributed to variations in performance across the motor tasks, but did not account for all of the variance on all tasks.

Conclusions: These findings suggest that children with ADHD may be more controlled by external stimuli than by internally represented information, possibly due to dysfunction of the medial motor system. However, it is likely that children with ADHD also display general motor-execution problems (as evidenced by IIV findings), suggesting that atypicalities may extend to both medial and lateral motor systems. Findings are interpreted within the context of contemporary theories regarding motor dysfunction in ADHD, and implications for understanding externalizing behaviors in ADHD are discussed

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J Clin Psychiatry. 2016;77:52-59.

RACIAL AND ETHNIC DISPARITIES IN PARENT-REPORTED DIAGNOSIS OF ADHD: NATIONAL SURVEY OF CHILDREN'S HEALTH (2003, 2007, AND 2011).

Collins KP, Cleary SD.

BACKGROUND: Attention-deficit/hyperactivity disorder (ADHD) is the most commonly diagnosed mental disorder among children in the United States. While overall ADHD prevalence continues to rise, few have examined difference by race/ethnicity.

OBJECTIVE: To examine trends in parent-reported ADHD prevalence between 2003 and 2011 across racial/ethnic groups and the role of sociodemographic factors in observed differences in ADHD.

METHOD: Data were from 3 waves of the National Survey of Children's Health (2003, 2007, and 2011), including 190,408 children aged 5-17 years. Independent variables included race/ethnicity (white non-Hispanic, black non-Hispanic, Hispanic, other non-Hispanic), gender, age, poverty level, primary language, insurance status, parental marital status, and neighborhood safety. Sociodemographic factors and year were compared among those diagnosed with ADHD and between racial/ethnic groups using $\chi(2)$ tests. Adjusted logistic regression models, stratified by race/ethnicity, were fit to examine the association between identified risk factors and ADHD across racial/ethnic groups. Parental report of an ADD or ADHD diagnosis for a child aged 5-17 years was the dependent variable. If the household included more than 1 child aged 5-17 years, 1 was selected at random.

RESULTS: Increasing trends were observed over the past decade in the prevalence of parent-reported ADHD overall (43%, $P < .001$), among children aged 10-14 years (47%, $P < .001$), and adolescents aged 15-17 years (52%, $P < .001$). Although the ADHD prevalence was still highest among whites, increasing trends were observed for all racial/ethnic groups, most notably among Hispanics, increasing 83% from 2003 to 2011 ($P < .001$). A greater increase in ADHD was also observed among females (55%, $P < .001$) than among males (40%).

CONCLUSIONS: Economics, family status, non-English language in the home, and neighborhood safety factors differentially impacted diagnosed ADHD across racial/ethnic groups. Although new insights into the role of economic, family, and neighborhood factors on parent-reported ADHD diagnoses were noted, more research is needed to understand causes of the observed racial/ethnic disparities.

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J Clin Psychopharmacol. 2016 Feb;36:106-07.

DIFFUSE MACULOPAPULAR RASH WITH INCREASING DOSAGE OF METHYLPHENIDATE.

Kaya I, Coskun M.

Presents the case report of a E is an 11-year-old boy who has been followed up with diagnosis of social and generalized anxiety and attention deficit disorders for the last 2 years. He was first started on sertraline 25mg. He used this dosage for 3 months without any significant side effects. Then sertraline was increased to 50 mg/d. There were no significant side effects except some level of decreased appetite during the day and rebound increased appetite at nights without any significant weight change. Methylphenidate has been the first-line psychopharmacological treatment in children and adolescents with attention-deficit hyperactivity disorder and results in significant improvement in 70% to 80% of affected children. The patient in our case developed nonpruritic diffuse rash including his face, neck, trunk, back, arms, and legs. As far as we can recognize, this is the first report of such a skin reaction related to MPH treatment. Although present reports

are not of life-threatening severity, skin rash may be frightening for the patient and family and impairs treatment compliance

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J Consult Clin Psychol. 2016.

LONG-TERM OUTCOMES OF BRIEF, INTENSIVE CBT FOR SPECIFIC PHOBIAS: THE NEGATIVE IMPACT OF ADHD SYMPTOMS.

Halldorsdottir T, Ollendick TH.

Objectives: The objectives were twofold: (a) examine long-term treatment effects in youth receiving 1-session treatment (OST) or educational support (EST) for a specific phobia (SP) and (b) examine the differential predictive and moderation effects of attention-deficit/hyperactivity disorder (ADHD) symptoms on immediate and long-term outcomes following the interventions.

Method: Eighty-three children (ages 6-15, 47% female, 89% White) with a SP were randomly assigned to receive OST or EST. Follow up assessments occurred at 1 week, 6 months, 1 year, and 4 years. Hierarchical linear growth modeling (HLGM) was used to explore the association of parent-reported ADHD symptoms, the 2 treatment conditions (i.e., OST vs. EST), and the trajectory of change in the severity of the SP from pretreatment to the 4-year follow-up. Age, conduct problems and learning problems were controlled for in all analyses.

Results: A greater immediate reduction in severity rating of the SP was observed in the OST compared to EST, whereas the trajectory of long-term outcomes was similar across conditions over time. Higher levels of ADHD symptoms predicted poor immediate and long-term treatment outcomes across treatment conditions. ADHD symptoms, however, did not moderate the relationship between treatment condition and immediate or long-term treatment outcomes.

Conclusions: The results of the study need to be interpreted in light of several study limitations. However, if confirmed, the findings suggest that anxious youth with comorbid ADHD symptoms are less likely to benefit from brief, intensive psychotherapy and may require either longer, standard CBT treatment or adjunctive pharmacotherapy

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J Intellect Disabil Res. 2016;60:167-78.

THE EMERGENCE AND STABILITY OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN BOYS WITH FRAGILE X SYNDROME.

Grefer M, Flory K, Cornish K, et al.

Background: Children with fragile X syndrome (FXS) are at high risk for developing a range of behavioural disorders, including attention deficit/hyperactivity disorder (ADHD) and autism spectrum disorders (ASD). However, very few studies have investigated the comorbid profile of FXS and ADHD and the possible dissociation from the FXS and ASD profile. The present study examined the relationship of childhood temperament characteristics of the Surgency facet (activity level, impulsivity, approach, shyness, and smiling and laughter) and the severity of ADHD and ASD features at two measurement time points in childhood, preschool (ages 3-4) and at school entry (ages 5-6).

Methods: The study consisted of males with FXS measured at each time point (preschool and school entry), as well as comparison of typically developing (TD) boys at the preschool measurement time point. Parent reported measures of temperament and behavioural symptoms were collected at each time point. Multiple regression analyses were used to analyse obtained data.

Results: Elevated activity level scores are associated with ADHD scores at preschool age and elevated shyness and decreased smiling and laughter are strongly associated with ADHD scores upon school entry. Impulsivity emerges as a strong indicator of elevated ADHD scores around school age, but even preschool impulsivity scores demonstrate some predictive value for higher ADHD scores later in school. Finally, no Surgency characteristic was significantly related to ASD scores at any age.

Conclusions: Impulsivity serves as an indicator of elevated ADHD symptoms across development periods in boys with FXS, while activity level is just indicative of higher ADHD scores at the preschool age. The

Surgency facet of temperament at either age does not predict strong relationships of comorbid pathologies of ADHD and ASD in FXS. However, Surgency characteristics may serve as informative discriminative factors when studying behavioural outcomes in boys with FXS

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J Nerv Ment Dis. 2016.

ADULT ATTENTION DEFICIT HYPERACTIVITY DISORDER SYMPTOMS, PERCEIVED STRESS, AND WELL-BEING: THE ROLE OF EARLY MALADAPTIVE SCHEMATA.

Miklósi M, Máté O, Somogyi K, Szabó M.

Attention deficit hyperactivity disorder (ADHD) is one of the most prevalent chronic neuropsychiatric disorders, severely affecting the emotional well-being of children as well as of adults. It has been suggested that individuals who experience symptoms of ADHD develop maladaptive schemata of failure, impaired self-discipline, social isolation, and shame. These schemata may then contribute to impaired emotional well-being by increasing unhelpful responses to stressful life events. However, to date, no empirical research has tested this theoretical proposition. In a sample of 204 nonclinical adults, we conducted a serial multiple mediator analysis, which supported the proposed model. More severe ADHD symptoms were associated with higher levels of perceived stress both directly and indirectly through stronger maladaptive schemata, which, in turn, were related to lower levels of emotional well-being. Results suggest that identifying and modifying maladaptive schemata may be an important addition to psychotherapy for adult ADHD patients

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J Pediatr Endocrinol Metab. 2016;29:85-92.

EFFECTS OF METHYLPHENIDATE ON APPETITE AND GROWTH IN CHILDREN DIAGNOSED WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER.

Gurbuz F, Gurbuz BB, Celik GG, et al.

The purpose of this study was to determine the levels of leptin, ghrelin, and nesfatin-1 to elucidate the causes of poor appetite and growth retardation in patients receiving methylphenidate therapy for attention deficit hyperactivity disorder. The study was performed on 89 male subjects; 48 patients and 41 healthy controls, aged 7-14 years. Following treatment, patients' leptin levels increased and ghrelin levels decreased while no significant change was found in nesfatin-1 levels. Of the 48 patients, 34 developed lack of appetite. In patients who developed lack of appetite, body weight SDS, body mass index (BMI), and BMI SDS were statistically significantly reduced; moreover, height SDS was reduced, though not to a statistically significant extent. This study attempted to elucidate the mechanisms that mediate the association between methylphenidate and appetite and growth, for which no studies have yet to be published

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Journal of Pediatric Health Care. 2016 Jan;30:88-93.

COLLABORATION BETWEEN PNPS AND SCHOOL NURSES: MEETING THE COMPLEX MEDICAL AND ACADEMIC NEEDS OF THE CHILD WITH ADHD.

Heuer B, Williams S.

Pediatric nurse practitioners take a lead role in diagnosing and coordinating the care of children with attention deficit hyperactivity disorder (ADHD). School nurses offer rich insight into the child's health and social and academic functioning in the school setting. School nurses develop individualized health care plans, administer and monitor medications, provide valuable input on Individualized Education Plans and Section 504 Accommodation Plans, and serve as the point person in communicating with the medical provider. Pediatric nurse practitioners can enhance the collaboration with school nurses by establishing communication parameters, streamlining medication regimens, and facilitating development of educational

curricula for school nurses regarding evidence-based ADHD management. Optimizing partnerships with school nurses will provide better surveillance of treatment efficacy and can facilitate improved health and academic and social outcomes for children with ADHD

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J Pediatr. 2016.

COMORBIDITY OF ATOPIC DISORDERS WITH AUTISM SPECTRUM DISORDER AND ATTENTION DEFICIT/HYPERACTIVITY DISORDER.

Liao TC, Lien YT, Wang S, et al.

Objective: To assess the relationship between allergic manifestations in early life and the occurrence of newly diagnosed autism spectrum disorder (ASD) and attention deficit/hyperactivity disorder (ADHD) throughout childhood.

Study design: We collected a population-based longitudinal cohort comprising children enrolled in Taiwan's National Health Insurance Program during 2000-2010. We first identified 387 262 children who had a diagnosis of atopic dermatitis (AD) before age 2 years, with 1:1 individualized matching to children without AD. Cox regression analyses were performed to estimate the early-onset and cumulative effects of allergic manifestations on ASD and ADHD.

Results: An estimated 0.5% of AD-exposed children received a diagnosis of ASD, and 3.7% were diagnosed with ADHD, significantly higher than the respective rates of 0.4% and 2.9% found in their nonexposed peers. Having AD before age 2 years was associated with an increased hazard ratio (HR) for ASD by 10% and that for ADHD by 16%; such increases were particularly prominent among those with earlier-onset or more severe AD. HRs were especially higher for children with persistent AD and emerging atopic respiratory diseases in childhood (eg, for ASD, adjusted HR, 1.75 and 2.13, respectively; $P < .001$).

Conclusion: The observed increased risks of ASD and ADHD associated with AD in infancy suggest that a disordered immunologic response may exert effects on neurodevelopment and have implications for research into etiology and treatment strategies

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J Am Acad Child Adolesc Psychiatry. 2016.

GENDER DIFFERENCES IN ASSOCIATIONS BETWEEN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND SUBSTANCE USE DISORDER.

Ottosen C, Petersen L, Larsen JT, et al.

Objective: To examine gender differences in the association between attention-deficit/hyperactivity disorder (ADHD) and substance use disorder (SUD), and to explore the impact of comorbid psychiatric conditions.

Method: This was a cohort study of all children born in Denmark in 1990 to 2003 (n = 729,560). By record linkage across nationwide registers, we merged data on birth characteristics, socioeconomic status, familial psychiatric history, and diagnoses of ADHD (N = 19,645), comorbidities, and SUD. Hazard ratios (HR) with 95% CIs were estimated by Cox regression and adjusted for a range of variables.

Results: ADHD increased the risk of alcohol abuse (HRfemales = 1.72 [95% CI = 1.42-2.08], HRmales = 1.57 [1.37-1.79]), cannabis abuse (HRfemales = 2.72 [2.12-3.47], HRmales = 2.24 [1.86-2.70]), and other illicit substance abuse (HRfemales = 2.05 [1.54-2.73], HRmales = 2.42 [1.98-2.96]), compared to individuals without ADHD. In the overall estimates, no gender differences were found. Among individuals with ADHD without comorbidities, females had a higher SUD risk than males, as did females with ADHD and conduct disorder (CD). Comorbid CD, depression, bipolar disorder, and schizophrenia further increased the risk of SUD in ADHD, compared to non-ADHD. Autism spectrum disorder in males with ADHD lowered the SUD risk.

Conclusion: ADHD increased the risk of all SUD outcomes. Individuals with ADHD without comorbidities were also at increased risk, and some comorbid disorders further increased the risk. Females and males

with ADHD had comparable risks of SUD, although females had higher risk of some SUDs than males. Females with ADHD may be perceived as less impaired than males, but they are at equally increased risk of SUD

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Kaohsiung J Med Sci. 2016;32:103-09.

ANXIETY AND DEPRESSION AMONG ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: THE ROLES OF BEHAVIORAL TEMPERAMENTAL TRAITS, COMORBID AUTISM SPECTRUM DISORDER, AND BULLYING INVOLVEMENT.

Hu HF, Chou WJ, Yen CF.

The aim of this study was to examine the associations of behavioral temperamental traits, comorbid autism spectrum disorder (ASD), and bullying involvement with anxiety and depression among adolescents with attention-deficit/hyperactivity disorder (ADHD) in Taiwan. A total of 287 adolescents aged 11-18 years diagnosed with ADHD participated in this study. Their severities of anxiety and depression were assessed. Multiple regression analysis was used to examine the correlates of anxiety and depression. The results show that adolescents with ADHD who reported a higher behavioral inhibition system (BIS) score, had comorbid ASD, and were bullying victims, reported more severe anxiety and depressive symptoms. Adolescents with ADHD who bullied others reported more severe depressive symptoms than those who did not bully. The results of this study indicated that behavioral temperamental traits on the BIS, comorbid ASD, and bullying involvement were significantly associated with anxiety and depression among the adolescents with ADHD

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Klinik Psikofarmakoloji Bülteni / Bulletin of Clinical Psychopharmacology. 2015 Dec;25:321-434.

SHOULD WE CONTINUE METHYLPHENIDATE TREATMENT DESPITE OROFACIAL OR EXTREMITY DYSKINESIAS?

Kazanci SY, Tarakcioglu MC, Bulbul L, et al.

Attention-deficit/hyperactivity disorder (ADHD) is the most common neuropsychiatric disease affecting 5.3% of school-aged children. Methylphenidate is the primary stimulant, which has been used widely more than 60 years to treat ADHD. In this paper 3 cases with orofacial and/or limb dyskinesia after methylphenidate administration are reported. In 2 of our patients, continuation of the methylphenidate treatment did not cause recurrent dyskinesia. We thought that despite dyskinetic side effects, in cases with normal IQ level, continuation of methylphenidate treatment may be safe and do not cause any recurrent dyskinetic movements. Despite dyskinesia, one more chance may be given to methylphenidate treatment

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Lancet. 2016 Feb;387:737.

ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Barnett R.

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Mayo Clin Proc. 2016;91:352-61.

CHILDHOOD ATTENTION-DEFICIT/HYPERACTIVITY DISORDER, SEX, AND OBESITY: A LONGITUDINAL POPULATION-BASED STUDY.

Aguirre Castaneda RL, Kumar S, Voigt RG, et al.

Objective To assess obesity rates during childhood and young adulthood in patients with attention-deficit/hyperactivity disorder (ADHD) and age- and sex-matched controls derived from a population-based birth cohort because cross-sectional studies suggest an association between ADHD and obesity.

Patients and Methods Study subjects included patients with childhood ADHD (n=336) and age- and sex-matched non-ADHD controls (n=665) from a 1976 to 1982 birth cohort (N=5718). Height, weight, and stimulant treatment measurements were abstracted retrospectively from medical records documenting care

provided from January 1, 1976, through August 31, 2010. The association between ADHD and obesity in patients with ADHD relative to controls was estimated using Cox models.
Results Patients with attention-deficit/hyperactivity disorder were 1.23 (95% CI, 1.00-1.50; P<.05) times more likely to be obese during the follow-up period than were non-ADHD controls. This association was not statistically significant in either sex (female participants: hazard ratio [HR], 1.49; 95% CI, 0.98-2.27; P=.06; male participants HR, 1.17, 95% CI, 0.92-1.48; P=.20). Patients with ADHD who were not obese as of the date ADHD research diagnostic criteria were met were 1.56 (95% CI, 1.14-2.13; P<.01) times more likely to be obese during the subsequent follow-up than were controls. This association was statistically significant in female study subjects (HR, 2.02; 95% CI, 1.13-3.60; P=.02), but not in male participants (HR, 1.41; 95% CI, 0.97-2.05; P=.07). A higher proportion of patients with ADHD were obese after the age of 20 years compared with non-ADHD controls (34.4% vs 25.1%; P=.01); this difference was observed only in female patients (41.6% vs 19.2%). There were no differences in obesity rates between stimulant-treated and nontreated patients with ADHD.
Conclusion Childhood ADHD is associated with obesity during childhood and young adulthood in females. Treatment with stimulant medications is not associated with the development of obesity up to young adulthood

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Mentálhigiéné és Pszichoszomatika. 2015 Dec;16:349-67.
VÉRZÉKENYSÉGBEN SZENVEDO GYERMEKEK ÉS SERDÜLOK ÉLETMINOSÉGÉNEK ÉS MENTÁLIS JÓLLÉTÉNEK VIZSGÁLATA SZÜLOI BESZÁMOLÓ ALAPJÁN. = QUALITY OF LIFE AND MENTAL HEALTH OF CHILDREN SUFFERING BLEEDING DISORDERS ACCORDING TO PARENT-REPORT.
Réka W, Mónika M.
Background: There have been several researches on the impact of rare diseases on quality of life (QoL) and mental health. Previous studies found that bleeding disorders, probably due to prophylactic treatment, do not impact QoL and mental well-being in children and adolescents; some findings suggest impairments in emotional, social and family functioning and increased prevalence of attention deficit and hyperactivity disorder, however.
Aims: The aim of the study was to assess QoL and psychopathology of children and adolescents suffering in bleeding disorders and compare them with healthy control and patients with attention deficit hyperactivity disorder (ADHD).
Methods: In a cross sectional design, parents of children and adolescents with bleeding disorders (N = 25), ADHD (N = 25) and healthy control (N = 25) fulfilled the Inventar zur Erfassung der Lebensqualität von Kindern und Jugendlichen (ILK) and the Strength and Difficulties Questionnaire (SDQ) assessing QoL and psychopathology.
Results: Parent-rated QoL did not differ between children with bleeding disorders and controls. Parent-rated QoL in the ADHD group was significantly lower in all but one (family life) domains than in the clinical group. Children with bleeding disorders showed significantly less psychopathology than controls in SDQ total difficulties score, peer problems, and emotional problems. According to parent-report, children with ADHD had higher scores on all but one SDQ subscale (prosocial behavior) than children with bleeding disorders.
Conclusions: Children and adolescents with bleeding disorders do not show impairments in QoL and mental health according to parent-report. The impact of bleeding disorders on QoL and mental well-being is much lower than the impact of ADHD

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Milli Nevrologiya Jurnali. 2015;61-64.
CLINICAL-NEUROLOGIC AND ANAMNESIS SYMPTOMS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN (ADHD) CHILDREN.
Saidkhodjayeva SN.
The researches of clinical-neurologic and neuro-physiologic manifestations of ADHD in 40 children we performed made it possible to extend and deepen our notions about the character of the alterations occurring

in case of that pathology. ADHD is 2.3 times more often met among boys. Equal distribution of attention deficit and hyperactivity at the age of 4-7 years old is changed by priority of attention deficit to 12 years old. The risk factors of ADHD formation are perinatal damage of CNS (65%), hereditary predisposition (37.5%), unfavorable social-psychological impacts (60.7%)

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Monatsschr Kinderheilkd. 2016;1-7.

ATTENTION DEFICIT/HYPERACTIVITY DISORDER: WHY NOT ADHD SPECTRUM?

Jenni O.

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders in childhood and adolescence. This article describes the diagnostic procedures in clinical practice and the different treatment modalities and also highlights the inconsistencies and dilemmas of this complex and heterogeneous disorder. Uncertainties arise because there is no generally accepted etiological model and no reliable test for the individual patient. Furthermore, a large overlap exists with other neurobehavioral disorders and finally ADHD symptoms are continuously distributed in the normal population. This makes the diagnosis dependent on environmental expectations and societal judgment. Thus, this article proposes the use of the term ADHD spectrum, which not only considers the dimensional nature of ADHD but also its heterogeneity and complexity

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Nervenarzt. 2016;1-10.

MINIMAL CEREBRAL DYSFUNCTIONS AND ADHD IN ADULTHOOD.

Linden M, Weddigen J.

Attention deficit hyperactivity disorder (ADHD) is of great importance not only in children but also in adults; however, despite extensive research there are still many unsolved questions with respect to the diagnosis. Patients not only suffer from attention deficits and hyperactivity but also a variety of other problems, such as dyspraxia, problems with stimulus discrimination, dysgrammatism, legasthenia, or motor coordination problems. Furthermore, there are also psychopathological disorders, such as problems with memory, formal thinking, emotional modulation, drive and vegetative stability, in the sense of a psycho-organic syndrome. Such syndromes have long been known in psychiatry under terms, such as complex capacity disorders, minimal cerebral dysfunction (MCD), minimal brain dysfunction (MBD), mild psycho-organic syndrome, psycho-organic axis syndrome, mild cognitive impairment, developmental disorder and developmental biological syndrome. Etiological data with respect to genetics and early childhood brain trauma support the notion of a psychobiological disorder for complex cerebral dysfunction in the sense of a psycho-organic syndrome. Depending on the individual life and work situation, these additional symptoms of ADHD are in many cases of greater relevance for life adjustment than the core symptoms, depending on the individual life and work situations. The concept of minimal cerebral dysfunction describes the ADHD problem better and has a direct bearing on the diagnosis, therapy and sociomedical care of the patients

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Neuropsychiatr Dis Treat. 2016 Feb;12.

EPILEPSY AND ATTENTION-DEFICIT HYPERACTIVITY DISORDER: LINKS, RISKS, AND CHALLENGES.

Williams AE, Giust JM, Kronenberger WG, et al.

Attention-deficit hyperactivity disorder (ADHD) has a prevalence rate of 7%–9% in the general population of children. However, in children with epilepsy, ADHD has been found to be present in 20%–50% of patients. This paper provides a review of ADHD prevalence in pediatric epilepsy populations and reviews data on specific symptom presentation and attention deficits in patients with epilepsy. This paper also reviews evidence-based treatments for ADHD and specifically the treatment of ADHD as a comorbid condition in children with epilepsy. (PsycINFO Database Record (c) 2016 APA, all rights reserved). (journal abstract)

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Neuropsychobiology. 2016;16-22.

EEG BRAIN WAVE ACTIVITY AT REST AND DURING EVOKED ATTENTION IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND EFFECTS OF METHYLPHENIDATE.

Thomas BL, Viljoen M.

Objective: The aim of this study was to assess baseline EEG brain wave activity in children with attention-deficit/hyperactivity disorder (ADHD) and to examine the effects of evoked attention and methylphenidate on this activity.

Method: Children with ADHD (n = 19) were tested while they were stimulant free and during a period in which they were on stimulant (methylphenidate) medication. Control subjects (n = 18) were tested once. EEG brain wave activity was tested both at baseline and during focussed attention. Attention was evoked and EEG brain wave activity was determined by means of the BioGraph Infiniti biofeedback apparatus.

Results: The main finding of this study was that control subjects and stimulant-free children with ADHD exhibited the expected reactivity in high alpha-wave activity (11-12 Hz) from baseline to focussed attention; however, methylphenidate appeared to abolish this reactivity.

Conclusion: Methylphenidate attenuates the normal cortical response to a cognitive challenge

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Neuropsychology. 2016.

EVALUATING THE CONSEQUENCES OF IMPAIRED MONITORING OF LEARNED BEHAVIOR IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER USING A BAYESIAN HIERARCHICAL MODEL OF CHOICE RESPONSE TIME.

Weigard A, Huang-Pollock C, Brown S.

Objective: Performance monitoring deficits have been proposed as a cognitive marker involved in the development of attention-deficit/hyperactivity disorder (ADHD), but it is unclear whether these deficits cause impairment when established action sequences conflict with environmental demands. The current study applies a novel data-analytic technique to a well-established sequence learning paradigm to investigate reactions to disruption of learned behavior in ADHD.

Method: Children (ages 8-12) with and without ADHD completed a serial reaction time task in which they implicitly learned an 8-item sequence of keypresses over 5 training blocks. The training sequence was replaced with a novel sequence in a transfer block, and returned in 2 subsequent recovery blocks. Response time (RT) data were fit by a Bayesian hierarchical version of the linear ballistic accumulator model, which permitted the dissociation of learning processes from performance monitoring effects on RT.

Results: Sequence-specific learning on the task was reflected in the systematic reduction of the amount of evidence required to initiate a response, and was unimpaired in ADHD. When the novel sequence onset, typically developing children displayed a shift in their attentional state while children with ADHD did not, leading to worse subsequent performance compared to controls.

Conclusions: Children with ADHD are not impaired in learning novel action sequences, but display difficulty monitoring their implementation and engaging top-down control when they become inadequate. These results support theories of ADHD that highlight the interactions between monitoring processes and changing cognitive demands as the cause of self-regulation and information-processing problems in the disorder.

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Nord J Psychiatry. 2016;1-7.

CONVERGENT AND DIVERGENT VALIDITY OF K-SADS-PL ANXIETY AND ATTENTION DEFICIT HYPERACTIVITY DISORDER DIAGNOSES IN A CLINICAL SAMPLE OF SCHOOL-AGED CHILDREN.

Villabø MA, Oerbeck B, Skirbekk B, et al.

Background The Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime Version (K-SADS-PL) is a commonly used diagnostic interview both in research and clinical settings, yet published data on the psychometric properties of the interview generated diagnoses are scarce.

Aims To examine the convergent and divergent validity of the Norwegian version of the K-SADS-PL current diagnoses of anxiety disorders and attention deficit hyperactivity disorder (ADHD).
Method Participants were 105 children aged 7-13 years referred for treatment at child mental health clinics and 36 controls. Diagnostic status was determined based on K-SADS-PL interviews with the mothers. Child and mother reported child symptoms of anxiety on the Multidimensional Anxiety Scale for Children and teachers reported anxiety symptoms on the Teacher Report Form. Mother and teacher reported on symptoms of ADHD on the Disruptive Behavior Rating Scale.
Results Rating scale data from multiple informants in a clinical sample and healthy controls supported the convergent and divergent validity of K-SADS-PL anxiety diagnoses combined, and, specifically, the diagnoses of separation anxiety disorder, social phobia, and specific phobia. Support was also observed for convergent and divergent validity of ADHD diagnoses, including the predominately inattentive subtype.
Conclusion The K-SADS-PL generates valid diagnoses of anxiety disorders and ADHD

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Pediatr Neurol. 2016.
ATTENTION DEFICIT HYPERACTIVITY DISORDER IN ADOLESCENTS WITH EPILEPSY.
Kwong KL, Lam D, Tsui S, et al.
BACKGROUND: We examined attention-deficit hyperactivity disorder in adolescents with epilepsy and the association with seizure-related and sociodemographic variables.
METHODS: Strengths and Weakness of Attention-Deficit Hyperactivity Disorder Symptoms and Normal Behaviors rating scale was administered to 122 children with epilepsy and 50 children with asthma, aged 10 to 18 years attending mainstream schools.
RESULTS: Twenty-nine (23.7%) adolescents with epilepsy compared with five (10%) with asthma had attention deficit hyperactivity disorder (P = 0.037). Adolescents with epilepsy had a significantly higher score in the inattention subscale when compared with those with asthma (-0.25 ± 1.2 vs -0.64 ± 1.07, P = 0.049). Combined subtype was most frequent in the epilepsy group. Oppositional defiant disorders were more prevalent in those having attention deficit hyperactivity disorder. Psychiatric assistance had only been provided to one third of our patients with epilepsy and attention deficit hyperactivity disorder at the time of study. There was a negative correlation between attention deficit hyperactivity disorder scores and age of seizure onset. A positive correlation was observed between the number of antiepileptic drugs and the inattentive subscale score. The impact of various correlates on individual subtypes was not identical. Independent risk factors associated with attention deficit hyperactivity disorder were medical comorbidities (odds ratio = 12.82, 95% confidence interval 4.44, 37.03, P < 0.0001) and age at seizure onset (odds ratio = 0.73, 95% confidence interval 0.56, 0.94, P = 0.016).
CONCLUSIONS: Attention deficit hyperactivity disorder is overrepresented in adolescents with epilepsy; screening for its symptoms should be an integral part of management in adolescents with epilepsy.

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Pediatr Int. 2015;57:856-59.
PREVALENCE OF ADHD IN PRIMARY SCHOOL CHILDREN IN VINH LONG, VIETNAM.
Pham HD, Nguyen HBH, Tran DT.
Background Attention-deficit hyperactivity disorder (ADHD) is the most common behavioral disorder in children. It affects not only the subjects but also their families and society. The purpose of this study was to determine the prevalence of ADHD in primary school children in South Vietnam, especially Vinh Long province.
Method Children were chosen randomly from primary schools in Vinh Long from February to March in 2009 in a cross-sectional study to determine the prevalence of ADHD using the ADHD Rating Scale-IV for parents/caregivers and teachers. ADHD Rating Scale-IV was based on DSM-IV for diagnosis of ADHD.
Results A total of 600 children were chosen and 1200 reports were collected from parents/caregivers and teachers. The prevalence rate of ADHD was 7.7%. The rates of the predominantly inattentive type, predominantly hyperactive type and combined type were 1.7%, 5% and 1%, respectively. The difference in

sex was not significant across all subtypes. The prevalence of ADHD in urban children was 2.2-fold that in rural children.
Conclusion The prevalence of ADHD in primary school children in Vinh Long, southern Vietnam, is in the same range as other regions in the world. Therefore, awareness of ADHD needs to be raised, to ensure suitable psychiatric care for children

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Pediatr Int. 2016.
MATERNAL STRESS AND PERINATAL FEATURES IN AUTISM AND ATTENTION DEFICIT/HYPERACTIVITY DISORDER.
Say GN, Karabekiro-ƒlu K, Babada-ƒi Z, et al.
Background: We investigated the shared and non-shared perinatal risk factors for autism spectrum disorders (ASD) and attention deficit/hyperactivity disorder (ADHD) in a clinical sample. Additionally, we compared these groups regarding pre/postpartum maternal stress and the duration of breastfeeding.
Methods: Children aged 3-18 years old with ASD (n=100) were compared with age- and gender-matched children with ADHD (n=100) and with age- and gender-matched healthy controls (n=80).
Results: Prematurity of the neonate and maternal stress/depressive mood in pregnancy were common risk factors shared by ASD and ADHD. Postpartum maternal depressive mood may be more specific to ASD, while shorter duration of breastfeeding may be related to ADHD.
Conclusions: ASD and ADHD may have some perinatal features in common. Identification of perinatal factors for ASD and ADHD carries clinical implications in terms of primary prevention

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Pharmacoepidemiol Drug Saf. 2016.
STIMULANT USE FOR ADHD AND RELATIVE AGE IN CLASS AMONG CHILDREN IN ISRAEL.
Hoshen MB, Benis A, Keyes KM, et al.
BACKGROUND: Diagnosis of children with attention-deficit/hyperactivity disorder (ADHD) is increasing. The present study sought to identify characteristics and medication treatment patterns of children with ADHD and compare them by relative age in class, sex, ethnicity, family size, sibling order, and other socioeconomic status, as well as find trends in disparity of pharmacotherapy.
METHODS: This study was based on data from 1 013 149 Clalit Health Services members aged 6-17 years during 2006-2011. Centrally acting sympathomimetic drug purchases were compared according to children's estimated relative age in class; youngest third (born August to November), middle third (born April to July), and oldest third (born December to March). Treatment trends were determined and compared according to sociodemographic and family-related factors.
RESULTS: The overall prevalence of stimulant use in the population was 2.6% in 2006 and 4.9% in 2011. The annual incidence of stimulant use increased from 0.75% to 1.36%, rising more sharply among children in the older age groups (≥12) than among younger ones. Moreover, the youngest third of children in class was more likely to use medication than the oldest third (risk ratio (RR) 1.17, confidence interval (CI) 1.12-1.23) or the middle third (RR 1.06, CI 1.01-1.11). Of the different ethnic sectors, incidence of stimulant use was highest among general Jewish (1.8% in 2011) and lowest among Arabs (0.37% in 2011).
CONCLUSIONS: The use of stimulant medication is growing among children in Israel. Although the overall use does not exceed the estimated prevalence of ADHD among children, the appropriateness of prescribing to the Israeli pediatric population, especially to the youngest children in class, may be questionable.

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Pharmacogenomics J. 2016.
PHARMACOGENETICS OF METHYLPHENIDATE RESPONSE AND TOLERABILITY IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.
Pagerols M, Richarte V, et al.

Methylphenidate (MPH) is the most frequently used pharmacological treatment in children with attention-deficit/hyperactivity disorder. However, a considerable interindividual variability exists in clinical outcome, which may reflect underlying genetic influences. We analyzed 57 single-nucleotide polymorphisms in 9 dopamine-related candidate genes (TH, DBH, COMT, DAT1 and DRD1-5) as potential predictors of MPH efficacy and tolerability, and we considered prenatal and perinatal risk factors as environmental hazards that may influence treatment effects in a gene-by-environment analysis. Our results provide evidence for the contribution of DRD3 (P=0.041; odds ratio (OR)=4.00), DBH (P=0.032; OR=2.85), TH (P=5.5e-03; OR=4.34) and prenatal smoking (P=1.7e-03; OR=5.10) to the clinical efficacy of MPH, with a higher risk for treatment failure in genetically susceptible subjects whose mother smoked during pregnancy. Adverse events after MPH treatment were significantly associated with variation in DBH (P=6.4e-03; OR=0.28) and DRD2 (P=0.047; OR=3.76). This study suggests that the dopaminergic system together with prenatal smoking exposure may moderate MPH treatment effects.The Pharmacogenomics Journal advance online publication, 26 January 2016; doi:10.1038/tpj.2015.89

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PLoS ONE. 2015 Dec;10.

COGNITION, EMOTION AND BEHAVIOR IN CHILDREN WITH TOURETTE'S SYNDROME AND CHILDREN WITH ADHD-COMBINED SUBTYPE—A TWO-YEAR FOLLOW-UP STUDY.

Hovik KT, Plessen KJ, Cavanna AE, et al.

Objective: This two-year follow-up study investigates the course of and association among measures of cognitive control, focused attention, decision-making and symptom severity (anxiety, depression and behavior) in children and adolescents with Tourette's Syndrome (TS) or Attention-Deficit/Hyperactivity Disorder-Combined subtype (ADHD-C).

Method: 19 children with TS, 33 with ADHD-C, and 50 typically developing children (TDC) were examined with a battery of psychometric measures and rating forms at baseline and two-years later.

Results: All three groups improved likewise in measures of cognitive control over time, whereas only the TDC improved in focused attention. The group of children with TS with comorbidities performed more similar to the children with ADHD-C in cognitive control at T1 and T2, whereas the children with TS without comorbidities performed more similar to the TDC in cognitive control at T1 and T2. In the decision-making task, the children with TS (with or without comorbidities) preferred a safer strategy in selecting advantageous choices than the children with ADHD-C and the TDC at T2. Children with TS and children with ADHD-C showed higher symptoms of anxiety and depression and more problems with emotional control compared with TDC at both time points. Finally, children with ADHD-C self-reported more depression symptoms than those with TS at both assessments. For the TS group, safer decision-making was related to better emotional control, and this relationship was stronger for the TS subgroup without comorbidities.

Conclusion: This study emphasizes the importance of addressing symptoms of anxiety and depression in children with TS or ADHD-C, identifying the effect of comorbidities in children with TS, and that children with TS or ADHD-C likely differ in their sensitivity to reinforcement contingencies

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PLoS ONE. 2015 Dec;10.

ATTENTION-RELATED EYE VERGENCE MEASURED IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Puig MS, Zapata LP, Puigcerver L, et al.

Recent evidence shows a novel role for eye vergence in orienting attention in adult subjects. Here we investigated whether such modulation in eye vergence by attention is present in children and whether it is altered in children with ADHD compared to control subjects. We therefore measured the angle of eye vergence in children previously diagnosed with ADHD while performing a cue task and compared the results to those from age-matched controls. We observed a strong modulation in the angle of vergence in the control group and a weak modulation in the ADHD group. In addition, in the control group the modulation in eye vergence was different between the informative cue and uninformative cue condition. This difference was less noticeable in the ADHD group. Our study supports the observation of deficient binocular vision in ADHD

children. We argue that the observed disruption in vergence modulation in ADHD children is manifest of altered cognitive processing of sensory information. Our work may provide new insights into attention disorders, like ADHD

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PLoS ONE. 2015;10.

SOCIAL NETWORK ANALYSIS REVEALS THE NEGATIVE EFFECTS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) SYMPTOMS ON FRIEND-BASED STUDENT NETWORKS.

Kim JW, Kim BN, Kim JI, et al.

Introduction: Social network analysis has emerged as a promising tool in modern social psychology. This method can be used to examine friend-based social relationships in terms of network theory, with nodes representing individual students and ties representing relationships between students (e.g., friendships and kinships). Using social network analysis, we investigated whether greater severity of ADHD symptoms is correlated with weaker peer relationships among elementary school students.

Methods: A total of 562 sixth-graders from two elementary schools (300 males) provided the names of their best friends (maximum 10 names). Their teachers rated each student's ADHD symptoms using an ADHD rating scale.

Results: The results showed that 10.2% of the students were at high risk for ADHD. Significant group differences were observed between the high-risk students and other students in two of the three network parameters (degree, centrality and closeness) used to assess friendship quality, with the high-risk group showing significantly lower values of degree and closeness compared to the other students. Moreover, negative correlations were found between the ADHD rating and two social network analysis parameters.

Conclusion: Our findings suggest that the severity of ADHD symptoms is strongly correlated with the quality of social and interpersonal relationships in students with ADHD symptoms

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PLoS ONE. 2016 Jan;11.

HEAD MOTION AND INATTENTION/HYPERACTIVITY SHARE COMMON GENETIC INFLUENCES: IMPLICATIONS FOR FMRI STUDIES OF ADHD.

Couvy-Duchesne B, Ebejer JL, Gillespie NA, et al.

Head motion (HM) is a well known confound in analyses of functional MRI (fMRI) data. Neuroimaging researchers therefore typically treat HM as a nuisance covariate in their analyses. Even so, it is possible that HM shares a common genetic influence with the trait of interest. Here we investigate the extent to which this relationship is due to shared genetic factors, using HM extracted from resting-state fMRI and maternal and self report measures of Inattention and Hyperactivity-Impulsivity from the Strengths and Weaknesses of ADHD Symptoms and Normal Behaviour (SWAN) scales. Our sample consisted of healthy young adult twins (N = 627 (63% females) including 95 MZ and 144 DZ twin pairs, mean age 22, who had mother-reported SWAN; N = 725 (58% females) including 101 MZ and 156 DZ pairs, mean age 25, with self reported SWAN). This design enabled us to distinguish genetic from environmental factors in the association between head movement and ADHD scales. HM was moderately correlated with maternal reports of Inattention (r = 0.17, p-value = 7.4E-5) and Hyperactivity-Impulsivity (r = 0.16, p-value = 2.9E-4), and these associations were mainly due to pleiotropic genetic factors with genetic correlations [95% CIs] of rg = 0.24 [0.02, 0.43] and rg = 0.23 [0.07, 0.39]. Correlations between self-reports and HM were not significant, due largely to increased measurement error. These results indicate that treating HM as a nuisance covariate in neuroimaging studies of ADHD will likely reduce power to detect between-group effects, as the implicit assumption of independence between HM and Inattention or Hyperactivity-Impulsivity is not warranted. The implications of this finding are problematic for fMRI studies of ADHD, as failing to apply HM correction is known to increase the likelihood of false positives. We discuss two ways to circumvent this problem: censoring the motion contaminated frames of the RS-fMRI scan or explicitly modeling the relationship between HM and Inattention or Hyperactivity-Impulsivity

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Psychiatr Serv. 2016;67:199-205.

PREVALENCE AND DIAGNOSIS RATES OF CHILDHOOD ADHD AMONG RACIAL-ETHNIC GROUPS IN A PUBLIC MENTAL HEALTH SYSTEM.

Siegel CE, Laska EM, Wanderling JA, et al.

Objective: This study estimated the proportions of Hispanic and non-Hispanic white and black children ages three to 17 with a diagnosis of attention-deficit hyperactivity disorder (ADHD) receiving services from the New York State public mental health system (NYS PMHS) and their annual treated ADHD prevalence rates. Findings were compared with those of recent national studies of general population samples.

Methods: Data were from a 2011 survey of users of NYS PMHS nonresidential services. Adjusted odds ratios compared the probability of an ADHD diagnosis among the groups by age, gender, and insurance type. Prevalence rates were compared among groups by age and gender.

Results: An estimated 133,091 children used the NYS PMHS, of whom31% had an ADHD diagnosis. The prevalence rate of ADHD among whites was significantly lower than that among Hispanics or blacks in all gender and age groups except Hispanic females ages 13 to 17. White children were significantly less likely than black children to receive an ADHD diagnosis.

Conclusions: National studies have reported higher ADHD rates among white children. Compared with children in the NYS PMHS, those in national studies had multiple access points to care, including private psychiatrists and clinicians and primary care practitioners. The higher reported ADHD rates in national studies may reflect higher rates of private insurance among white children, which would increase the likelihood of their using private practitioners. Cultural factors that influence whether and where care is sought and whether practitioners appropriately diagnosis ADHD may also explain the difference in findings

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Psychiatry Res Neuroimaging. 2014;224:242-45.

INTERGENERATIONAL TRANSMISSION OF FRONTO-PARIETAL DYSFUNCTION DURING FORETHOUGHT IN ATTENTION DEFICIT/HYPERACTIVITY DISORDER: A PILOT STUDY.

Poissant H, Rapin L, Mendrek A.

There are only a few published reports of neural abnormalities within the families of children with attention deficit/hyperactivity disorder (ADHD). Functional magnetic resonance imaging was used to compare cerebral activation of ADHD and control biological parent-child dyads during forethought, a prospective function of working memory. Reduced activations in ADHD dyads were found in the inferior frontal gyrus, right superior parietal lobule and left inferior parietal lobule. This suggests that fronto-parietal abnormalities are shared within ADHD families

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Psychiatry Res. 2016;236:42-46.

BLOOD LEAD, PARENTAL MARITAL STATUS AND THE RISK OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN ELEMENTARY SCHOOL CHILDREN: A LONGITUDINAL STUDY.

Choi WJ, Kwon HJ, Lim MH, et al.

The aim of this study was to investigate the blood lead level and parental marital status that might influence the development of attention-deficit/hyperactivity disorder (ADHD) symptoms in school-aged children. The participants in the survey included elementary school children, and they were followed up biennially. The participants' parents or caregivers were administered a questionnaire including ADHD rating scale. Among 2967 who were not suspected to have ADHD at baseline survey, 2195 children who took follow-up test for ADHD were evaluated. The incidence rate of suspected ADHD was 5.0% (107 cases) during the two years of the follow-up period. The geometric mean blood lead level was 1.56 ++g/dL. Relative risk ratio for ADHD was estimated using logistic regression analysis. After adjustment for potential confounders, ADHD developed more frequently in children with blood lead levels of >2.17 ++g/dL (highest quartile) (RR 1.552, 95% CI 1.002-2.403) and in children with a single parent (RR 1.805, 95% CI 1.002-3.254). The RR was 3.567 (95% CI 1.595-7.980) in children with relatively high blood lead levels (>2.17 ++g/dL) from single-parent

families, compared with those with low blood lead and a two-parent family. The ADHD risk in association with blood lead level was modified by family status

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Psychol Assess. 2016;28:245-50.

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) SYMPTOMS, ANXIETY SYMPTOMS, AND EXECUTIVE FUNCTIONING IN EMERGING ADULTS.

Jarrett MA.

The current study examined attention-deficit/hyperactivity disorder (ADHD) and anxiety symptoms in relation to self-reported executive functioning deficits in emerging adults. College students (N = 421; ages 17-25; 73.1% female) completed self-reports of ADHD, anxiety, and executive functioning in a laboratory setting. Structural equation modeling analyses revealed that self-reported executive functioning deficits were significantly related to all 3 symptom domains. Executive functioning deficits were most strongly related to inattention followed by hyperactivity/impulsivity and anxiety. Analyses based on clinical groups revealed that groups with ADHD and comorbid anxiety showed greater deficits on self-regulation of emotion and self-organization/problem solving than those with ADHD only or anxiety only. Groups with ADHD showed greater deficits with self-motivation and self-restraint than those with anxiety only. All clinical groups differed from a control group on executive functioning deficits. Overall, anxiety symptoms appear to be associated with college students' self-reported executive functioning deficits above and beyond relationships with ADHD symptomatology. Further, those with ADHD and anxiety appear to show increased difficulties with self-regulation of emotion and self-organization/ problem solving, a domain which appears to overlap substantially with working memory. Future studies should seek to replicate our findings with a clinical population, utilize both report-based and laboratory task measures of executive functioning, and integrate both state and trait anxiety indices into study designs. Finally, future studies should seek to determine how executive functioning deficits can be best ameliorated in emerging adults with ADHD and anxiety

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Psychol Assess. 2016;28:214-25.

PARENT AND TEACHER RATINGS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER SYMPTOMS: FACTOR STRUCTURE AND NORMATIVE DATA.

Dupaul GJ, Reid R, Anastopoulos AD, et al.

Comprehensive assessment of attention-deficit/hyperactivity disorder (ADHD) symptoms includes parent and teacher questionnaires. The ADHD Rating Scale-5 was developed to incorporate changes for the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013). This study examined the fit of a correlated, 2-factor structure of ADHD (i.e., DSM-5 conceptual model) and alternative models; determined whether ADHD symptom ratings varied across teacher and child demographic characteristics; and presented normative data. Two samples were included: (a) 2,079 parents and guardians (1,131 female, 948 male) completed ADHD symptom ratings for children (N = 2,079; 1,037 males, 1,042 females) between 5 and 17 years old (M = 10.68; SD = 3.75) and (b) 1,070 teachers (766 female, 304 male) completed ADHD symptom ratings for students (N = 2,140; 1,070 males, 1,070 females) between 5 and 17 years old (M = 11.53; SD = 3.54) who attended kindergarten through 12th grade. The 2-factor structure was confirmed for both parent and teacher ratings and was invariant across child gender, age, informant, informant gender, and language. In general, boys were higher in symptom frequency than girls; older children were rated lower than younger children, especially for hyperactivity-impulsivity; and non-Hispanic children were rated higher than Hispanic children. Teachers also rated non-Hispanic African American children higher than non-Hispanic White, Asian, and Hispanic children. Non-Hispanic White teachers provided lower hyperactivity-impulsivity ratings than non-Hispanic, African American, and Hispanic teachers. Normative data are reported separately for parent and teacher ratings by child gender and age. The merits of using the ADHD Rating Scale-5 in a multimodal assessment protocol are discussed

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Psychological Science. 2016 Feb;27:257-69.

VARIATION IN AN IRON METABOLISM GENE MODERATES THE ASSOCIATION BETWEEN BLOOD LEAD LEVELS AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN.

Nigg JT, Elmore AL, Natarajan N, et al.

Although attention-deficit/hyperactivity disorder (ADHD) is a heritable neurodevelopmental condition, there is also considerable scientific and public interest in environmental modulators of its etiology. Exposure to neurotoxins is one potential source of perturbation of neural, and hence psychological, development. Exposure to lead in particular has been widely investigated and is correlated with neurodevelopmental outcomes, including ADHD. To investigate whether this effect is likely to be causal, we used a Mendelian randomization design with a functional gene variant. In a case-control study, we examined the association between ADHD symptoms in children and blood lead level as moderated by variants in the hemochromatosis (HFE) gene. The HFE gene regulates iron uptake and secondarily modulates lead metabolism. Statistical moderation was observed: The magnitude of the association of blood lead with symptoms of ADHD was altered by functional HFE genotype, which is consistent with a causal hypothesis

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Psychoneuroendocrinology. 2015;61:28.

ASSOCIATIONS BETWEEN MATERNAL ANXIETY SYMPTOMS DURING AND THREE YEARS AFTER PREGNANCY AND CHILD'S BEHAVIORAL SYMPTOMS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Wolford E, Pesonen AK, Lahti M, et al.

Maternal prenatal anxiety has been shown to increase the risk of behavioral symptoms of attention deficit hyperactivity disorder (ADHD) in the offspring. Whether this association is independent of maternal anxiety measured concurrent to offspring ratings, and whether mother's prenatal and concurrent anxiety add to increasing the child's ADHD symptoms risk even further remains uncertain. We examined these questions in the Prediction and Prevention of Pre-eclampsia (PREDO) study. We studied 2312 mother-child dyads (50.6% boys) with singleton offspring born between 2005-2010. The mothers completed the Spielberger State-Trait Anxiety Inventory (STAI) every two weeks up to 14 times during pregnancy starting from 12 0/7 - 13 6/7 weeks of gestation, and 3.5 years after pregnancy the mothers completed the Beck Anxiety Inventory (BAI) in conjunction with rating the child's ADHD symptoms using the Conners' 10-item rating scale. A higher mean level of maternal prenatal anxiety throughout the pregnancy, and higher 2nd and 3rd pregnancy trimester-specific means predicted higher levels of behavioral ADHD symptoms (P-values < .01), and a higher risk of ADHD symptoms above the clinical cutoff (ГëÑ15 points) (P-values < .05) in the offspring. These associations were independent of maternal anxiety reported concurrent to rating the child's ADHD symptoms. Mother's prenatal and concurrent anxiety did not add to increasing the child's ADHD symptoms risk. Our findings thus suggest that exposure to an adverse maternal environment in prenatal life may be more important than an exposure in early childhood in increasing the offspring's risk of behavioral symptoms of ADHD

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Res Dev Disabil. 2016;53-54:86-94.

SUICIDALITY AND ITS RELATIONSHIPS WITH INDIVIDUAL, FAMILY, PEER, AND PSYCHOPATHOLOGY FACTORS AMONG ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Chou WJ, Liu TL, Hu HF, et al.

The aim of this study was to examine the prevalence rates of suicidal intent and its correlates among adolescents diagnosed with ADHD in Taiwan. A total of 287 adolescents aged 11-18 years and diagnosed with ADHD participated in this study. Their suicidal ideation and suicide attempts were assessed. Logistic regression analysis was used to examine the associations of suicide with individual, family, peer, ADHD, and psychopathology factors. A total of 12.2% of the participants reported suicidal ideation or a suicide attempt. A logistic regression analysis model showed that adolescents who were older, were bullying perpetrators, and reported high depression level were more likely to have suicidal intent. These three factors were also

significantly correlated with suicidal ideation; however, only having high depression level was significantly correlated with suicidal attempts. The results of this study showed that a high proportion of adolescents with ADHD reported suicidal ideation or a suicide attempt. Multiple factors were significantly associated with suicidal intent among adolescents with ADHD. Clinicians, educational professionals, and parents of adolescents with ADHD should monitor the possibility of suicide in adolescents with ADHD who exhibit the correlates of suicidal intent identified in this study

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Res Dev Disabil. 2016;51-52:49-59.

THE WRITTEN EXPRESSION ABILITIES OF ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Molitor SJ, Langberg JM, Evans SW.

Students with Attention-Deficit/Hyperactivity Disorder (ADHD) often experience deficits in academic achievement. Written expression abilities in this population have not been extensively studied but existing prevalence estimates suggest that rates of comorbid writing underachievement may be substantially higher than rates of comorbid reading and mathematics underachievement. The current study examined written expression abilities in a school-based sample of 326 middle school age students with ADHD. The prevalence of written expression impairment, the associations between written expression and academic outcomes, and specific patterns of written expression were investigated. Students with ADHD in this sample experienced written expression impairment (17.2-22.4%) at a similar rate to reading impairment (17.0-24.3%) and at a slightly lower rate than mathematics impairment (24.7-36.3%). Students' written expression abilities were significantly associated with school grades and parent ratings of academic functioning, above and beyond the influence of intelligence. Analyses of patterns suggest that students with ADHD exhibit greater deficits in written expression tasks requiring organization and attention to detail, especially in the context of a complex task

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Scientific World Journal. 2015;2015.

ASSOCIATIONS BETWEEN INADEQUATE PARENTING PRACTICES AND BEHAVIORAL PROBLEMS IN CHILDREN AND ADOLESCENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Triguero Veloz Teixeira MC, De Freitas Marino RL, Rodrigues Carreiro LR.

Children and adolescents with ADHD present behaviors such as impulsiveness, inattention, and difficulties with personal organization that represent an overload for parents. Moreover, it also increases their level of stress and leads them to resort to inadequate educational strategies. The present study verifies associations between inadequate parenting practices and behavioral profiles of children and adolescents with ADHD. The sample was composed of 22 children with ADHD (age range 6-16 years) and their mothers. Spearman correlation analyses were made with the scores of Parenting Style Inventory (PSI) and Child Behavior Checklist for ages 6-18 (CBCL/6-18). Results indicate statistically significant associations between behavioral problems and the use of punishment practices and negligence. When assessing a child with ADHD, it is important to verify the predominant types of parenting practices that can influence both immediate interventions and the prognosis of the disorder

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Southeast Asian J Trop Med Public Health. 2015 Sep;46:924-38.

RISK FACTORS AND INCIDENCE OF FALLS AMONG F.

Lee SH, Kim KS, Lee JS, et al.

This study aimed to determine the incidence of falls among children in South Korea, and the risk factors associated with these falls in order to develop preventive strategies. We studied 1,044 elementary school students in the fifth and sixth grades from Seoul, South Korea and evaluated the incidence of falls based on four surveys conducted in June, September, and December 2010 and February 2011. The surveys included the number of falls, the types of medical care received, and the potential factors associated with those falls.

Risk factors related to the falls were examined using a generalized estimating equation method. Statistical analysis was performed using SAS, version 9.2. The overall incidence of falls was 376 per 1,000 person-years; and a total of 44 children were hospitalized. Having a previous history of fall [odds ratio (OR) = 1.33; 95% confidence interval (CI): 1.08-1.64] and attention deficit hyperactivity disorder (ADHD) (OR = 3.63; 95% CI: 2.97-4.44) were risk factors associated with falls. Comparative analyses of the odds of having a single fall versus recurrent falls showed that ADHD ($p < 0.001$) and overweight/obesity ($p = 0.004$) were significantly associated with risk of recurrent falls. These results suggest novel safety programs should be developed taking these risk factors into consideration in order to reduce the incidence of falls among children in South Korea

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State Legis. 2016 Feb;42:19-21.

CALMING THE CHAOS. DISPARITIES AND GAPS IN THE TREATMENT OF HYPERACTIVITY IN CHILDREN HAS CAUGHT SOME LAWMAKERS' ATTENTION.

Johnson T.

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Tijdschr Psychiatr. 2015;57:917-22.

NEURAL ACTIVATION AND CONNECTIVITY DURING RESPONSE INHIBITION IN ADOLESCENTS WITH ADHD.

van Rooij D, Buitelaar JK.

BACKGROUND: We studied the neural correlates of response inhibition in a large cohort of adolescents with ADHD, their unaffected siblings and controls. Response inhibition is a key executive function deficit of attentiondeficit/hyperactivity disorder (ADHD).

AIM: To obtain new insight into the biological nature of response inhibition deficits in adolescents with ADHD.

METHOD: We studied the neural correlates of response inhibition in a large cohort of adolescents with ADHD (n = 185), their siblings unaffected by ADHD (n = 111) and controls (n = 126). We took fMRI measurement while the subjects performed the stop-task; this allowed us to investigate neural activation and neural connectivity.

RESULTS: Our results indicate that adolescents with ADHD show reduced brain activation and reduced connectivity in their response inhibition network. Our neural measurements correlated with subjects' performance on the stop-task and with the number of ADHD symptoms in the adolescents with ADHD. Unaffected siblings showed similar but less severe neural deviations but no cognitive deficits; unaffected siblings also showed unique patterns of compensatory connectivity.

CONCLUSION: These results provide new insights into the biological background of response inhibition and of ADHD. Neural measurements can give us a better understanding of the familial patterns of biological alterations, even if no behavioral deficits could be detected in the unaffected siblings. These neural correlates can also help to explain part of the ADHD phenotype

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Transl Psychiatry. 2015;5.

DEVELOPMENTAL CHANGES IN GAMMA-AMINOBUTYRIC ACID LEVELS IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Bollmann S, Ghisleni C, Poil SS, et al.

While the neurobiological basis and developmental course of attention-deficit/hyperactivity disorder (ADHD) have not yet been fully established, an imbalance between inhibitory/excitatory neurotransmitters is thought to have an important role in the pathophysiology of ADHD. This study examined the changes in cerebral levels of GABA+, glutamate and glutamine in children and adults with ADHD using edited magnetic resonance spectroscopy. We studied 89 participants (16 children with ADHD, 19 control children, 16 adults with ADHD and 38 control adults) in a subcortical voxel (children and adults) and a frontal voxel (adults only). ADHD adults showed increased GABA+ levels relative to controls ($P = 0.048$), while ADHD children showed

no difference in GABA+ in the subcortical voxel (P>0.1), resulting in a significant age by disorder interaction (P = 0.026). Co-varying for age in an analysis of covariance model resulted in a nonsignificant age by disorder interaction (P = 0.06). Glutamine levels were increased in children with ADHD (P = 0.041), but there was no significant difference in adults (P>0.1). Glutamate showed no difference between controls and ADHD patients but demonstrated a strong effect of age across both groups (P<0.001). In conclusion, patients with ADHD show altered levels of GABA+ in a subcortical voxel which change with development. Further, we found increased glutamine levels in children with ADHD, but this difference normalized in adults. These observed imbalances in neurotransmitter levels are associated with ADHD symptomatology and lend new insight in the developmental trajectory and pathophysiology of ADHD

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ORIGINAL ARTICLE

Sleep in children with attention-deficit/hyperactivity disorder (ADHD) before and after 6-month treatment with methylphenidate: a pilot study

Piernanda Vigliano[1] · Giovanni Battista Galloni[1] · Irene Bagnasco[1] · Giuliana Delia[1] · Alessandra Moletto[1] · Mauro Mana[1] · Samuele Cortese[2,3]

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Abstract Children with ADHD may present with sleep disturbances that add to the impairment of the disorder. The long-term sleep effects of the first-line pharmacological treatment for ADHD, i.e., psychostimulants, are unclear. In this pilot study, we compared polysomnographic variables in children with ADHD ($n = 11$, aged 6–15 years), before pharmacological treatment, and in children without ADHD ($n = 22$, aged 5–14 years); we also assessed polysomnographic changes in children with ADHD ($n = 7$) after a 6-month treatment with methylphenidate immediate-release (once or twice daily). Compared to children without ADHD, those with ADHD at baseline presented with significantly increased duration of awakenings ($p = 0.02$), reduction in sleep efficiency ($p = 0.03$), and increase in stage I (N1) ($p < 0.01$) and reduction in stage II (N2) ($p = 0.02$) and stage III–IV (N3) percentages. Methylphenidate treatment did not significantly change any parameter of sleep architecture.

Conclusion: Preliminary evidence from this pilot study shows that, compared to children without ADHD, those with ADHD presented a more fragmented and less effective sleep at baseline and that the 6-month methylphenidate treatment did not further negatively impact on sleep architecture.

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What is known:
- *Children with ADHD may present with subjectively reported and/or objectively confirmed disturbances of sleep.*
- *The long-term effects on sleep of the first-line pharmacological treatment for ADHD, i.e., psychostimulants, are not clear.*

What is new:
- *Our study showed that the 6-month continuous treatment with methylphenidate did not further negatively impact on sleep architecture in children with ADHD.*

Keywords Sleep disorders · ADHD · Children · Methylphenidate · Polysomnography · Arousal

Abbreviations

ADHD	Attention-Deficit/Hyperactivity Disorder
CAP	Cyclic Alternating Pattern
DCD	Developmental Coordination Disorder
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, fourth edition
GM	Global Movements in sleep

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LD	Learning Disorder
MPH	Methylphenidate
N1	sleep stage I
N2	sleep stage II
N3	sleep stages III-IV
ODD	Oppositional Defiant Disorder
REM	Rapid Eye Movement sleep

Introduction

An increasing body of research is available on the relationship between sleep and Attention-Deficit/Hyperactivity Disorder (ADHD) [8, 13, 15, 17–19]. Such interest is prompted by evidence showing that the quality and quantity of sleep in children impact on their emotional and cognitive development (in particular on their executive functions), thus aggravating ADHD symptoms [20].

Due to heterogeneity in sample characteristics and tools used to assess sleep, the prevalence of sleep disturbances in children with ADHD reported subjectively by parents and/or children varies from 50 to 75 % [20]. The most commonly reported sleep disturbance is sleep onset delay. Studies based on objective methods such as polysomnography (PSG) showed an association of ADHD to specific sleep disorders such as periodic limb movement disorder and obstructive sleep hypo-apnea [20, 25]. In addition, actigraphic studies reported a significant increase in sleep latency, a reduction in the time spent in bed, and earlier awakenings in children with ADHD compared to non-ADHD controls [9, 11]. PSG studies on sleep macro- and micro-architecture provided mixed results: while some studies did not report any significant difference in quantity, quality, or efficiency of sleep between children with and without ADHD, others did find significant differences in sleep onset latencies, stage shifts, percentage of REM and non-REM sleep, and number of sleep cycles or sleep efficiency, as summarized in Cortese et al. [9]. In addition, there is some evidence that, compared to children without ADHD, those with ADHD may present with a significantly higher percentage of nocturnal epileptic abnormalities, in the absence of epileptic seizures (e.g., [4]). Furthermore, empirical evidence shows that ADHD is associated with a preference for evening for usual activities [6].

The use of psychostimulants (including methylphenidate, MPH), the first-line pharmacological option for ADHD, is a possible confound in sleep studies in this population since the sympathetic effects of psychostimulants may impact on alertness and sleep architecture [10]. In addition, there is evidence that ADHD drugs may phase-shift the circadian clock (e.g., [3, 23]). Currently, empirical evidence on the effects of psychostimulants on sleep parameters in children with ADHD is mixed [8], so that further methodologically sound research is warranted on this topic. In addition, available PSG studies [12, 16, 27] assessed the sleep effects of psychostimulants, in particular, MPH, over a relatively short period of time (up to 7 weeks); therefore, studies on longer-term effects of MPH are needed. Understanding the long-term impact of MPH on sleep is of clinical relevance given the concerns about the possible adverse effects during treatment with psychostimulants [10].

In this pilot study, we aimed to compare PSG parameters in children with ADHD, before pharmacological treatment, and in non-ADHD comparisons and to assess changes in PSG parameters in children with ADHD after a 6-month MPH treatment. Given the lack of evidence on long-term effects of MPH on objective sleep parameters in children with ADHD, the present study was exploratory and no a priori hypotheses were formulated.

Material and methods

Participants

Twenty-eight children were diagnosed with ADHD at the Division of Child Neuropsychiatry, Martini Hospital, Turin, Italy, between March 2010 and March 2013. Children with ADHD were included regardless of their intellectual level. Eleven of these children and their parents agreed to have a sleep assessment at baseline (referred here as "T0") and after 6 months ("T1"). There were not significant differences ($p > 0.05$) in demographics, functioning, or comorbidities between the 11 children with ADHD who participated in the study and those who did not.

Among the participants, eight children started a pharmacological treatment for ADHD at T0, after consent from parents/carers. Seven were started on MPH immediate-release (the only formulation of MPH available in Italy at the time of the study) at T0 (soon after the sleep study). One child was initially treated with atomoxetine (suspended after 6 months due to poor effectiveness) and was excluded from this study, which focused on MPH. The seven children treated with MPH immediate-release took the drug once (8 a.m.) or twice (8 a.m. and 2 p.m.) a day. In Italy, the prescription of ADHD medications undergoes systematic monitoring, carried out by means of a national register in which compilation by local reference centers is compulsory. According to the national registry procedure, dosage of MPH was 0.3–0.6 mg/kg/dose/die. Based on clinical assessment, all the participants with ADHD were considered as good responders and no rebound effect of ADHD symptoms in the afternoon/night was reported by parents.

The non-ADHD comparison group consisted of 22 children, seen in the same center, matched for age, cognitive level, and prevalence of coordination disorder and psychiatric comorbidity. Twelve controls presented with functional epileptiform abnormalities in the absence of obvious epileptic

pathology. The others came to observation for disturbance of consciousness of uncertain origin and presented with normal neurological exam. Children without ADHD had a sleep assessment at T0. None of the participants (children with ADHD and controls) were pharmacologically treated (other than with MPH for the ADHD group) or had any chronic diseases.

Assessment

Psychiatric evaluation The diagnosis of ADHD was based on DSM-IV [1] criteria and supported by information from the following parent and teacher questionnaires validated in Italian, *Scale per l'individuazione di comportamenti di disattenzione e Iperattività* ("Scale for the detection of behaviors of inattention and hyperactivity"), "*Genitori*" (Parents) (SDAG) and "*Insegnanti*" (Teachers) (SDAI) [7], as well as by a scale used internationally, i.e., the Swanson, Nolan, and Pelham questionnaire (SNAP-IV) [30]). Other comorbid disorders were diagnosed according to DSM-IV criteria by means of psychiatric interviews based on the items of the K-SADS-PL [14]. The cognitive evaluation was based on the Wenchsler Intelligence Scale for Children-III (WISC-III) [24].

Sleep assessment The parents/carers were interviewed in order to gather information about the sleep habits of their children as well as any sleep disorders detectable at home (referred here as "subjective evaluation of sleep"). Children were then prepared for the PSG assessment on Fridays afternoon and had a short electroencephalographic (EEG) record during wakefulness; sleep was recorded from 8 p.m. until spontaneous awakening the next day, leaving the children free to ask for darkness and to fall asleep at the usual evening hour. Children were prepared with an EEG montage, which allowed the assessment not only of sleep stages but also of possible epileptiform abnormalities. The following polygraphic derivations were used: eye movements, mylohyoid muscle activity, chest breathing, and electrocardiogram. The sleep parameters assessed were as follows: sleep duration, sleep latency, duration of wakefulness in sleep, sleep efficiency, duration of each sleep stage, presence of sleep apnea, number of awakenings lasting more than 8 min, number of global movements leading to awakening or a change in the sleep phase, and number of global movements without modification of the sleep stage. We defined global movements as movements that determined the appearance of muscle activity on polygraphic and EEG channels, as well as changes in rhythm and amplitude of breathing and heart rate, according to Scholle et al. [28].

Statistical analysis

The Fisher's exact test for independent groups was used to compare sleep between ADHD and non-ADHD participants at T0. The Fisher's exact test for paired data was carried out to assess changes in these parameters after the 6-month treatment with MPH (comparison of data obtained in the seven children with ADHD at T0, who participated in the medication phase of the study, and T1). PRIMIT (advanced statistics for biomedical disciplines, http://proxy.racine.ra.it/epiinfo/Softwared.htm) was used for statistical analyses. Statistical significance was defined as $p < 0.05$ (two-tailed). Given the exploratory nature of the study, no correction for multiple comparisons was applied.

Results

Sample characteristics (age, gender, subjective evaluation of sleep, and rates of psychiatric comorbidities) are reported in Table 1. The average age of children with ADHD at baseline was 10.3 years (SD 2.8). Four children with ADHD presented with comorbid intellectual disability, five with oppositional defiant disorder (ODD), three with specific learning disorders (LD), and three with developmental coordination disorder (DCD); two of the children with DCD also had severe phono-articulatory impairment and consequent severe deficit in expressive language. All the 11 children with ADHD presented with the combined type of the disorder. All the children diagnosed with ADHD exceeded the clinical cutoff at the scale SNAP-IV with a mean value of 2.38 (SD 0.45) on the subscale of inattention, 2.11 (SD 0.55) on the scale of hyperactivity, 2.21 (SD 0.44) on the combined scale, and 1.53 (SD 0.94) on the ODD subscale (cutoff indicating clinical significance for all scales is 1.5) (Table 2). Five children with ADHD had normal IQ. The average full-scale IQ at the WISC-III of children with ADHD was 75.90 (SD 20.10), the verbal IQ 80.44 (SD 15.85), and the performance IQ 76.90 (SD 20.98) (Table 2). The average age of comparisons was 10.4 years (SD 3.3) (Table 1). Five comparisons presented with LD, four with intellectual disability, one with ODD, and one with DCD. Average full-scale IQ at the WISC-III of comparisons was 68.5 (SD 15.3), the verbal IQ 78 (SD 12.35), and the performance IQ 71.75 (SD 13.78) (Table 2). At the interview, none of the participants were reported by their parents with snoring or restless leg syndrome, while a subsample of participants was reported with other sleep disturbances (Table 2).

Polysomnographic parameters in children with ADHD compared to controls Tables 3 and 4 report PSG data in the ADHD and non-ADHD group, respectively. Compared to non-ADHD, children with ADHD at baseline had significant increased duration of awakenings from sleep ($p = 0.02$), reduction in sleep efficiency ($p = 0.03$), and increase in the percentage of light sleep—stage I (N1) ($p < 0.01$) and reduction in stage II (N2) ($p = 0.02$) and stages III–IV (N3) ($p = 0.05$), with stability of the duration of the REM phase. Despite the

Table 1 Characteristics of participants

	11 Participants with ADHD	22 Comparisons
Gender	1 F/10 M	10 F/12M
Age, years (mean, SD)	10.3 ± 2.8	10.4 ± 3.3
ADHD subtype	11: Combined type	NA
Subjective sleep items (as reported by parents at standard interview)		
Bad quality of sleep	11	7
Daily sleepiness	0	0
Snoring	0	0
Global movements during sleep	11	7
Early awakening	6	0
Symptoms of restless legs syndrome	0	0
Psychiatric comorbidity		
Oppositional defiant disorder	5	1
Developmental coordination disorder	3 (2 With dysarthria)	1
Specific learning disorders	3	5
Intellectual disability	4	4
Functional epileptic abnormalities	4	12
Disturbance of consciousness of uncertain origin	0	10

M males, *F* females, *NA* not applicable

increase in duration of awakenings during sleep, we did not observe any significant between-group difference in the number of awakenings lasting more than 8 min. Children with ADHD also showed a significant increase in global movements not causing any change in the sleep phase ($p = 0.02$) as well as in global movements resulting in a transition from one sleep phase to another or from sleep to wakefulness ($p < 0.01$) (Table 3). All the significant differences observed correspond to large effect sizes (Table 3).

Changes in polysomnographic parameters in children with ADHD at T0 and T1 Details of the results are shown

Table 2 Behavioral and cognitive data

Participants with ADHD[a]	SNAP-IV scores				IQ		
	Inattentive	Hyperactive	Combined	ODD	Total	Verbal	Performance
1	2.77	2.77	2.77	1.75	100	96	104
2	2.7	1.6	2.1	2.33	80	89	76
3	2.55	2.22	2.3		58	46	77
4	3	3	3	3	73	88	85
5	1.5	1.7	1.6	0.3	51	62	51
6	2	1.88	1.94	1.44	64	73	42
7	2.8	2	2.4	1.5	91	103	82
8	2.1	2.2	2	0.4	56	62	61
9	2	1.1	1.55	2	101	99	107
10	2.3	2.6	2.45	2.3	70	73	75
11	2.44	2.1	2.2	0.3	91	97	86
Mean	2.38	2.11	2.21	1.53	75.90	80.72	76.90
SD	0.45	0.55	0.44	0.94	20.10	15.85	20.98
Controls							
Mean	NA	NA	NA	NA	68.5	78	71.75
SD	NA	NA	NA	NA	15.3	12.35	13.75

IQ intellectual quotient, *ODD* oppositional defiant disorder, *SD* standard deviation, *SNAP-IV* Swanson, Nolan, and Pelham questionnaire

[a] Number refers to each of the 11 participants

Table 3 Sleep parameters in children with ADHD at baseline ("T0")

Participants with ADHD[a]	Age	Total sleep (min)	Wakings from sleep (min)	Sleep latency (min)	Effective sleep (min)	Sleep efficiency (%)	N1 (%)	N2 (%)	N3 (%)	REM (%)	REM latency (min)	*N* REM episodes	*N* wakings <8 min	GM−	GM+
1	10	593	94	24	499	84.1	23.2	42.9	15.8	17.8	224.0	4	0	33	24
2	10	553	131	11	422	76.3	20.4	40.5	15.2	20.1	179.0	3	5	17	23
3	15.5	503	99	7	404	80.3	15.6	45.0	23.5	15.6	171.0	2	1	19	16
4	9.5	615	41	15	574	93.3	10.8	52.4	18.0	20.4	157.0	5	1	18	14
5	15.5	488	64	53	424	86.9	34.0	37.5	11.3	17.4	57.0	5	2	19	33
6	9	604	50	25	554	91.7	16.9	55.6	10.1	17.5	246.0	4	2	31	21
7	9	530	51	50	479	90.4	5.2	48.0	20.0	22.5	193.0	5	0	25	21
8	6	562	94	7	468	83.3	17.7	35.9	23.9	22.0	210.0	5	2	20	28
9	14	576	33	30	543	94.2	7.6	49.9	14.5	24.9	119.0	6	0	71	20
10	6.5	460	13	30	447	97.1	16.3	45.0	21.0	17.9	150.0	4	0	32	19
11	9	572	22	33	539	94.2	24.7	33.7	17.2	27.1	98.0	5	0	47	31
Mean	10.4	550.55	62.91	25.91	486.64	88.35	17.49	44.22	17.32	20.29	164.00	4.36	1.18	30.18	22.73
SD	3.3	49.85	37.04	15.68	59.29	6.64	8.16	6.96	4.54	3.54	56.24	1.12	1.54	16.32	5.93
Significance	NS	NS	*p = 0.02*	NS	NS	*p = 0.03*	*p = 0.001*	*p = 0.02*	*p* = 0.05	NS	NS	NS	NS	*p = 0.02*	*p < 0.01*
Effect size	0.03 (−0.6, 0.76)	0.05 (−0.68, 0.77)	*0.87 (0.11, 1.63)*	0.36 (−0.37, 1.08)	−0.43 (−1.17, 0.3)	*−0.81 (−1.56, −0.06)*	*1.62 (0.79, 2.46)*	*−0.84 (−1.60, −0.09)*	*−0.71 (−1.45, 0.04)*	−0.04 (−0.77, 0.68)	0.12 (−0.61, 0.84)	0.4 (−0.33, 1.13)	−0.05 (−0.78, 0.67)	*0.83 (0.08, 1.59)*	*2.15 (1.24, 3.06)*

Significance and effect sizes refer to the comparison between children with and without ADHD. Significant values are indicated in italics

NS not significant, *SD* standard deviation, *GM−* global movements without change of sleep stage, *GM+* global movements causing an awakening or a change in sleep stage, *N1* sleep stage I, *N2* sleep stage II, *N3* sleep stages III–IV, *REM* rapid eye movement

[a] Number refers to each of the 11 participants

Table 4 Sleep parameters in children without ADHD at baseline ("T0")

Comparisons[a]	Age	Total sleep (min)	Wakings from sleep (min)	Sleep latency (min)	Effective sleep (min)	Sleep efficiency (%)	N1 (%)	N2 (%)	N3 (%)	REM (%)	REM latency (min)	*N* REM episodes	*N* wakings <8 min	GM−	GM+
1	14	517	79	36	438	84.7	1.2	60.5	12.7	16.8	222.0	4	3	0	0
2	10	471	0	39	471	100.0	0.8	52.2	23.6	23.3	171.0	4	0	0	0
3	14	454	29	7	425	93.6	6.6	47.3	25.6	20.5	155.0	2	1	10	1
4	7	594	16	23	578	97.3	22.8	48.1	16.3	11.1	234.0	4	0	27	17
5	6	585	21	12	564	96.4	3.2	38.5	28.2	27.5	201.0	4	1	24	12
6	8	587	28	10	559	95.2	8.7	62.5	15.9	14.1	212	3	2	9	12
7	14.5	506	26	4	480	94.8	9.8	44.4	18.8	26.5	73.0	3	0	21	18
8	6	570	72	24	498	87.4	4.0	51.4	27.0	20.5	139.0	4	3	14	8
9	12	525	14	59	511	97.3	0.8	53.0	23.5	22.7	223.0	4	0	10	5
10	12.5	573	28	4	545	85.1	7.5	49.1	20.9	22.9	109.0	5	0	6	12
11	9.5	485	77	65	408	84.0	6.6	48.0	27.5	15.2	233.0	2	3	10	10
12	9.5	532	12	35	497	93.4	4.0	44.3	35.8	20.3	198.0	3	0	3	7
13	5	506	29	15	477	94.3	10.5	37.5	29.8	22.2	128.0	6	2	11	11
14	13	600	4	11	596	99.3	2.0	63.5	11.3	23.2	152.0	4	0	34	6
15	9	672	105	6	567	84.5	13.4	42.3	20.6	22.1	82	3	7	26	22
16	9	537	29	26	508	94.6	6.5	60.4	22.6	9.6	161.0	1	2	26	4
17	13.5	463	20	20	443	95.7	4.1	55.5	16.3	24.2	66.0	5	1	10	9
18	8	510	41	8	469	92.0	8.8	48.6	19.0	23.6	131.0	4	2	13	15
19	11	611	53	6	558	91.3	13.0	50.0	19.6	17.7	116.0	5	0	22	16
20	10	607	62	7	545	89.8	4.0	59.3	17.8	18.7	133.0	5	1	27	10
21	11.5	564	8	12	556	98.6	1.8	53.2	18.0	24.0	181.0	4	0	41	8
22	12.5	586	20	6	566	96.6	11.8	42.6	18.0	23.9	175	6	0	51	13
Mean	10.3	547.95	35.14	19.77	511.77	93.00	6.90	50.55	21.31	20.48	158.86	3.86	1.27	17.95	9.82
SD	2.8	56.12	27.81	17.41	54.92	5.03	5.30	7.49	5.91	4.70	51.34	1.25	1.70	13.22	5.84

SD standard deviation, *GM−* global movements without change of sleep stage, *GM+* global movements causing an awakening or a change in sleep stage, *N1* sleep stage I, *N2* sleep stage II, *N3* sleep stages III–IV, *REM* rapid eye movement

[a] Number refers to each of the 22 comparison participants

in Table 5. We did not detect any significant change in sleep architecture parameters. No other significant differences were found, including no significant changes in the frequency of epileptiform abnormalities.

Discussion

We compared polysomnographic variables in children with ADHD, before pharmacological treatment, and in children without ADHD; additionally, we assessed changes in polysomnographic parameters in children with ADHD after the 6-month treatment with MPH immediate-release.

We note that the average total IQ of children with ADHD was 75.90, thus below the lower limit of normal IQ. This may reflect, on the one hand, the inclusion of four participants with intellectual disability and, on the other hand, the well-known impact of ADHD on intelligence tests [2]. It is important to appreciate that ADHD is a valid diagnosis in the presence of intellectual disability [2]. As previously mentioned, we did not select our subjects based on their IQ. Therefore, we are confident that our children are representative of a typical clinical population of ADHD seen in tertiary level neuropsychiatric centers. Of note, we deemed important to match the control participants on IQ, so that our results are not biased by sub-average IQ of children with ADHD.

We also note that the majority of children with ADHD included in our study did not have "pure" ADHD; rather, they presented with other neuropsychiatric disorders. If this makes our findings not fully comparable with those of other studies that included only children with ADHD without comorbidities (e.g., [16]), it has the advantage to refer to a more naturalistic sample, thus making our conclusions more relevant for the day-to-day clinical practice. In addition, comparison subjects, rather than being healthy/typically developing children, presented with neuropsychiatric problems other than ADHD. This is of relevance since it allowed us to ascertain sleep alterations related to ADHD rather than to comorbid neuropsychiatric conditions.

Comparison between children with ADHD and controls

We found a significant increase in global movements along with a significant increase in duration of wakings from sleep, a decrease in the duration of stages III and IV, and an increase in duration of stage I. Of note, based on information gathered from parents and clinical assessment, global movements were not part of a specific syndrome such as rhythmic movement disorder, restless leg syndrome, or respiratory disorders like hypo-apnea. A possible explanation that may account for all the aforementioned findings is that global movements in sleep may contribute to keep the sleep in light stages, leading to a reduction in the percentage of deep sleep. Therefore, our

Table 5 Sleep parameters in children with ADHD at T1 and comparison of sleep parameters between T0 and T1

Participants with ADHD[a]	Age	Total sleep (min)	Waking in sleep (min)	Sleep latency (min)	Effective sleep (min)	Efficiency (%)	N1 (%)	N2 (%)	N3 (%)	REM (%)	REM latency	*N* REM episodes	*N* wakings <8 min	GM–	GM+
2	11.5	575	152	18	423	73.5	9	49	15.1	22.7	186	7	6	19	20
3	14	512	18	32	484	94.5	5.6	55.8	21.5	17	166	4	0	22	18
4	10	580	18	34	562	96.9	2.9	56.8	13.2	27.1	134	4	0	26	8
6	10	504	21	7	483	95.8	6	60.5	10.6	22.7	103	5	0	59	29
8	6.5	548	52	17	496	90.5	25.8	38.9	16.5	18.6	147	4	3	44	22
9	14	550	21	62	529	96	9.8	55.2	14	21	75	5	0	43	21
11	9	593	38	7	555	93.6	21.3	30.2	17.4	24.8	63	6	0	37	29
Mean	10.7	551.71	45.71	25.29	504.57	91.54	11.48	49.48	15.46	21.98	124.86	5	1.29	35.71	21
SD	2.7	33.95	48.57	19.41	48.4	8.23	8.66	11.04	3.48	3.46	46.18	1.15	2.36	14.3	7.16
Significance	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	$p = 0.05$	NS	NS	NS	NS
Effect size	0.10 (−0.85, 1.05)	0.03 (−0.92, 0.97)	−0.37 (−1.32, 0.59)	−0.03 (−0.98, 0.92)	0.32 (−0.63, 1.28)	0.4 (−0.56, 1.35)	−0.68 (−1.66, 0.30)	0.52 (−0.45, 1.48)	−0.45 (−1.42, 0.51)	0.46 (−0.50, 1.42)	−0.74 (−1.73, 0.24)	0.54 (−0.43. 1.50)	0.05 (−0.9, 1)	0.35 (−0.61, 1.31)	−0.24 (−1.20, 0.71)

Significance and effect sizes refer to the comparison of sleep parameters in children with ADHD between "T0" and "T1"

NS not significant, *SD* standard deviation, *GM–* global movements without change of sleep stage, *GM+* global movements causing an awakening or a change in sleep stage, *N1* sleep stage I, *N2* sleep stage II, *N3* sleep stages III–IV, *REM* rapid eye movement

[a] Refers to the ID of participants with ADHD who completed T1 study phase

results lend support to the hypothesis that the pathophysiology underlying ADHD, at least in a subset of cases, includes a disorder of movement and arousal. This is in agreement with the results of a study of sleep micro-architecture in children [22], reporting greater frequency of cyclic alternating pattern (CAP) types A2 and A3 (sensitive indicator of sleep fragmentation) in children with ADHD compared to controls.

We note that the findings of a significant reduction of sleep efficiency with no substantial changes in sleep onset latency as well as in REM latency and duration are consistent with the conclusions of the most updated meta-analysis of objective sleep parameters in children with ADHD [9]. On the other hand, the alterations that we found in duration of stages I, II, and III–IV were not reported in this meta-analysis. This may be accounted for by the profile of neuropsychiatric comorbidities in our sample.

Changes in sleep parameters after 6-month treatment with MPH in children with ADHD

We first note the relatively low percentage of children with ADHD treated with psychostimulants (more specifically MPH) in relation to figures reported in other countries, in particular North America [26]. This reflects a complex series of cultural and historical factors that contribute to low rates of children treated with psychostimulants in Italy.

The effect of ADHD pharmacological treatments, including MPH, on sleep is complex, as pointed out by Stein et al. [29], and is likely to be moderated by the type of medication, regimen, schedule, and duration of treatment.

Empirical evidence from studies based on questionnaires (usually filled out by parents), summarized by Cortese et al., [8] shows that insomnia is more frequent in children treated with MPH immediate-release versus those on placebo. However, since available studies lasted, on average, only 3 weeks, evidence on possible attenuation of insomnia with time, which is reported in clinical practice, could not be assessed in these studies. Moreover, extant studies are rather heterogeneous in terms of dose-scheduling protocols (e.g., inclusion of a dose of medication in the early evening), which is relevant, since, in some individuals, sleep disturbance may be related to a rebound effect rather than to medication per se [20]. In addition, MPH has been reported to improve some sleep-related disturbances, such as bed-wetting and sleepwalking [20].

A few studies have also assessed the sleep effects of ADHD drugs by means of objective techniques such as PSG. In a study in which children with ADHD were randomly assigned to an on- or 48-h off-MPH protocol, Galland et al. [12] concluded that MPH reduced sleep quantity but did not alter sleep architecture. In a 6-week, prospective, open-label trial, Kim et al. [16] reported that OROS MPH led to increased percentage of stage 2 sleep and decreased number of awakenings. In a 7-week study comparing the sleep effects of MPH and atomoxetine, Sangal et al. [27] found that children receiving twice-daily atomoxetine presented with shorter sleep onset latencies, compared to MPH thrice-daily, and, although both drugs decreased nighttime awakenings, MPH was associated with a significantly greater decrease.

Our study extends these findings providing, for the first time, data on the long-term (>12 weeks, defined as in Maia et al. [21]) effects of MPH treatment on sleep architecture. Overall, we did not find any negative effects of MPH on sleep, which is of relevance considering the concerns around adverse effects of ADHD drugs. Actually, MPH led to an increase in stage II duration, which replicates the finding by Kim et al. [16], and decreased REM latency, although these changes were not statistically significant. Of note, there was no change in sleep onset latency. Parents of children with ADHD quite often report increased sleep onset difficulties during the first days/weeks of treatment with MPH. This might be accounted for by either direct effect of MPH or rebound effects. However, our finding points overall to a lack of significant direct longer-term effects on sleep latency as shown by objective assessment.

Since we assessed children treated with one (8 a.m.) or two doses (8 a.m. and 2 p.m.) of MPH immediate-release, we cannot exclude that MPH given in the evening/night would negatively impact on sleep architecture. However, since there is evidence, from subjective studies [29], that a third late afternoon dose of MPH immediate-release does not disrupt sleep in the majority of children with ADHD, the impact of late doses of MPH on objective sleep parameters warrants further investigation. We also found no significant changes in the frequency of epileptiform abnormalities after treatment, in line with available evidence [10].

Our results should be considered in the light of study limitations and strengths. One limitation is the study design (open label). This is an exploratory study, with no control group for the effects of MPH. However, while randomized controlled trials would be necessary to assess the effects of MPH in a rigorous way, long-term RCTs with MPH cannot be conducted for ethical constraints given the well-established efficacy and effectiveness of MPH in the day-to-day clinical practice. An option would have been to include a waiting list or a group of children for which parents do not wish pharmacological reasons; however, this would have introduced clear selection bias. Another limitation relates to the sample size. This is in part due to the limited number of children who are diagnosed with ADHD in Italy, where only children with severe ADHD are diagnosed and treated. Therefore, while the limited number of subjects may be considered a limitation, it also made it unlikely that our subjects presented with subthreshold forms of ADHD, which may be a confound in other studies where more liberal thresholds for the diagnosis of ADHD are used. Finally, the study focused on objective sleep measures and did

not include standardized subjective sleep measures. Study strengths are represented by use of state-of-the-art tools to diagnose ADHD and objective assessment of sleep, rather than relying only on subjective reports of sleep by parents, which may be hampered by recall bias or incomplete awareness of sleep disturbances in children. We also note that study participants presented with a wide age range. Since only 9 % of the ADHD group was female ($n = 1$) versus 45 % in the comparison group ($n = 10$), the wide age range of our participants may lead to bias since the onset of puberty is associated with changes in sleep functioning and girls enter puberty before boys [5].

Conclusions

This pilot study is the first to report on the long-term (>12 weeks) effects of MPH immediate-release, once or twice daily, on sleep architecture assessed by means of PSG. While, compared to children without ADHD, children with ADHD not yet pharmacologically treated with MPH presented with a more fragmented and less effective sleep, the 6-month treatment with MPH immediate-release did not negatively impact on sleep architecture and continuity. This should be further explored in larger studies.

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Authors' contribution Piernanda Vigliano: conception and design of the study, data collection, critically revising the manuscript

Giovanni Battista Galloni: data collection, critically revising the manuscript

Irene Bagnasco: data collection, critically revising the manuscript

Giuliana Delia: data collection, critically revising the manuscript

Alessandra Moletto: data collection, critically revising the manuscript

Mauro Mana: data collection, critically revising the manuscript.

Samuele Cortese: critically revising the study design, drafting the manuscript, critically revising the manuscript

Compliance with ethical standards

Conflict of interests Dr. Cortese received financial support to attend medical meetings from Eli Lilly and Company (2007–9) and Shire Pharmaceuticals (2009–10) and was a coinvestigator in studies sponsored by GlaxoSmithKline (2006), Eli Lilly and Company (2007–8), and Genopharm (2008). He served as a consultant for Shire Pharmaceuticals (2009–10). He received royalties from Argon Healthcare Italy (2010–2012). Dr. Cortese has no current relationships with pharmaceutical companies. No other conflicts of interest were reported by any of the other coauthors.

Research involving human participants/informed consent All procedures performed were in accordance with the ethical standards of the study institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This was a retrospective study. For this type of study formal consent is not required.

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