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Sleep Med Rev. 2015.

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SAVE THE DATE

Congresso ADHD

PERCORSI DIAGNOSTICO-TERAPEUTICI CONDIVISI PER L'ADHD

UNA RISPOSTA ALLE CRITICITÀ E AI BISOGNI INEVASIE.

IRCCS Istituto di Ricerche Farmacologiche Mario Negri

Milano, 9-10 novembre 2015

PROGRAMMA IN VIA DI DEFINIZIONE

BIBLIOGRAFIA ADHD LUGLIO 2015

Acad Pediatr. 2015;15:439-43.

EXAMINING TRENDS AND COEXISTING CONDITIONS AMONG CHILDREN QUALIFYING FOR SSI UNDER ADHD, ASD, AND ID.

Pulcini CD, Perrin JM, Houtrow AJ, et al.

Objective To examine the prevalence trends and coexisting conditions in attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), and intellectual disability (ID) in the pediatric Supplemental Security Income (SSI) population and general population.

Methods The Social Security Administration (SSA) provided data on primary and secondary diagnoses of children qualifying for SSI for years 2000 to 2011. We compared SSA data with 2000-2011 National Health Interview Survey data on the prevalence of mental health diagnoses among children in the general population living between 0 and 199% of the federal poverty line. We utilized linear regression analysis to test the statistical significance of differences in the trends of the conditions' prevalence.

Results Over this time period, the SSI population experienced increases in ADHD (5.8%) and ASD (7.2%) and a decrease in ID (-10.3%). Comparison with change in the general population indicated no significant difference in ADHD but significant differences in ASD and ID. Relative percentage changes reflect similar changes. The SSI population qualifying for SSI with ADHD (70.8%) had higher rates of coexisting conditions than the general population (66.1%), but lower rates of coexisting conditions for ASD and ID.

Conclusions ADHD is on the rise among children receiving SSI and in the general population. This suggests that the rise of ADHD in the SSI population is expected and does not represent a misallocation of resources. Changes described among the SSI population in ASD and ID may allude to diagnostic/coding trends and/or true changes in prevalence. Limitations arise from the comparability of the 2 data sets

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

Acta Paediatr Int J Paediatr. 2015.

POLYMORPHISMS IN THE FK506 BINDING PROTEIN 5 GENE ARE ASSOCIATED WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND DIURNAL CORTISOL LEVELS.

Isaksson J, Allen M, Nilsson KW, et al.

Aim: Previous studies have shown an association between childhood attention deficit hyperactivity disorder (ADHD) and a down-regulated hypothalamus-pituitary-adrenal axis (HPA axis) with low diurnal cortisol levels. Given the role of the FK506 binding protein 5 (FKBP5) as an important regulator of the negative feedback system of the HPA axis, we set out to investigate possible associations between single nucleotide polymorphisms (SNPs) in FKBP5 in relation to ADHD and diurnal cortisol levels.

Methods: Children with ADHD (n = 81) and healthy comparisons (n = 88) collected saliva four times during a regular school day for radioimmunoassay analysis of cortisol and for genotyping of five SNPs in FKBP5 (rs9296158, rs1360780, rs9470080, rs7748266 and rs9394309).

Results: We found associations between SNP genotypes and ADHD as well as between genotypes and diurnal cortisol levels. One of these SNPs, rs9470080, was significantly associated with both ADHD and lower cortisol levels.

Conclusion: This study contributes to previous findings on a down-regulated HPA axis in children with ADHD by demonstrating an association between ADHD, lower cortisol levels and SNPs of the FKBP5-gene. The relevance of these findings for the development and shaping of ADHD symptoms needs to be approached in larger samples, preferably also taking stress reactivity into consideration

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Acta Psychiatr Scand. 2015;132:39-50.

INTRA-INDIVIDUAL REACTION TIME VARIABILITY BASED ON EX-GAUSSIAN DISTRIBUTION AS A POTENTIAL ENDOPHENOTYPE FOR ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Lin H-Y, Hwang-Gu S-L, Gau SSF.

Objective: Intra-individual variability in reaction time (IIV-RT), defined by standard deviation of RT (RTSD), is considered as an endophenotype for attention-deficit/hyperactivity disorder (ADHD). Ex-Gaussian distributions of RT, rather than RTSD, could better characterize moment-to-moment fluctuations in neuropsychological performance. However, data of response variability based on ex-Gaussian parameters as an endophenotypic candidate for ADHD are lacking.

Method: We assessed 411 adolescents with clinically diagnosed ADHD based on the DSM-IV-TR criteria as probands, 138 unaffected siblings, and 138 healthy controls. The output parameters, mu, sigma, and tau, of an ex-Gaussian RT distribution were derived from the Conners' continuous performance test. Multi-level models controlling for sex, age, comorbidity, and use of methylphenidate were applied.

Results: Compared with unaffected siblings and controls, ADHD probands had elevated sigma value, omissions, commissions, and mean RT. Unaffected siblings formed an intermediate group in-between probands and controls in terms of tau value and RTSD. There was no between-group difference in mu value. Conforming to a context-dependent nature, unaffected siblings still had an intermediate tau value in-between probands and controls across different interstimulus intervals.

Conclusion: Our findings suggest IIV-RT represented by tau may be a potential endophenotype for inquiry into genetic underpinnings of ADHD in the context of heterogeneity

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Applied Neuropsychology: Child. 2015 Jul;4:197-210.

RATES OF EFFORT TEST FAILURE IN CHILDREN WITH ADHD: AN EXPLORATORY STUDY.

Harrison AG, Flaro L, Armstrong I.

The present study assessed performance on symptom validity tests (SVTs) and various cognitive-processing measures to evaluate the impact of having attention-deficit hyperactivity disorder (ADHD) on SVT performance using a clinical sample of 73 children aged 7 to 18 years old who had a previous diagnosis of ADHD. Cognitive impairment associated with ADHD may lead these individuals to perform poorly on what are considered to be relatively easy but boring SVTs. Few clients in this sample returned a

score pattern on the Word Memory Test, Medical Symptom Validity Test, or Nonverbal Medical Symptom Validity Test that would have classified them as having invested poor effort; the Computerized Assessment of Response Bias returned higher rates of failure. In the absence of a lifelong history of severe attention and impulse control problems, and especially where secondary gains exist for obtaining a diagnosis, clinicians should interpret low scores on these SVTs as indicating low effort or noncredible performance as opposed to failure due to the symptoms of ADHD

Arch Dis Child. 2015;100:A219.

MANAGING PARENTAL EXPECTATIONS IN PAEDIATRIC ADHD CLINICS-A NEW MODEL OF CARE.

Perera S, Katangodage D.

Method A Prospective, questionnaire based study of parental expectations of children and adolescents attending a Paediatric ADHD follow up clinic from July 2013-august 2014. Case selection through the hospital appointment system, by parental choice.(clinician blinded). 80 completed forms were evaluated. Clinical details were verified from electronic records at data entry.

Results The age of children and adolescents who attended the clinic ranged from 6-17 years with a mean of 10.90yrs. The M: F ratio was 74:6. The primary diagnoses were ADHD(43.7%), ODD(20%), ASD (5%), CD (5%), LD (5%), Tourette's, anxiety and behaviour problems. Secondary diagnoses were ADHD (25%), ODD (15%), Social Interaction difficulties, insomnia, anxiety and significant mental health problems 56% were satisfied with the ADHD management, 5% had a mixed reaction and 5% not.18.7% did not comment. The rest did not have ADHD. The reasons for satisfaction were as follows 25% happy about overall Mx, 12.5% about the medication response, 5% about symptom improvement.no comment from the rest. Reasons for non-satisfaction were lack of CAMHS support, lack of educational support, no improvement of symptoms.

Conclusion The model of care based on parental expectations should provide a quick and easy approach to manage the next consultations effectively by focusing on reasons for satisfactions and not during the previous. A larger study awaits. (Table Presented)

Behav Brain Res. 2015;292:484-92.

ATTENTION DEFICIT HYPERACTIVITY DISORDER AND DEVELOPMENTAL COORDINATION DISORDER: TWO SEPARATE DISORDERS OR DO THEY SHARE A COMMON ETIOLOGY.

Goulardins JB, Rigoli D, Licari M, et al.

Attention deficit hyperactivity disorder (ADHD) has been described as the most prevalent behavioral disorder in children. Developmental coordination disorder (DCD) is one of the most prevalent childhood movement disorders. The overlap between the two conditions is estimated to be around 50%, with both substantially interfering with functioning and development, and leading to poorer psychosocial outcomes. This review provides an overview of the relationship between ADHD and DCD, discussing the common presenting features, etiology, neural basis, as well as associated deficits in motor functioning, attention and executive functioning. It is currently unclear which specific motor and cognitive difficulties are intrinsic to each disorder as many studies of ADHD have not been screened for DCD and vice-versa. The evidence supporting common brain underpinnings is still very limited, but studies using well defined samples have pointed to non-shared underpinnings for ADHD and DCD. The current paper suggests that ADHD and DCD are separate disorders that may require different treatment approaches

Biol Psychiatry. 2015;78:107-15.

THE SPEED OF VISUAL ATTENTION AND MOTOR-RESPONSE DECISIONS IN ADULT ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Cross-Villasana F, Finke K, Hennig-Fast K, et al.

Background Adults with attention-deficit/hyperactivity disorder (ADHD) exhibit slowed reaction times (RTs) in various attention tasks. The exact origins of this slowing, however, have not been established. Potential candidates are early sensory processes mediating the deployment of focal attention, stimulus response translation processes deciding upon the appropriate motor response, and motor processes generating the response.

Methods We combined mental chronometry (RT) measures of adult ADHD (n = 15) and healthy control (n = 15) participants with their lateralized event-related potentials during the performance of a visual search task to differentiate potential sources of slowing at separable levels of processing: the posterior contralateral negativity (PCN) was used to index focal-attentional selection times, while the lateralized readiness potentials synchronized to stimulus and response events were used to index the times taken for response selection and production, respectively. To assess the clinical relevance of event-related potentials, a correlation analysis between neural measures and subjective current and retrospective ADHD symptom ratings was performed.

Results ADHD patients exhibited slower RTs than control participants, which were accompanied by prolonged PCN and lateralized readiness potentials synchronized to stimulus, but not lateralized readiness potentials synchronized to response events, latencies. Moreover, the PCN timing was positively correlated with ADHD symptom ratings.

Conclusions The behavioral RT slowing of adult ADHD patients was based on a summation of internal processing delays arising at perceptual and response selection stages; motor response production, by contrast, was not impaired. The correlation between PCN times and ADHD symptom ratings suggests that this brain signal may serve as a potential candidate for a neurocognitive endophenotype of ADHD

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Biol Psychol. 2015;110:12-23.

REDUCED INTRASUBJECT VARIABILITY WITH REINFORCEMENT IN BOYS, BUT NOT GIRLS, WITH ADHD: ASSOCIATIONS WITH PREFRONTAL ANATOMY.

Rosch KS, Dirlikov B, Mostofsky SH.

This study examined the impact of motivational contingencies (reinforcement and punishment) on go/no-go (GNG) task performance in girls and boys with ADHD relative to typically developing (TD) children and associations with prefrontal anatomy. Children ages 8-12 with ADHD (n= 107, 36 girls) and TD controls (n= 95, 34 girls) completed a standard and a motivational GNG task and associations with prefrontal cortex (PFC) surface area were examined. Intrasubject variability (ISV) was lower during the motivational compared to the standard GNG among TD girls and boys, and boys with ADHD, but not among girls with ADHD. A greater reduction in ISV was associated with greater PFC surface area among children with ADHD. This novel demonstration of improvement in ISV with motivational contingencies for boys, but not girls, with ADHD and associations with PFC anatomy informs our understanding of sex differences and motivational factors contributing to ISV in children with ADHD

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BMJ. 2015;350:h1961.

AUTISM PHENOTYPE VERSUS REGISTERED DIAGNOSIS IN SWEDISH CHILDREN: PREVALENCE TRENDS OVER 10 YEARS IN GENERAL POPULATION SAMPLES.

Lundstrom S, Reichenberg A, Anckarsater H, et al.

OBJECTIVE: To compare the annual prevalence of the autism symptom phenotype and of registered diagnoses for autism spectrum disorder during a 10 year period in children.

DESIGN: Population based study.

SETTING: Child and Adolescent Twin Study and national patient register, Sweden.

PARTICIPANTS: 19, 993 twins (190 with autism spectrum disorder) and all children (n=1,078,975; 4620 with autism spectrum disorder) born in Sweden over a 10 year period from 1993 to 2002.

MAIN OUTCOME MEASURES: Annual prevalence of the autism symptom phenotype (that is, symptoms on which the diagnostic criteria are based) assessed by a validated parental telephone interview (the Autism-Tics, ADHD and other Comorbidities inventory), and annual prevalence of reported diagnoses of autism spectrum disorder in the national patient register.

RESULTS: The annual prevalence of the autism symptom phenotype was stable during the 10 year period ($P=0.87$ for linear time trend). In contrast, there was a monotonic significant increase in prevalence of registered diagnoses of autism spectrum disorder in the national patient register ($P<0.001$ for linear trend).

CONCLUSIONS: The prevalence of the autism symptom phenotype has remained stable in children in Sweden while the official prevalence for registered, clinically diagnosed, autism spectrum disorder has increased substantially. This suggests that administrative changes, affecting the registered prevalence, rather than secular factors affecting the pathogenesis, are important for the increase in reported prevalence of autism spectrum disorder

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BMJ. 2015;350:h1234.

UNIVERSITY OF TORONTO IS CRITICISED FOR STUDY OF HOMEOPATHY IN ADHD.

Dyer O.

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BMJ. 2015;350:h1094.

ADHD IS A RISK FACTOR FOR PREMATURE DEATH, DANISH STUDY SHOWS.

Young J.

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Brain Cogn. 2015;99:1-7.

NEURAL DYSFUNCTION IN ADHD WITH READING DISABILITY DURING A WORD RHYMING CONTINUOUS PERFORMANCE TASK.

Mohl B, Ofen N, Jones LL, et al.

Background: Attention-Deficit/Hyperactivity Disorder (ADHD) is a heterogeneous, neurodevelopmental disorder which co-occurs often with Reading Disability (RD). ADHD with and without RD consistently have higher inattentive ratings compared with typically developing controls, with co-occurring ADHD and RD also demonstrating impaired phonological processing. Accordingly, inattention has been associated with greater phonological impairment, though the neural correlates of the association are poorly understood from a functional neuroimaging perspective. It was postulated that only the co-occurring subgroup would demonstrate hypoactivation of posterior, left hemispheric, reading-related areas and, to a lesser extent, alterations in right hemispheric, attention areas compared with controls.

Methods: A novel word rhyming Continuous Performance Task assesses functional activation differences in phonology- and attention-related areas between three groups: ten boys with ADHD and RD, fourteen boys with ADHD without RD, and fourteen typically developing controls. Subjects respond to words that rhyme with a target word as mono- and disyllabic, English words are visually presented over 90. s blocks.

Results: Behavioral performance was not different between groups. Some hypoactivation of left hemispheric, reading-related areas was apparent in ADHD and RD, but not ADHD without RD, compared with controls. Right hemispheric, attention areas showed alterations in both ADHD subgroups relative to controls; however, the differences for each subgroup were dissimilar.

Conclusions: The dorsal decoding subnetwork may not be grossly compromised in ADHD with Reading Disability. The role of cognitive impairments, including the level of inattention, on phonology requires clarification from a neuroimaging perspective

Brain Imaging Behav. 2015.

A PRELIMINARY STUDY OF THE EFFECTS OF WORKING MEMORY TRAINING ON BRAIN FUNCTION.

Stevens MC, Gaynor A, Bessette KL, et al.

Working memory (WM) training improves WM ability in Attention-Deficit/Hyperactivity Disorder (ADHD), but its efficacy for non-cognitive ADHD impairments ADHD has been sharply debated. The purpose of this preliminary study was to characterize WM training-related changes in ADHD brain function and see if they were linked to clinical improvement. We examined 18 adolescents diagnosed with DSM-IV Combined-subtype ADHD before and after 25 sessions of WM training using a frequently employed approach (CogmedΓäó) using a nonverbal Sternberg WM fMRI task, neuropsychological tests, and participant- and parent-reports of ADHD symptom severity and associated functional impairment. Whole brain SPM8 analyses identified ADHD activation deficits compared to 18 non-ADHD control participants, then tested whether impaired ADHD frontoparietal brain activation would increase following WM training. Post hoc tests examined the relationships between neural changes and neurocognitive or clinical improvements. As predicted, WM training increased WM performance, ADHD clinical functioning, and WM-related ADHD brain activity in several frontal, parietal and temporal lobe regions. Increased left inferior frontal sulcus region activity was seen in all Encoding, Maintenance, and Retrieval Sternberg task phases. ADHD symptom severity improvements were most often positively correlated with activation gains in brain regions known to be engaged for WM-related executive processing; improvement of different symptom types had different neural correlates. The responsiveness of both amodal WM frontoparietal circuits and executive process-specific WM brain regions was altered by WM training. The latter might represent a promising, relatively unexplored treatment target for researchers seeking to optimize clinical response in ongoing ADHD WM training development efforts

Brain Injury. 2014;28:1461-72.

TRAUMATIC BRAIN INJURY-RELATED ATTENTION DEFICITS: TREATMENT OUTCOMES WITH LISDEXAMFETAMINE DIMESYLATE (VYVANSE).

Tramontana MG, Cowan RL, Zald D, et al.

Background and objectives: Attention deficits are often among the most persistent and debilitating impairments resulting from traumatic brain injury (TBI). This study examined the effects of lisdexamfetamine dimesylate (Vyvanse) in treating attention deficits due to moderate-to-severe TBI. It was the first study of lisdexamfetamine dimesylate with this population and, in fact, was the first controlled trial in this area examining a stimulant medication option other than methylphenidate

Methods: This was a 12-week, randomized, double-blind, placebo-controlled, cross-over trial. A total of 22 rigorously selected cases were enrolled, 13 of whom completed the trial. They were 16-42 years of age and had newly acquired attention deficits persisting for 6-34 months post-injury. They were assessed on a broad range of neuropsychological and behavioural measures at baseline, 6-weeks and at 12-weeks

Results and conclusions: Positive treatment effects were found involving selective measures of sustained attention, working memory, response speed stability and endurance and in aspects of executive functioning. No major problems with safety or tolerability were observed. Some moderating treatment effects were found from a broad range of pre-treatment subject characteristics and injury variables examined. Avenues for further research and treatment applications in this area are discussed

Brain Topogr. 2015;28:580-90.

A MATTER OF TIME: THE INFLUENCE OF RECORDING CONTEXT ON EEG SPECTRAL POWER IN ADOLESCENTS AND YOUNG ADULTS WITH ADHD.

Kitsune GL, Cheung CHM, Brandeis D, et al.

Elevated theta or theta/beta ratio is often reported in attention deficit hyperactivity disorder (ADHD), but the consistency across studies and the relation to hypoarousal are increasingly questioned. Reports of elevated delta related to maturational lag and of attenuated beta activity are less well replicated. Some critical inconsistencies could relate to differences in recording context. We examined if resting-state EEG power or global field synchronization (GFS) differed between recordings made at the beginning and end of a 1.5-hr testing session in 76 adolescents and young adults with ADHD, and 85 controls. In addition, we aimed to examine the effect of IQ on any potential group differences. Both regional and midline electrodes yielded group main effects for delta, trends in theta, but no differences in alpha or theta/beta ratio. An additional group difference in beta was detected when using regions. Group by time interactions in delta and theta became significant when controlling for IQ. The ADHD group had higher delta and theta power at time-1, but not at time-2, whereas beta power was elevated only at time-2. GFS did not differ between groups or condition. We show some ADHD-control differences on EEG spectral power varied with recording time within a single recording session, with both IQ and electrode selection having a small but significant influence on observed differences. Our findings demonstrate the effect of recording context on resting-state EEG, and highlight the importance of accounting for these variables to ensure consistency of results in future studies

Cereb Cortex. 2015;25:1757-70.

INVERSE EFFECT OF FLUOXETINE ON MEDIAL PREFRONTAL CORTX ACTIVATION DURING REWARD REVERSAL IN ADHD AND AUTISM.

Chantiluke K, Barrett N, Giampietro V, et al.

Attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) share brain function abnormalities during cognitive flexibility. Serotonin is involved in both disorders, and selective serotonin reuptake inhibitors (SSRIs) can modulate cognitive flexibility and improve behavior in both disorders. Thus, this study investigates shared and disorder-specific brain dysfunctions in these 2 disorders during reward reversal, and the acute effects of an SSRI on these. Age-matched boys with ADHD (15), ASD (18), and controls (21) were compared with functional magnetic resonance imaging (fMRI) during a reversal task. Patients were scanned twice, under either an acute dose of Fluoxetine or placebo in a double-blind, placebo-controlled randomized design. Repeated-measures analyses within patients assessed drug effects. Patients under each drug condition were compared with controls to assess normalization effects. fMRI data showed that, under placebo, ASD boys underactivated medial prefrontal cortex (mPFC), compared with control and ADHD boys. Both patient groups shared decreased precuneus activation. Under Fluoxetine, mPFC activation was up-regulated and normalized in ASD boys relative to controls, but down-regulated in ADHD boys relative to placebo, which was concomitant with worse task performance in ADHD. Fluoxetine therefore has inverse effects on mPFC activation in ASD and ADHD during reversal learning, suggesting dissociated underlying serotonin abnormalities

Child Neuropsychol. 2015.

NEUROPSYCHOLOGICAL DEFICITS IN PRESCHOOL AS PREDICTORS OF ADHD SYMPTOMS AND ACADEMIC ACHIEVEMENT IN LATE ADOLESCENCE.

Sjöwall D, Bohlin G, Rydell AM, Thorell LB.

High levels of ADHD symptoms are related to severe negative outcomes, which underscore the importance of identifying early markers of these behavior problems. The main aim of the present study was therefore to investigate whether neuropsychological deficits in preschool are related to later ADHD symptoms and academic achievement, over and above the influence of early ADHD symptom levels. The present study is

unique because it includes a broader range of predictors compared to previous studies and the participants are followed over time for as long as 13-áyears (i.e., ages 5ÏÇô18 years). Preschool data included measures of executive functioning and reaction time variability as well as emotional reactivity and emotion regulation of both positive and negative emotions. When controlling for early ADHD symptom levels, working memory, reaction time variability, and regulation of happiness/exuberance were significantly related to inattention whereas regulation of happiness/exuberance and anger reactivity were significantly related to hyperactivity/impulsivity. Furthermore, working memory and reaction time variability in preschool were significantly related to academic achievement in late adolescence beyond the influence of early ADHD symptoms. These findings could suggest that it is possible to screen for early neuropsychological deficits and thereby identify children who are at risk of negative outcomes. Furthermore, our results suggest that interventions need to look beyond executive functioning deficits in ADHD and also target the role of emotional functioning and reaction time variability. The importance of including both the positive and negative aspects of emotional functioning and distinguishing between emotion regulation and emotional reactivity was also demonstrated

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Child Neuropsychol. 2015.

DIFFERENCES IN MEMORY FUNCTIONING BETWEEN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND/OR FOCAL EPILEPSY.

Lee SE, Kibby MY, Cohen MJ, et al.

Prior research has shown that attention-deficit/hyperactivity disorder (ADHD) and epilepsy are frequently comorbid and that both disorders are associated with various attention and memory problems. Nonetheless, limited research has been conducted comparing the two disorders in one sample to determine unique versus shared deficits. Hence, we investigated differences in working memory (WM) and short-term and delayed recall between children with ADHD, focal epilepsy of mixed foci, comorbid ADHD/epilepsy and controls. Participants were compared on the Core subtests and the Picture Locations subtest of the ChildrenÏÇÖs Memory Scale (CMS). Results indicated that children with ADHD displayed intact verbal WM and long-term memory (LTM), as well as intact performance on most aspects of short-term memory (STM). They performed worse than controls on Numbers Forward and Picture Locations, suggesting problems with focused attention and simple span for visual-spatial material. Conversely, children with epilepsy displayed poor focused attention and STM regardless of the modality assessed, which affected encoding into LTM. The only loss over time was found for passages (Stories). WM was intact. Children with comorbid ADHD/epilepsy displayed focused attention and STM/LTM problems consistent with both disorders, having the lowest scores across the four groups. Hence, focused attention and visual-spatial span appear to be affected in both disorders, whereas additional STM/encoding problems are specific to epilepsy. Children with comorbid ADHD/epilepsy have deficits consistent with both disorders, with slight additive effects. This study suggests that attention and memory testing should be a regular part of the evaluation of children with epilepsy and ADHD

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Child Neuropsychol. 2015.

CONFIRMATORY FACTOR ANALYSIS OF THE BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTIONING (BRIEF) IN CHILDREN AND ADOLESCENTS WITH ADHD.

Lyons Usher AM, Leon SC, Stanford LD, et al.

The Behavior Rating Inventory of Executive Functioning (BRIEF) is a parent report measure designed to assess executive skills in everyday life. The present study employed a confirmatory factor analysis (CFA) to evaluate three alternative models of the factor structure of the BRIEF. Given the executive functioning difficulties that commonly co-occur with attention-deficit/hyperactivity disorder (ADHD), the participants included 181 children and adolescents with a diagnosis of ADHD. The results indicated that an oblique two-factor model, in which the Monitor subscale loaded on both factors (i.e., Behavioral Regulation, Metacognition) and measurement errors for the Monitor and Inhibit subscales were allowed to correlate,

provided an acceptable goodness-of-fit to the data. This two-factor model is consistent with previous research indicating that the Monitor subscale reflects two dimensions (i.e., monitoring of task-related activities and monitoring of personal behavioral activities) and thus loads on multiple factors. These findings support the clinical relevance of the BRIEF in children with ADHD, as well as the multidimensional nature of executive functioning

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Clin Toxicol (Phila). 2015 Jun;53:477-85.

COMPARISON OF LISDEXAMFETAMINE AND DEXTROAMPHETAMINE EXPOSURES REPORTED TO U.S. POISON CENTERS.

Kaland ME, Klein-Schwartz W.

CONTEXT: Lisdexamfetamine is a pro-drug stimulant that requires the enzymatic hydrolysis of lysine from dexamphetamine for pharmacologic effects. There is limited information comparing non-therapeutic lisdexamfetamine and dextroamphetamine exposures.

OBJECTIVE: The objective was to compare lisdexamfetamine exposures with dextroamphetamine/amphetamine extended release and dextroamphetamine/amphetamine immediate release.

METHODS: A retrospective observational case series of single-substance exposures to lisdexamfetamine, dextroamphetamine/amphetamine extended release, or dextroamphetamine/amphetamine immediate release reported to the National Poison Data System from 2007 to 2012 was performed. Data were analyzed for demographics, reason, clinical effects, management site, and outcomes.

RESULTS: There were 23,553 exposures: lisdexamfetamine (7,113), dextroamphetamine/amphetamine extended release (6,245), and dextroamphetamine/amphetamine immediate release (10,195). The most frequent clinical effects observed for lisdexamfetamine, dextroamphetamine/amphetamine extended release, and dextroamphetamine/amphetamine immediate release were agitation (19.8%, 21.7%, and 25.1%, respectively) and tachycardia (19.2%, 22.8%, and 23.9%, respectively). The reason was most often exploratory (93.4%) in children < 6 years and therapeutic error (65.6%) in children aged 6-12 years. In adolescents and adults most common reasons were suicide attempts (28.4%) followed by abuse (19.5%) and therapeutic errors (18.8%). Overall, 61.6% of cases were managed in a health care facility, with the majority treated in the emergency department only. The majority of cases (76.0%) experienced no or minor effects. More serious outcomes (moderate/major/death) occurred in 21.2% of lisdexamfetamine, 24.7% of dextroamphetamine/amphetamine extended release, and 25.5% of dextroamphetamine/amphetamine immediate release. There were 4 deaths (1 dextroamphetamine/amphetamine extended release and 3 dextroamphetamine/amphetamine immediate release). In patients aged 6 years and more, abuse/misuse was more frequently reported for dextroamphetamine/amphetamine immediate release (32.5%) and dextroamphetamine/amphetamine extended release (23.0%) than that for lisdexamfetamine (13.5%). The odds of abuse/misuse was 2.3 (95% confidence interval [CI]: 2.0-2.4) times higher for dextroamphetamine/amphetamine immediate release than that for lisdexamfetamine and dextroamphetamine/amphetamine extended release combined; the odds of dextroamphetamine/amphetamine extended release abuse/misuse was 1.9 (95% CI: 1.7-2.2) times higher than lisdexamfetamine. In 2011, the number of lisdexamfetamine abuse/misuse cases exceeded dextroamphetamine/amphetamine extended release by approximately 26% and plateaued in 2012, but was significantly lower (approximately 75%) than dextroamphetamine/amphetamine immediate release.

CONCLUSIONS: Toxic effects were similar for all three drugs. Although the majority of cases were treated at health care facilities, the majority of patients experienced no effects or minor toxicity. Serious outcomes occurred in approximately 21% of lisdexamfetamine and 25% of dextroamphetamine/amphetamine extended release and dextroamphetamine/amphetamine immediate release. Lisdexamfetamine may have less abuse potential, especially compared with the immediate-release dextroamphetamine/amphetamine formulation

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Clin Toxicol (Phila). 2015 Mar;53:168-77.

METHYLPHENIDATE INTOXICATIONS IN CHILDREN AND ADULTS: EXPOSURE CIRCUMSTANCES AND EVIDENCE-BASED DOSE THRESHOLD FOR PRE-HOSPITAL TRIAGE.

Hondebrink L, Rietjens SJ, Hunault CC, et al.

CONTEXT: Methylphenidate intoxications mostly have a relatively mild course, although serious complications can occur. **OBJECTIVE:** We aimed to characterize methylphenidate exposures and reassess our current dose threshold for hospital referral (2 mg/kg).

METHODS: In a prospective follow-up study, we analysed 364 consecutive methylphenidate exposures that were reported to the Dutch Poisons Information Center. Patients and/or physicians were surveyed by telephone using standardized questionnaires. Three physicians independently scored the observed severity of the intoxication of each patient as 'no/mild' (observation at home) or 'moderate/severe' (hospital referral necessary).

RESULTS: Unintentional exposures (40%) mostly occurred at home involving the patients' own medication or those from a family member. Compared to unintentionally exposed patients, intentionally exposed patients were exposed to relatively high methylphenidate doses (3.1 vs 1.6 mg/kg), more often used immediate release methylphenidate formulations (62 vs 34%) and more frequently had concomitant exposures (71 vs 17%). Severe symptoms like convulsions or coma were reported only in patients with concomitant exposures. Following exposure to methylphenidate only (i.e. no concomitant exposures), the most commonly reported symptoms were dry mucosa, headache, agitation, sleepiness and tachycardia. Our results show that the reported methylphenidate dose is predictive of the observed severity of the intoxication and can therefore aid in pre-hospital triage.

CONCLUSION: We increased our current dose threshold for hospital referral from 2 to 3 mg/kg. In addition, we will refer patients at lower doses when clinical symptoms indicate the need for hospital referral. Application of this new dose threshold optimizes triage, thereby reducing unnecessary hospital referral and thus costs, without jeopardising patient safety

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Clin EEG Neurosci. 2015;46:177-82.

USE OF EEG BETA-1 POWER AND THETA/BETA RATIO OVER BROCA'S AREA TO CONFIRM DIAGNOSIS OF ATTENTION DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN.

Sangal RB, Sangal JM.

The Food and Drug Administration has approved a medical device using the electroencephalogram (EEG) theta/beta ratio (tbr) to help assess pediatric attention deficit/hyperactivity disorder (ADHD). Tbr is reported to be higher in ADHD, with increased theta and decreased beta. This study examined theta and beta-1 power differences between ADHD and normal children, during tasks of selective attention, and elucidated topographical differences. EEGs were collected from 28 normal and 58 ADHD children, aged 6 to 14 years, using 31 scalp electrodes during auditory and visual tasks requiring selective attention. Spectral analysis was performed. Tbr was higher in ADHD than in normal children (2.60 vs 2.25, $P = .007$), with lower beta-1 (3.66 vs 4.22, $P = .01$), but no difference in theta power. There was lower beta-1 ($P < .001$) and higher tbr ($P = .002$) over Broca's area (electrode locations F7 and FC5). Beta-1 power over Broca's area was the best diagnostic test, with sensitivity 0.86 and specificity 0.57. Tbr is higher and beta-1 power lower in ADHD than in normal children, especially over Broca's area. Beta-1 power and tbr assist in confirming the diagnosis of ADHD in a sample with moderate pretest probability of ADHD

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Clinical Journal of Sport Medicine. 2015;25:355-60.

RELATIONSHIP OF ATTENTION DEFICIT HYPERACTIVITY DISORDER AND POSTCONCUSSION RECOVERY IN YOUTH ATHLETES.

Mautner K, Sussman WI, Axtman M, et al.

OBJECTIVE: To investigate whether attention deficit hyperactivity disorder (ADHD) influences postconcussion recovery, as measured by computerized neurocognitive testing.

DESIGN: This is a retrospective case control study.

SETTING: Computer laboratories across 10 high schools in the greater Atlanta, Georgia area.

PARTICIPANTS: Immediate postconcussion assessment and cognitive testing (ImPACT) scores of 70 athletes with a self-reported diagnosis of ADHD and who sustained a sport-related concussion were compared with a randomly selected age-matched control group. Immediate postconcussion assessment and cognitive testing scores over a 5-year interval were reviewed for inclusion.

MAIN OUTCOME MEASURES: Postconcussion recovery was defined as a return to equivalent baseline neurocognitive score on the ImPACT battery, and a concussion symptom score of ≤ 7 .

RESULTS: Athletes with ADHD had on average a longer time to recovery when compared with the control group (16.5 days compared with 13.5 days), although not statistically significant. The number of previous concussions did not have any effect on the rate of recovery in the ADHD or the control group. In addition, baseline neurocognitive testing did not statistically differ between the 2 groups, except in verbal memory.

CONCLUSIONS: Although not statistically significant, youth athletes with ADHD took on average 3 days longer to return to baseline neurocognitive testing compared with a control group without ADHD.

CLINICAL RELEVANCE: Youth athletes with ADHD may have a marginally prolonged recovery as indexed by neurocognitive testing and should be considered when prognosticating time to recovery in this subset of student athletes

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Curr Opin Psychiatry. 2015 Mar;28:91-101.

AN UPDATE ON PHARMACOTHERAPY FOR AUTISM SPECTRUM DISORDER IN CHILDREN AND ADOLESCENTS.

Young NJ, Findling RL.

PURPOSE OF REVIEW: Although there is no known efficacious pharmacotherapy for core symptoms of autism spectrum disorder (ASD), psychotropic medications are commonly prescribed for behavioral/emotional symptoms associated with ASD. We reviewed current evidence-based pharmacotherapy options and updates from recent noteworthy studies.

RECENT FINDINGS: Atypical antipsychotics, particularly risperidone and aripiprazole, are effective in reducing irritability, stereotypy and hyperactivity. Metabolic adverse events, including weight gain and dyslipidemia, are common. Methylphenidate is effective in reducing attention-deficit hyperactivity disorder (ADHD) symptoms. Atomoxetine and alpha-2 agonists appear effective in reducing ADHD symptoms. Selective serotonin reuptake inhibitors are not effective in improving repetitive behaviors in children with ASD, and frequently cause activating adverse events. Efficacy of antiepileptic drugs is inconclusive. Overall, efficacy and tolerability of pharmacotherapy in children with ASD are less favorable than data seen in typically developing children with similar symptoms. Newer agents, including glutamatergic agents and oxytocin, appear promising albeit with mixed results.

SUMMARY: Current evidence-based pharmacotherapy options in children with ASD are very limited, and many have substantial adverse events. Clinicians should use pharmacotherapy as a part of comprehensive treatment, and judiciously weigh risks and benefits. New pharmacotherapy options for core symptoms as well as co-occurring symptoms of ASD are in urgent need

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Curr Opin Psychiatry. 2015 Mar;28:107-12.

TREATMENT OF THE PSYCHIATRIC PROBLEMS ASSOCIATED WITH FRAGILE X SYNDROME.

Hagerman RJ, Polussa J.

PURPOSE OF REVIEW: This work reviews recent research regarding treatment of fragile X syndrome (FXS), the most common inherited cause of intellectual disability and autism spectrum disorder. The

phenotype includes anxiety linked to sensory hyperarousal, hyperactivity, and attentional problems consistent with attention deficit hyperactivity disorder and social deficits leading to autism spectrum disorder in 60% of boys and 25% of girls with FXS.

RECENT FINDINGS: Multiple targeted treatments for FXS have rescued the phenotype of the *fmr1* knockout mouse, but few have been beneficial to patients with FXS. The failure of the metabotropic glutamate receptor 5 antagonists falls on the heels of the failure of Arbaclofen's efficacy in children and adults with autism or FXS. In contrast, efficacy has been demonstrated in a controlled trial of minocycline in children with FXS. Minocycline lowers the abnormally elevated levels of matrix metalloproteinase 9 in FXS. Acamprosate and lovastatin have been beneficial in open-label trials in FXS. The first 5 years of life may be the most efficacious time for intervention when combined with behavioral and/or educational interventions.

SUMMARY: Minocycline, acamprosate, lovastatin, and sertraline are treatments that can be currently prescribed and have shown benefit in children with FXS. Use of combined medical and behavioral interventions will likely be most efficacious for the treatment of FXS

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Dev Cognitive Neurosci. 2015;14:32-37.

GREY MATTER VOLUME DIFFERENCES ASSOCIATED WITH GENDER IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A Voxel-BASED MORPHOMETRY STUDY.

Villemonteix T, De Brito SA, Slama H, et al.

Female participants have been underrepresented in previous structural magnetic resonance imaging reports on attention-deficit/hyperactivity disorder (ADHD). In this study, we used optimized voxel-based morphometry to examine grey matter volumes in a sample of 33 never-medicated children with combined-type ADHD and 27 typically developing (TD) children. We found a gender-by-diagnosis interaction effect in the ventral anterior cingulate cortex (ACC), whereby boys with ADHD exhibited reduced volumes compared with TD boys, while girls with ADHD showed increased volumes when compared with TD girls. Considering the key role played by the ventral ACC in emotional regulation, we discuss the potential contribution of these alterations to gender-specific symptoms' profiles in ADHD

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Dev Cognitive Neurosci. 2015;14:38-49.

FEEDBACK ASSOCIATED WITH EXPECTATION FOR LARGER-REWARD IMPROVES VISUOSPATIAL WORKING MEMORY PERFORMANCES IN CHILDREN WITH ADHD.

Hammer R, Tennekoon M, Cooke GE, et al.

We tested the interactive effect of feedback and reward on visuospatial working memory in children with ADHD. Seventeen boys with ADHD and 17 Normal Control (NC) boys underwent functional magnetic resonance imaging (fMRI) while performing four visuospatial 2-back tasks that required monitoring the spatial location of letters presented on a display. Tasks varied in reward size (large; small) and feedback availability (no-feedback; feedback). While the performance of NC boys was high in all conditions, boys with ADHD exhibited higher performance (similar to those of NC boys) only when they received feedback associated with large-reward. Performance pattern in both groups was mirrored by neural activity in an executive function neural network comprised of few distinct frontal brain regions. Specifically, neural activity in the left and right middle frontal gyri of boys with ADHD became normal-like only when feedback was available, mainly when feedback was associated with large-reward. When feedback was associated with small-reward, or when large-reward was expected but feedback was not available, boys with ADHD exhibited altered neural activity in the medial orbitofrontal cortex and anterior insula. This suggests that contextual support normalizes activity in executive brain regions in children with ADHD, which results in improved working memory

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Dusunen Adam. 2015;28:103-11.

THE INTERACTION BETWEEN ATTENTION DEFICIT HYPERACTIVITY DISORDER AND ANXIETY SYMPTOMS.

Gokce S, Ayaz AB, Arman AR, et al.

Objective: Attention deficit hyperactivity disorder (ADHD) and anxiety disorders are commonly seen in the field of child psychiatry. Childhood ADHD and anxiety disorders are comorbid with an estimated rate of 13% to 50%. In this study, it was aimed to research anxiety symptoms and its relation with ADHD symptoms in children with ADHD.

Method: Fifty children with ADHD and 49 healthy controls (aged 8-15 years) who do not have any psychiatric diagnosis were included in study. We used socio-demographic information form, Conners' Teacher Rating Scale (CTRS), Child Behavior Checklist for 4-18 years (CBCL), The Screen for Child Anxiety Related Emotional Disorders (SCARED) both parent and child report for assessing these children. The diagnosis were made with Kiddie Schedule for Affective Disorders and Schizophrenia Present and Lifetime Version (K-SADS-PL).

Results: The anxiety disorders comorbidity rate was 24% in ADHD group. The total scores of SCARED parent and children reports were higher in ADHD group. SCARED children report scores were higher than SCARED parent report scores in both groups.

Discussion: Our results agree with the previously reported common anxiety comorbidity with ADHD and the association between attention deficit symptoms and anxiety symptoms. In our study, parents reported fewer anxiety symptoms in their children than children's self reports. Clinicians should evaluate anxiety symptoms carefully in children with ADHD that could be unnoticed by their parents. The treatment should be determined according to the comorbidities

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Egypt J Med Hum Genet. 2015.

MAGNESIUM SUPPLEMENTATION IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

El BF, AlShahawi HA, Zahra S, et al.

Background: Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental disorder with associated mineral deficiency. Aim: To assess magnesium level in ADHD children and compare it to the normal levels in children. Then, to detect the effect of magnesium supplementation as an add on therapy, on magnesium deficient patients.

Methods: The study was conducted on 25 patients with ADHD and 25 controls. All subjects had magnesium estimation in serum and hair. ADHD children were further assessed by Wechsler intelligence scale for children, Conners' parent rating scale, and Wisconsin card sorting test. Then magnesium deficient patients were assigned into 2 groups, those who received magnesium, and those who did not. The difference between the studied groups was assessed by Conners' parents rating scale and Wisconsin card sorting test.

Results: Magnesium deficiency was found in 18 (72%) of ADHD children. The magnesium supplemented group improved as regards cognitive functions as measured by the Wisconsin card sorting test and Conners' rating scale. The patients reported minor side effects from magnesium supplementation.

Conclusion: Magnesium supplementation in ADHD, proves its value and safety

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Erciyes Tip Dergisi. 2015;37:48-50.

ANTI-GANGLIOSIDE, ANTI-GLUTAMATE, AND ANTI-GAD ANTIBODY LEVELS IN ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Sevgi Özmen, Esra Demirci, Didem Behice Öztıp, Fatih Kardaş, Selma Gökahmetoğlu, Hüseyin Per

Objective: The etiology of Attention-Deficit Hyperactivite Disorder (ADHD) is still unclear. In the present study, we aimed to demonstrate the relationship among anti-ganglioside antibodies, anti-glutamate receptor antibodies, and anti-glutamic acid decarboxilaz (anti-GAD) antibodies, which are believed to be involved in the etiology of ADHD.

Materials and Methods: The study included 36 children who were diagnosed with ADHD according to DSM IV diagnostic criteria and 21 healthy children as the control group. In all subjects, anti-ganglioside antibodies, anti-glutamate receptor antibodies, and anti-GAD antibodies were studied in the Microbiology Laboratory of Erciyes University, Medical School.

Results: The mean age was 9.34 years in the ADHD group, which consisted of 5 girls and 31 boys. The mean age was 7.8 years in the control group, which consisted of 8 girls and 13 boys. No significant differences were observed in the levels of antiganglioside antibodies, anti-glutamate receptor antibodies, and anti-GAD antibodies between the ADHD and control groups.

Conclusion: Although the etiology is unknown in ADHD, it is believed that autoimmune factors may be involved in the etiopathogenesis according to currently available information. However, there is a need for further studies with larger sample size to clarify the linkage between ADHD and anti-neuronal antibody levels

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Eur Child Adolesc Psychiatry. 2015 Apr;24:365-84.

EXECUTIVE FUNCTION AND ATTENTION IN CHILDREN AND ADOLESCENTS WITH DEPRESSIVE DISORDERS: A SYSTEMATIC REVIEW.

Vilgis V, Silk TJ, Vance A.

Numerous studies have shown that Major Depressive Disorder (MDD) in adults is associated with deficits in cognitive control. Particularly, impairment on executive function (EF) tasks has been observed. Research into EF deficits in children and adolescents with MDD has reported mixed results and it is currently unclear whether paediatric MDD is characterised by impairments in EF and attention. PsycInfo, Scopus and Medline were systematically searched to identify all studies that have investigated EF and attention in paediatric depressive disorders between 1994 and 2014. 33 studies meeting inclusion/exclusion criteria were identified. While across different domains of EF some studies identified a deficit in the clinical group, the majority of studies failed to find deficits in response inhibition, attentional set shifting, selective attention, verbal working memory, and verbal fluency. More research is needed to clarify the relationship between depressive disorders in children and adolescents and spatial working memory processing, sustaining attention, planning, negative attentional bias and measures of 'hot' EF. There is little support for EF deficits in paediatric depression. However, there are numerous methodological problems that may account for null findings. Alternatively, chronicity and/or severity of symptoms may explain discrepancies between cognitive deficits in adult and paediatric MDD. Recommendations for future studies are discussed

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Eur Child Adolesc Psychiatry. 2015.

HOW 'CORE' ARE MOTOR TIMING DIFFICULTIES IN ADHD? A LATENT CLASS COMPARISON OF PURE AND COMORBID ADHD CLASSES.

Van Der Meer JMJ, Hartman CA, Thissen AJAM, et al.

Children with attention-deficit/hyperactivity disorder (ADHD) have motor timing difficulties. This study examined whether affected motor timing accuracy and variability are specific for ADHD, or that comorbidity with autism spectrum disorders (ASD) contributes to these motor timing difficulties. An 80-trial motor timing task measuring accuracy (++) , variability (σ²) and infrequent long response times (σ²) in estimating a 1-s interval was administered to 283 children and adolescents (8-17 years) from both a clinic and population based sample. They were divided into four latent classes based on the SCQ and CPRS-R:L data. These classes were: without behavioral problems (Normal-class) (n = 154), with only ADHD symptoms (ADHD-class) (n = 49), and two classes with both ASD and ADHD symptoms; ADHD(+ASD)-class (n = 39) and ASD(+ADHD)-class (n = 41). The pure ADHD-class did not deviate from the normal class on any of the motor timing measures (mean RTs 916 and 925 ms, respectively). The comorbid ADHD(+ASD) and ASD(+ADHD) classes were significantly less accurate (more time underestimations) compared to the Normal class (mean RTs 847 and 870 ms, respectively). Variability in motor timing was reduced in the younger children in the ADHD(+ASD) class, which may reflect a tendency

to rush the tedious task. Only patients with more severe behavioral symptoms show motor timing deficiencies. This cannot merely be explained by high ADHD severity with ASD playing no role, as ADHD symptom severity in the pure ADHD-class and the ASD(+ADHD) class was highly similar, with the former class showing no motor timing deficits

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Eur Child Adolesc Psychiatry. 2015.

COMORBIDITY AND CORRELATES OF DISRUPTIVE MOOD DYSREGULATION DISORDER IN 6-8 YEAR-OLD CHILDREN WITH ADHD.

Mulraney M, Schilpzand EJ, Hazell P, et al.

This study aimed to characterize the nature and impact of disruptive mood dysregulation disorder (DMDD) in children with attention-deficit/hyperactivity disorder (ADHD) including its co-occurrence with other comorbidities and its independent influence on daily functioning. Children with ADHD (6-8 years) were recruited through 43 Melbourne schools, using a 2-stage screening (parent and teacher Conners 3 ADHD index) and case-confirmation (Diagnostic Interview Schedule for Children, Version IV; [DISC-IV]) procedure. Proxy DMDD diagnosis was confirmed via items from the oppositional defiant disorder (ODD) and major depressive disorder modules of the DISC-IV. Outcome domains included comorbid mental health disorders, academic functioning, social functioning, child and family quality of life, parent mental health, and parenting behaviors. Unadjusted and adjusted linear and logistic regression were used to compare children with comorbid ADHD and DMDD and children with ADHD without DMDD. Thirty-nine out of 179 children (21.8 %) with ADHD had comorbid DMDD. Children with ADHD and DMDD had a high prevalence of ODD (89.7 %) and any anxiety disorder (41.0 %). Children with ADHD and DMDD had poorer self-control and elevated bullying behaviors than children with ADHD without DMDD. Children with ADHD and DMDD were similar to children with ADHD in the other domains measured when taking into account other comorbidities including ODD. One in five children with ADHD in their second year of formal schooling met criteria for DMDD. There was a very high diagnostic overlap with ODD; however, the use of a proxy DMDD diagnosis containing items from the ODD module of the DISC-IV may have artificially inflated the comorbidity rates. DMDD added to the burden of ADHD particularly in the area of social functioning

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Eur Psychiatry. 2015;30:578.

STUDY OF THE STATUS OF MENTAL HEALTH IN MOTHERS WITH PARENTING STYLE IN THE CHILDREN WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER (ADHD).

Derakhshanpoor F, Khaki S, Vakili A, et al.

Introduction: ADHD is most common behavioral disorder that affects children. The family has a very important role in the management of these children. The aim is parenting style and parental mental health status in children with attention deficit and hyperactivity disorder

Methods: This study is a descriptive study and study is ADHD children referred to psychiatric clinics in 5th Azar and Taleghanis hospital. The case group (64 children with ADHD) are based on random sampling. The control group selected of 64 school children in Gorgan based on the multi-stage cluster sampling. The description provided to parents of children then demographic questionnaire, DSM-IV, Bamrynd and GHQ will be provided. After data collection we analyzed Descriptive statistics and Chi-square

Results: 47 male and 17 females were in each group, subscales of physical symptoms, maternal anxiety and depression one the base of GHQ questionnaires was a significant relationship between on ADHD and control groups. This means that maternal ADHD children are more anxious and depressed and have poorer health than the others. GHQ score of the two groups was also significant in the sense that the mother's mental health is impaired ADHD. Authoritative parenting style out of the case and control groups showed no statistically significant difference

Conclusion: The results of this study appear to be the outcomes of the four factors of ADHD, maternal education, GHQ mother and maternal age on the sheer style of ADHD is more effective than the GHQ.

Thus, the second factor that is important for the mental health of families: 1 - treatment ADHD 2. ADHD-level of education

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Eur Psychiatry. 2015;30:1861.

ADHD IN ADULTS: A CHALLENGING DIAGNOSIS.

Durúes D, Gomes J, Borralho R, et al.

Introduction Attention-deficit/hyperactivity disorder (ADHD) has been classically described as a children disorder until the late 1960s. However, research has shown that ADHD is not outgrown and young adults continue to experience problems and disability as they grow old. In addition, ADHD shares important features with Borderline personality disorder (BPD), such as impulsivity, emotional lability and dysregulation, which can make these disorders difficult to distinguish.

Objectives/Aims This work aims to review ADHD's definition, epidemiology, frequent psychiatric comorbidities, differential diagnosis - highlighting its similarities with BPD -, treatment, and outcome. Methods A review of relevant literature was conducted alongside online database research (PubMed and Medscape).

Results ADHD is a neurodevelopmental disorder defined by persistent impairing levels of inattention, motor hyperactivity and impulsivity that exhibit a negative impact in functioning. It is estimated to affect 5% of children and 2.5% of adults. As the affected individual grows it is likely that the symptoms of hyperactivity will decrease, but the inattention, poor planning, and impulsivity tend to persist into adulthood, compromising social, academic, and occupational functioning. It may be difficult to distinguish between ADHD and personality disorders, especially BPD. However, BPD has characteristic features like fear of abandonment, self-injury/suicidal behavior, extreme ambivalence, feelings of emptiness, and stress-related paranoia/severe dissociation, that are not present in ADHD.

Conclusions Despite some similarities in clinical presentation in adolescents and young adults, PHDA and BPD differ substantially in their treatment, impairment in functioning, and outcome, making it crucial to establish a correct diagnosis which will enable proper treatment

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Eur Psychiatry. 2015;30:420.

THE ROLE OF PARENTAL TEMPERAMENT TRAITS IN DISRUPTIVE BEHAVIORAL DISORDERS OF CHILDREN WITH ADHD.

Bilgic A, Yilmaz S, Ozcan O, et al.

Introduction: No study up to now investigated the role of parental temperament traits in disruptive behavioral disorders (DBD) of children with attention-deficit/hyperactivity disorder (ADHD).

Objectives: To determine the relationships between parent temperament characteristics and child DBD symptoms in children with ADHD.

Methods: The sample consisted of 542 treatment-naïve children with ADHD aged 6-17 years. All children had to be living with both biological mothers and fathers. The severity of ADHD and comorbid DBD were assessed via parent and teacher rated Turgay DSM-IV-Based Child and Adolescent Behavioral Disorders Screening and Rating Scale. Temperamental dimensions of mothers and fathers were measured by TEMPS-A. The association between parental ADHD and DBD was evaluated with two separate structural equation models.

Results: Relationships of parent ADHD and DBD symptoms were presented in Figures 1 and 2.

Discussion: This study showed a significant relationship between maternal depressive and paternal cyclothymic affective temperament and conduct disorder, and between maternal anxious and irritable, and paternal cyclothymic affective temperament and oppositional defiant disorder in children with ADHD. This study highlights that children with more severe behavioural symptoms are more likely to have a parent with certain temperament traits

Eur Psychiatry. 2015;30:565.

PREVALENCE AND INCIDENCE OF ATTENTION DEFICIT HYPERACTIVITY DISORDER AMONG CHILDREN AND ADOLESCENTS IN SLOVENIA FROM 1997 TO 2012: AN EPIDEMIOLOGICAL STUDY FROM A NATIONAL PERSPECTIVE.

Stuhec M, Svab V, Locatelli I.

INTRODUCTION: Attention deficit hyperactivity disorder (ADHD) is still underdiagnosed in many EU countries. Despite its relevance in terms of public health, the incidence and prevalence of this disorder is not well researched.

OBJECTIVES: The national incidence and prevalence of ADHD diagnosis in children and adolescents has not yet been reported in any South Eastern European country.

AIM: The main aim of this study was to investigate the incidence and prevalence of ADHD diagnosis among children and adolescents in Slovenia in 2012, based on national data from 1997 to 2012. Different epidemiological models were built.

METHODS: The data from the National Institute of Public Health of the Republic of Slovenia for the years 1997-2012 were analyzed. The yearly database includes all newly diagnosed out patients with ADHD in Slovenia. **RESULTS:** In 1997, the annual incidence rate of ADHD diagnosis was 0.0317 % and increased to 0.0469 % in 2000 and to 0.0823 % in 2012. The prevalence rate of ADHD diagnosis was estimated between 722 and 767 per 100,000 children and adolescents. If the increase persists, the prevalence of ADHD diagnosis in 2020 will be 6.3-fold higher than in 1997 and 1.3-fold higher than in 2012.

CONCLUSIONS: ADHD is a common mental health disorder in Slovenia, but it is still underdiagnosed in comparison with Western countries. Results indicate a need for improved timely interventions in Slovenia, not only in child and adolescent psychiatry but also in primary settings and adult psychiatry, where ADHD should be recognized efficiently

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Eur Psychiatry. 2015;30:577.

META-ANALYSIS OF THE EFFECT OF MODAFINIL IN CHILDREN AND ADOLESCENTS WITH ATTENTION DEFICIT AND HYPERACTIVE DISORDER.

Gomez Z, Noble P.

Introduction: Attention-deficit/hyperactivity disorder (ADHD) affects 5%-10% of school-aged children. Treatment includes medical use of stimulants. However, treatment of non-stimulant drugs should be considered as an alternative. The efficacy of Modafinil, a centrally acting agent that is structurally and pharmacologically different from stimulants in the treatment of ADHD was studied and abrupt discontinuation was not associated with symptoms of withdrawal or with rebound of symptoms of ADHD.

Objective: To assess the evidence from randomized controlled trials the effect of Modafinil compared with placebo in the treatment of patients with Attention-deficit/hyperactivity disorder (ADHD) .

Method: Meta-analysis of 3 randomized trials identified through Medline/Pubmed and Cochrane Library (as of September 2012). Summary of the outcome variables was computed using difference of two means of the ADHD-R Scale-IV and their corresponding standard error of the means under random effects models. Statistical analysis was done using Revman version 5. **Results:** A total number of 932 participants with ADHD were represented. All studies included were randomized and placebo controlled. The main outcome measure is Change in Home and School Version of ADHD-R Scale - IV scores from baseline.

Results showed mean difference between Modafinil and placebo using the Home Version is -10.13 (95% CI -14.11, -6.14). The overall effect was statistically significant ($z=4.98$; $p<0.00001$) in favor of Modafinil. The mean difference between Modafinil and placebo using the School Version is -9.27 (95% CI -12.62, -5.92). The overall effect was statistically significant ($z=5.42$; $p<0.00001$) in favor of Modafinil. **Conclusion:** Modafinil is effective in improving symptoms in ADHD

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Eur Psychiatry. 2015;30:421.

COMPARATIVE EFFICACY OF ATOMOXETINE, LISDEXAMFETAMINE, BUPROPION AND METHYLPHENIDATE IN TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN AND ADOLESCENTS: A METAANALYSIS WITH FOCUS ON BUPROPION.

Stuhec M, Munda B, Svab V, et al.

INTRODUCTION: Pharmacotherapy is essential for the treatment of children and adolescents with Attention Deficit Hyperactivity Disorder (ADHD). There are only two metaanalyses available in the literature where bupropion (BUP) was also included and compared to atomoxetine (ATX) and methylphenidate (MPH) in the treatment of ADHD in youths.

OBJECTIVES: There is a lack of comparative effectiveness research among ADHD medications in terms of efficacy, where BUP is compared with ATX, lisdexamfetamine (LDX) and MPH.

AIM: The main aim of this work was to compare the efficacy of these drugs in children and adolescents using a metaanalysis.

METHODS: A literature search was conducted to identify double-blind, placebo-controlled, noncrossover studies of ADHD. A systematic electronic literature search of PubMed (1975-April 2014) and clinicaltrials.gov with full text (1981-April 2014) was conducted. Drug efficacy was calculated based on the standardized mean difference (SMD). Treatment score was the primary endpoint. **RESULTS:** 28 articles and 27 trials met inclusion criteria and were sufficient for inclusion in the metaanalysis. BUP 0.32 (95% CI, -0.05, 0.69) showed small efficacy, ATX 0.68 (95% CI, 0.59, 0.76), and MPH 0.75 (95% CI, 0.52, 0.98) showed modest efficacy in reducing ADHD symptoms and LDX showed high efficacy 1.28 (95% CL, 0.71, 1.84).

CONCLUSIONS: The results suggest that LDX has the best efficacy and has promising potential for treating children and adolescents with ADHD. Effect sizes should not be the only evidence for clinicians when choosing ADHD medication. More research is needed for a better clinical evaluation of BUP

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Eur Psychiatry. 2015;30:988.

ADULT PSYCHIATRIC COMORBIDITIES OF ATTENTION-DEFICIT HYPERACTIVITY DISORDER DIAGNOSED IN CHILDHOOD-SYSTEMATIC REVIEW.

R. Gonçalves, A. Machado, D. Loureiro, J. Cerejeira.

Objectives/Aims: The aim of this study was to identify psychiatric disorders with higher rates of comorbidity with ADHD than would be expected from the base rates of those disorders in the population at large.

Methods: Systematic review of longitudinal prospective studies. Pubmed and PsycINFO search up to September 2014, using 'ADHD' and 'adult', combined with 'comorbidity' or 'outcome' and 'longitudinal' or 'prospective' as search terms.

Results: We found 8 studies that met our inclusion criteria. All of them have shown that ADHD persisted into adulthood in a significant percentage of children with ADHD. Elevated rates of antisocial personality disorder (ASD) have also been shown in all studies. Higher rates of major depressive disorder and substance use disorder across lifetime have been reported in four of those studies, with the others showing no differences between ADHD and control group. Three studies have shown higher rates of anxiety disorders and bipolar disorder. One study of ADHD girls has shown higher rates of eating disorders in females with childhood ADHD. Only one study evaluated other personality disorders than ASD, reporting elevated rates of passive-aggressive personality disorder, histrionic personality disorder and borderline personality disorder in adults with childhood ADHD.

Conclusion: Only ASD showed consistent comorbidity with ADHD in all studies. More studies are needed to extract accurate conclusions

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Eur Psychiatry. 2015;30:1195.

INATTENTION AND HYPERACTIVITY/IMPULSIVITY SYMPTOMS IN PARENTS OF CHILDREN DIAGNOSED WITH ADHD.

Kobylinska L, Botezatu SM, Anghel CG, et al.

Introduction: For a long period ADHD was considered to be a diagnostic limited to childhood. In the 1970s, clinical evidence showed symptoms in adults diagnosed with ADHD in childhood. Evidence shows that 15- 20% of the parents of children with ADHD could also qualify for this diagnostic.

Aims: The aim of this study was to see whether parents of children diagnosed with ADHD have traits significant for this pathology and how these symptoms correlate with the ones experienced by their children.

Objectives: Inattention and hyperactivity/impulsivity symptoms were assessed in parents of children diagnosed with ADHD and the most severe traits found were compared with those of their children.

Methods: In the study were included 93 parents of 50 children diagnosed with ADHD by a specialist in Child Psychiatry. For each child parents completed the ADHD-Rating Scale and for assessment of their symptoms, the Diagnostic Interview Voor ADHD (DIVA) was applied to parents.

Results: 34% of parents of children diagnosed with ADHD fulfill criteria for Adult ADHD. The most significant correlation was found between ADHD-RS scores for hyperactivity/impulsivity and DIVA scores for this kind of symptomatology. The little number of subjects represents a clear limitation, as this was performed as a pilot study.

Conclusions: Considering the high prevalence of ADHD in parents of diagnosed children and also the impact of their impairment over their children's education, it is important to quantify this risk and rise awareness of the need for ADHD screenings in parents of children diagnosed with this pathology

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Eur Psychiatry. 2015;30:1168.

MISDIAGNOSIS OF ADHD IN ADOPTION CASES: IMPLICATIONS FOR PSYCHIATRIC EPIDEMIOLOGY.

Koprowski E.

A fourteen year-old bi-racial girl, adopted more than a decade earlier, presents with behavioral problems, i.e. bullying, poor grades, difficulty with social interaction with peers and teachers, etc. in middle school. Physicians initially diagnosed, and treated, the child with stimulants for ADHD. We suggest a differential diagnosis (D/Dx) of depression from the unacknowledged trauma of adoption. Deeper interviewing into the psycho-dynamics of an adopted child, as well as observation, and interview of peers, is required to discern depression from ADHD. The child makes remarks, set as jokes, but which reveal psychic pain. "You don't like me because I'm black," is a statement she has made to a close friend, on several instances, only to immediately amend the remark by saying, "I'm joking." We believe this repeated behavior demonstrates self-loathing. The patient clearly meets the diagnostic criteria for depression –presents with "anger or irritability" as well as "reckless behavior" and "helplessness/hopelessness" and "loss of interest in daily activities" and "self-loathing." (DSM V, 2013). ADHD presents with similar, but fewer symptoms, e.g. "inattention, hyperactivity, impulsivity." (DSM-V, American Psychiatric Association Publishing). As the child enters high school this fall, we believe it is time to adjust the diagnosis and treatment strategy and recommend psychotherapy as well as treatment with an anti-depressant shown to be safe with adolescents as a transitional care strategy. ADHD is too much of a surface diagnosis in this case. Reasoning by analogy, the same kinds of symptoms may be seen in other adoption cases

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Eur Psychiatry. 2015;30:432.

ASSESSMENT OF EMOTIONAL EXPRESSION IN PATIENTS DIAGNOSED WITH ADHD AND TREATMENT METHYLPHENIDATE.

Monzon-Díaz J, Rodriguez-Lorenzo T, Henry-Benitez M, et al.

Introduction: Although investigation have demonstrated that stimulants are effective medication for the treatment of the symptoms on the ADHD, a commonly described but quite slightly studied side effect of this type of medication, is the effect on the emotional expression of patients.

Objectives: evaluate the effect of the treatment with Methylphenidate on the affective/emotional expression in children diagnosed with ADHD.

Methods: It's a descriptive study of several cases series, from a center and about a unique group, where 'n' will be 15 children diagnosed with ADHD at the University Hospital, who were required beginning treatment with methylphenidate, with a daily dose of at least 0,3mg/Kg. In this study it will be evaluated the emotional expression of the group, according to the scale Expression and Emotion Scale for Children (EESC) making a comparison between the previous moment to the treatment and a subsequent month from its beginning.

Results: The evaluation of the total result of the EESC conducted by the parent didn't show statistically significant differences between scores previously of the treatment and results after a month with it. The dominions (positive emotions, emotional flatness and emotional lability) didn't show differences between both periods of time, nevertheless, the positive emotions showed a tendency of reduction more showy than the rest, without getting to be statistically significant ($p=0.0638$).

Conclusion: Statistically there haven't been significant changes in the emotional expression of the children caused by the treatment with methylphenidate. Nevertheless, the data show that there is a tendency to an improvement in it

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Eur Psychiatry. 2015;30:691.

HIGHER PREVALENCE OF IRON DEFICIENCY AS STRONG PREDICTOR OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN.

Bener A.

Aim: The aim of this study was to determine the association between Iron deficiency and ADHD and the impact and role of iron deficiency on the development of ADHD in children.

Methods and subjects: Case-Control design based on 630 ADHD and 630 healthy children and conducted at the School Health and Primary Health care Clinics . The health status of the subjects was assessed by ascertaining clinical presentations and symptoms, family history, BMI, iron deficiency, ferritin, serum 25(OH) vitamin D, calcium, magnesium, and phosphorus levels. Descriptive, univariate and multivariate statistical analysis were performed.

Results: Mean age ($\pm$ SD, in years) for ADHD and control children were 11.54- $\pm$ 3.83 vs. 11.50- $\pm$ 3.62. There were statistically significant differences between ADHD and healthy children control subjects with respect to paternal education level ($p<0.001$), occupation of father ($p<0.002$), educational level of mother ($p<0.010$), monthly income ($p=0.034$), consanguineous marriages of parent ($p=0.019$) and BMI in percentiles ($p<0.001$), child behaviour ($p<0.001$), and school performance ($p=0.031$). There were statistically significant differences between ADHD versus control children for vitamin D, serum iron ,ferritin (36.26- $\pm$ 5.93 vs 38.19- $\pm$ 5.61 ng/ml), hemoglobin (12.02- $\pm$ 2.13 vs 12.89- $\pm$ 2.02 g/dL) magnesium, serum calcium level and phosphorous. Multivariate logistic regression analysis revealed that serum vitamin D level, serum iron, ferritin, serum calcium level, physical activity, nervous behaviour, consanguinity, BMI and child order were considered as the main factors associated with the ADHD after adjusting for age, gender and other variables.

Conclusion: The study indicates that low serum iron, ferritin levels and vitamin D deficiency may be associated with ADHD.

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Eur Psychiatry. 2015;30:564.

IMPACT OF PARENTAL ADHD DIMENSIONS ON DISRUPTIVE BEHAVIORAL DISORDERS SYMPTOMATOLOGY IN CHILDREN WITH ADHD.

Bilgic A, Yilmaz S, Ozcan O, et al.

Introduction: Little is known about the effect of parental attention-deficit/hyperactivity disorder (ADHD) dimensions on the development of disruptive behavioral disorders (DBD) in children with ADHD.

Objectives: To study the association of parental ADHD on the DBD symptoms in children with ADHD.

Methods: The sample consisted of 542 treatment-naïve children with ADHD aged 6-17 years. All children had to be living with both biological mothers and fathers. The severity of ADHD and comorbid DBD were assessed via parent and teacher rated Turgay DSM-IV-Based Child and Adolescent Behavioral Disorders Screening and Rating Scale. Current ADHD severity of mothers and fathers were evaluated by a self-report inventory. The association between parental ADHD and DBD was evaluated with two separate structural equation models.

Results: Relationships of parent ADHD and DBD symptoms were presented in Figures 1 and 2.

Discussion: These results suggest maternal hyperactivity may be a vulnerability factor for the development of conduct disorder and oppositional defiant disorder in children with ADHD

FASEB J. 2015 May;29:1960-72.

DEVELOPMENTAL PESTICIDE EXPOSURE REPRODUCES FEATURES OF ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Richardson JR, Taylor MM, Shalat SL, et al.

Attention-deficit hyperactivity disorder (ADHD) is estimated to affect 8-12% of school-age children worldwide. ADHD is a complex disorder with significant genetic contributions. However, no single gene has been linked to a significant percentage of cases, suggesting that environmental factors may contribute to ADHD. Here, we used behavioral, molecular, and neurochemical techniques to characterize the effects of developmental exposure to the pyrethroid pesticide deltamethrin. We also used epidemiologic methods to determine whether there is an association between pyrethroid exposure and diagnosis of ADHD. Mice exposed to the pyrethroid pesticide deltamethrin during development exhibit several features reminiscent of ADHD, including elevated dopamine transporter (DAT) levels, hyperactivity, working memory and attention deficits, and impulsive-like behavior. Increased DAT and D1 dopamine receptor levels appear to be responsible for the behavioral deficits. Epidemiologic data reveal that children aged 6-15 with detectable levels of pyrethroid metabolites in their urine were more than twice as likely to be diagnosed with ADHD. Our epidemiologic finding, combined with the recapitulation of ADHD behavior in pesticide-treated mice, provides a mechanistic basis to suggest that developmental pyrethroid exposure is a risk factor for ADHD

Genes Brain Behav. 2015;14:419-27.

LPHN3 AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: A SUSCEPTIBILITY AND PHARMACOGENETIC STUDY.

Bruxel EM, Salatino-Oliveira A, Akutagawa-Martins GC, et al.

Latrophilin 3 (LPHN3) is a brain-specific member of the G-protein coupled receptor family associated to both attention-deficit/hyperactivity disorder (ADHD) genetic susceptibility and methylphenidate (MPH) pharmacogenetics. Interactions of LPHN3 variants with variants harbored in the 11q chromosome improve the prediction of ADHD development and medication response. The aim of this study was to evaluate the role of LPHN3 variants in childhood ADHD susceptibility and treatment response in a naturalistic clinical cohort. The association between LPHN3 and ADHD was evaluated in 523 children and adolescents with ADHD and 132 controls. In the pharmacogenetic study, 172 children with ADHD were investigated. The primary outcome measure was the parent-rated Swanson, Nolan and Pelham Scale - version IV applied at baseline, first and third months of treatment with MPH. The results reported herein suggest the CGC haplotype derived from single nucleotide polymorphisms (SNPs) rs6813183, rs1355368 and rs734644 as an ADHD risk haplotype ($P = 0.02$, OR = 1.46). Although non-significant after multiple testing correction, its interaction with the 11q chromosome SNP rs965560 slightly increases risk ($P < 0.03$, OR = 1.55). Homozygous individuals for the CGC haplotype showed faster response to MPH treatment as a significant interaction effect between CGC haplotype and treatment over time was observed ($P < 0.001$). Homozygous individuals for the GT haplotype derived from SNPs rs6551665 and rs1947275 showed a nominally significant interaction with treatment over time ($P = 0.04$). Our findings replicate previous findings reporting

that LPHN3 confers ADHD susceptibility, and moderates MPH treatment response in children and adolescents with ADHD

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Hu Li Za Zhi. 2015 Feb;62:39-49.

DEPRESSION AND RELATED FACTORS IN MOTHERS OF SCHOOL-AGED CHILDREN WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Chen WL, Tsai ST, Chou FH.

BACKGROUND: The mothers of children with attention-deficit hyperactivity disorder tend to experience depression at higher levels because of the poor social interaction and deviant behaviors of their children. These depressed mothers often harm themselves and negatively impact their family and community.

PURPOSE: This study examines maternal depression and its related factors in the mothers of school-aged children with attention-deficit hyperactivity disorder.

METHODS: A cross-sectional study with a purposive sampling of 100 mothers of school-age children with attention-deficit hyperactivity disorder was developed. Data were collected using a structured questionnaire that included the Parenting Stress Index (PSI), social support scale, and the Beck Depression Inventory (BDI). The Pearson product moment correlation and stepwise multiple regression were used to analyze data.

RESULTS: The findings showed that almost half of the mothers with school-aged ADHD children suffered higher parenting stress and that 34% required professional psychiatry referral. In addition, 40% of the participants suffered from depression. Higher levels of parenting stress were associated with a higher incidence of depression ($r = .647, p < .001$). Participants with better social support had lower depression levels ($r = -.327, p < .01$). 'Parenting stress' and having a monthly total household income of $\leq$ NT\$40,000 were significant predictors of maternal depression. 'Maternal stress' was the most significant predictor, with a total explained variance of 41.9% (R^2 change = 41.9%).

CONCLUSIONS: The results of this study are intended to help medical staff better care for the mothers of school-aged children with ADHD. These results will assist in the evaluation of maternal depression, parenting stress, and levels of required social support. It will especially help in the evaluation of maternal depression symptoms of those mothers of low socioeconomic status with high parenting stress. Providing these mothers with parental training, education on effective parenting and discipline strategies, and better social support may effectively reduce maternal depression, which will help minimize the negative impacts of this depression on the family and the community

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Huisarts en Wetenschap. 2015;58:362-64.

ADHD MEDICATION: INCREASED AND LONGER USE.

Van Den Ban E.

In the period 2001-2006, the use of medication for attention deficit hyperactivity disorder (ADHD) increased 6.5-fold in the Netherlands, with the greatest increase being seen in boys aged 6–11 years. More than 50[%] of users stop taking medication within a year. Part of this increase is due to the availability of extended release preparations, which ensure that patients with ADHD continue to take their medications long term. While the prevalence of ADHD is similar in all ethnic groups in the Netherlands, individuals with a Moroccan and especially Turkish background take medication less often and tend to stop taking medication sooner. Individuals with ADHD have a 2-fold increased risk of injuries that result in hospitalization, and in adolescents with ADHD this risk is 3-fold higher. ADHD medication may help diminish this risk

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Hum Brain Mapp. 2015;36:2544-57.

SENSATION-TO-COGNITION CORTICAL STREAMS IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Carmona S, Hoekzema E, Castellanos FX, et al.

We sought to determine whether functional connectivity streams that link sensory, attentional, and higher-order cognitive circuits are atypical in attention-deficit/hyperactivity disorder (ADHD). We applied a graph-theory method to the resting-state functional magnetic resonance imaging data of 120 children with ADHD and 120 age-matched typically developing children (TDC). Starting in unimodal primary cortex-visual, auditory, and somatosensory-we used stepwise functional connectivity to calculate functional connectivity paths at discrete numbers of relay stations (or link-step distances). First, we characterized the functional connectivity streams that link sensory, attentional, and higher-order cognitive circuits in TDC and found that systems do not reach the level of integration achieved by adults. Second, we searched for stepwise functional connectivity differences between children with ADHD and TDC. We found that, at the initial steps of sensory functional connectivity streams, patients display significant enhancements of connectivity degree within neighboring areas of primary cortex, while connectivity to attention-regulatory areas is reduced. Third, at subsequent link-step distances from primary sensory cortex, children with ADHD show decreased connectivity to executive processing areas and increased degree of connections to default mode regions. Fourth, in examining medication histories in children with ADHD, we found that children medicated with psychostimulants present functional connectivity streams with higher degree of connectivity to regions subserving attentional and executive processes compared to medication-na+ve children. We conclude that predominance of local sensory processing and lesser influx of information to attentional and executive regions may reduce the ability to organize and control the balance between external and internal sources of information in ADHD

Int J Neuropsychopharmacol. 2015;18:1-5.

EFFECT OF ATOMOXETINE ON THE COGNITIVE FUNCTIONS IN TREATMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN WITH CONGENITAL HYPOTHYROIDISM: A PILOT STUDY.

Yang R, Gao W, Li R, et al.

Background: With early initiation of thyroxine supplementation, children with congenital hypothyroidism (CH) retain some subtle deficits, such as attention and inhibitory control problems. This study assessed the effects of atomoxetine on cognitive functions in treatment of attention deficit hyperactivity disorder (ADHD) symptoms in children with CH.

Methods: In a 6-month, open-labeled pilot study, 12 children were recruited and received atomoxetine. The measures of efficacy were scores on the Swanson, Nolan and Pelham Teacher and Parent Rating Scale, version IV (SNAP-IV) and Clinical Global Impression-Severity scale (CGI-S). The cognitive functions were evaluated with the Wechsler Intelligence Scale for Chinese Children, Digit Span, Wisconsin Card Sorting Test, and Stroop test.

Results: A statistically significant difference was found between the mean CGI-S and SNAP-IV scores before and after treatment ($p < 0.01$). All the indicators of cognitive functions at the endpoint were improved compared with those at baseline. No serious adverse events were reported.

Conclusion: Atomoxetine appears to be useful in improving ADHD symptoms, as well as cognitive functions, in children with CH. Larger, randomized, double-blinded, clinical trials are required to replicate these results

Iran J Psychiatry. 2015;10:106-14.

MEMANTINE VERSUS METHYLPHENIDATE IN CHILDREN AND ADOLESCENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: A DOUBLE-BLIND, RANDOMIZED CLINICAL TRIAL.

Mohammadi MR, Mohammadzadeh S, Akhondzadeh S.

Objectives: The aim of this randomized clinical trial was to assess the efficacy of memantine versus methylphenidate in the treatment of children with attention deficit hyperactivity disorder.

Method: Forty participants (34 boys and 6 girls) aged 6-11 who were diagnosed with attention deficit hyperactivity disorder based on (DSM-IV-TR) criteria were selected for this study. The participants were randomly assigned to two groups: group one (n = 22) received memantine and the other group (n = 18) received methylphenidate for six weeks. Treatment outcomes were assessed using the Attention Deficit Hyperactivity Rating Scale and Clinical Global Impression- Severity Scale administered at baseline and at weeks 3 and 6 following the treatment. Also, a two-way repeated measures analysis of variance (time-treatment interaction) was used.

Results: At 6 weeks, methylphenidate produced a significantly better outcome on the Parent Rating Scale scores and Clinical Global Impression- Severity than memantine. Side effects were observed more often in the memantine group. However, with respect to the frequency of side effects, the difference between the memantine and methylphenidate groups was not significant. The most common side effects associated with memantine are appetite suppression, headache, vomiting, nausea and fatigue.

Conclusion: The results of this study revealed that although memantine was less effective than methylphenidate in the treatment of attention deficit hyperactivity disorder, it may be considered as an alternative treatment

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Iran J Psychiatr Behav Sci. 2015;9.

CONCURRENT VALIDITY OF THE BEHAVIOR RATING INVENTORY OF EXECUTIVE FUNCTION IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Zarrabi M, Shahrivar Z, Tehrani DM, et al.

Background: Attention deficit hyperactivity disorder (ADHD) is a common psychiatric disorder in which impairment of executive functions plays an important role. Objectives: The main objective of this study was to assess the validity of the Behavior Rating Inventory of Executive Function (BRIEF) in children with ADHD.

Patients and Methods: Thirty children, aged 7-12 years, attending the child and adolescent clinic of Roozbeh hospital and diagnosed with ADHD according to interview with a child and adolescent psychiatrist, formed our ADHD group. In contrast, thirty participants of the control group were selected from 7 to 12 year-old students according to Conners' Teacher/Parent Rating Scale and did not have ADHD. The kiddie schedule for affective disorders and schizophrenia-present and lifetime version-Persian version was also completed for all children to rule out other psychiatric disorders. After oral consent, parents of 60 children (ADHD = 30, control = 30), completed three questionnaires of ADHD-Rating Scale-IV, Conners' Parent Rating Scale-Revised: Short Version and BRIEF.

Results: Children in ADHD group got higher scores than those in the control group in all subscales and indices of BRIEF ($P < 0.001$). There were also good correlations between subscales and indices of BRIEF and the two other rating scales ($P < 0.001$).

Conclusion: BRIEF could be used as a valid tool to assess behavioral aspects of executive functions, especially to discriminate children with ADHD and normal ones

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JAMA Psychiatry. 2015 Apr;72:325-33.

LIFETIME PREVALENCE, AGE OF RISK, AND GENETIC RELATIONSHIPS OF COMORBID PSYCHIATRIC DISORDERS IN TOURETTE SYNDROME.

Hirschtritt ME, Lee PC, Pauls DL, et al.

IMPORTANCE: Tourette syndrome (TS) is characterized by high rates of psychiatric comorbidity; however, few studies have fully characterized these comorbidities. Furthermore, most studies have included relatively few participants (<200), and none has examined the ages of highest risk for each TS-associated comorbidity or their etiologic relationship to TS.

OBJECTIVE: To characterize the lifetime prevalence, clinical associations, ages of highest risk, and etiology of psychiatric comorbidity among individuals with TS.

DESIGN, SETTING, AND PARTICIPANTS: Cross-sectional structured diagnostic interviews conducted between April 1, 1992, and December 31, 2008, of participants with TS (n = 1374) and TS-unaffected family members (n = 1142).

MAIN OUTCOMES AND MEASURES: Lifetime prevalence of comorbid DSM-IV-TR disorders, their heritabilities, ages of maximal risk, and associations with symptom severity, age at onset, and parental psychiatric history.

RESULTS: The lifetime prevalence of any psychiatric comorbidity among individuals with TS was 85.7%; 57.7% of the population had 2 or more psychiatric disorders. The mean (SD) number of lifetime comorbid diagnoses was 2.1 (1.6); the mean number was 0.9 (1.3) when obsessive-compulsive disorder (OCD) and attention-deficit/hyperactivity disorder (ADHD) were excluded, and 72.1% of the individuals met the criteria for OCD or ADHD. Other disorders, including mood, anxiety, and disruptive behavior, each occurred in approximately 30% of the participants. The age of greatest risk for the onset of most comorbid psychiatric disorders was between 4 and 10 years, with the exception of eating and substance use disorders, which began in adolescence (interquartile range, 15-19 years for both). Tourette syndrome was associated with increased risk of anxiety (odds ratio [OR], 1.4; 95% CI, 1.0-1.9; P = .04) and decreased risk of substance use disorders (OR, 0.6; 95% CI, 0.3-0.9; P = .02) independent from comorbid OCD and ADHD; however, high rates of mood disorders among participants with TS (29.8%) may be accounted for by comorbid OCD (OR, 3.7; 95% CI, 2.9-4.8; P < .001). Parental history of ADHD was associated with a higher burden of non-OCD, non-ADHD comorbid psychiatric disorders (OR, 1.86; 95% CI, 1.32-2.61; P < .001). Genetic correlations between TS and mood (RhoG, 0.47), anxiety (RhoG, 0.35), and disruptive behavior disorders (RhoG, 0.48), may be accounted for by ADHD and, for mood disorders, by OCD.

CONCLUSIONS AND RELEVANCE: This study is, to our knowledge, the most comprehensive of its kind. It confirms the belief that psychiatric comorbidities are common among individuals with TS, demonstrates that most comorbidities begin early in life, and indicates that certain comorbidities may be mediated by the presence of comorbid OCD or ADHD. In addition, genetic analyses suggest that some comorbidities may be more biologically related to OCD and/or ADHD rather than to TS

J Adolesc Health. 2015;57:192-97.

ATTENTION DEFICIT HYPERACTIVITY DISORDER MEDICATION USE AMONG TEENS AND YOUNG ADULTS.

Johansen ME, Matic K, McAlearney AS.

Purpose The purpose of this study was to determine rates of stimulant/atomoxetine use among teens (aged 12-17 years) and young adults (aged 18-23 years) and to investigate associations in medication use before and after the transition from teen to young adult. **Methods** Repeated cross-sectional analyses using the nationally representative Medical Expenditure Panel Survey. The sample included all teens and young adults between 2003 and 2012. Within this group, a staggered sample of individuals between 2006 and 2012 born during a 5-year range was used to minimize false positive findings due to temporal trends. The primary outcome was attention deficit hyperactivity disorder (ADHD) medication use (two or more prescriptions and ≥ 60 tablets). A multivariable logistic regression was utilized to determine associations between ADHD medication use and race/ethnicity and other sociodemographic factors. **Results** A total of 62,699 individuals were included between 2003 and 2012. Rates of ADHD medication use increased for both teens (4.2%-6.0%) and young adults (1.2%-2.6%) between 2003-2004 and 2011-2012. In adjusted analysis, blacks, Hispanics, and Asians had lower rates of use compared with whites. The decrease in use among young adults was more pronounced among blacks compared with whites. A usual source of care and health insurance were less common among young adults, and both were associated with ADHD medication use. **Conclusions** Although there has been an increase in the use of ADHD medications in both teens and young adults, we found a drop-off in levels of ADHD treatment among young adults when compared with teens. A portion of this decrease appears to be related to race/ethnicity, usual source of care, and health insurance status

Journal of Attention Disorders. 2015 Jul;19:578-90.

EVALUATION OF THE DURATION OF ACTION AND COMPARATIVE EFFECTIVENESS OF LISDEXAMFETAMINE DIMESYLATE AND BEHAVIORAL TREATMENT IN YOUTH WITH ADHD IN A QUASI-NATURALISTIC SETTING.

Manos MJ, Caserta DA, Short EJ, et al.

Objective: This study compared the relative effects of three treatment conditions: long-acting stimulant medication (MED), behavior modification, and medication/behavioral treatments combined (COM) in children with ADHD.

Method: A total of 25 children, aged 6 to 12 years, received the three treatment conditions during a 7-week Summer Treatment Program in an alternating treatments design. Counselors completed behavioral ratings from 0.5 to 12.5 hr post dose, and parents completed nighttime ratings.

Results: Ratings for SKAMP (Swanson, Kotkin, Agler, M-Flynn, and Pelham) and for following instructions indicated COM and MED improved symptoms over BEH treatment beginning 3 hr post dose ($p = .008$), with ratings maintained 12.5 hr post dose ($p = .001$ and $.006$). Results for frustration tolerance indicated significant improvement in all three conditions until 9 hr post dose.

Conclusion: MED and COM separated from BEH at 3 hr post dose, and sustained benefit was observed across the day for two of three measures. BEH appears to have an additive effect, extending the duration of frustration tolerance

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Journal of Attention Disorders. 2015 Jul;19:591-602.

DOES COMORBID DISRUPTIVE BEHAVIOR MODIFY THE EFFECTS OF ATOMOXETINE ON ADHD SYMPTOMS AS MEASURED BY A CONTINUOUS PERFORMANCE TEST AND A MOTION TRACKING DEVICE?

Wehmeier PM, Kipp L, Banaschewski T, et al.

OBJECTIVE: To compare the reduction of ADHD symptoms under atomoxetine in patients with and without comorbid oppositional defiant disorder (ODD) or conduct disorder (CD) using a computer-based continuous performance test (cb-CPT) combined with an infrared motion tracking (MT) device.

METHOD: Secondary analysis of a placebo-controlled study in ADHD patients (6-12 years old) treated with atomoxetine (target dose: 1.2 mg/kg per day). Cb-CPT/MT scores were analyzed using ANCOVA (last observation carried forward [LOCF]).

RESULTS: The data ($N = 125$) suggested a more pronounced atomoxetine effect in the group with comorbid ODD/CD as measured by all cb-CPT/MT parameters except for "normalized variation of reaction time" (nVRT).

CONCLUSION: The results showed that atomoxetine reduced ADHD severity as measured by cb-CPT and MT parameters regardless of whether comorbid ODD/CD was present. The treatment effect of atomoxetine on hyperactivity appears to be more pronounced in the subgroup of patients with comorbid ODD/CD than in the subgroup without this comorbidity

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Journal of Attention Disorders. 2015 Jul;19:620-29.

PERSISTENT HANDWRITING DIFFICULTIES IN CHILDREN WITH ADHD AFTER TREATMENT WITH STIMULANT MEDICATION.

Brossard-Racine M, Shevell M, Snider L, et al.

Objective: Children with ADHD often present with handwriting difficulties. However, the extent to which motor and attention skills influence performance in this group has not yet been explored. The objective of this study was to examine the factors associated with change in handwriting performance.

Method: This study examines the factors associated with change in handwriting performance of 49 children newly diagnosed with ADHD (mean age = 8.4 [SD = 1.3] years) prior to and 3 months following use of a stimulant medication.

Results: Handwriting legibility and speed improved significantly at follow-up evaluation. However, most of the children with legibility difficulties at baseline continued to demonstrate difficulties when evaluated 3 months after initiation of medication. Change in handwriting legibility was best determined by improvements

in visual-motor integration skills ($\hat{\rho}^2 = 0.07-0.10$; $p < .001$), while the change in speed did not appear to be consistently related to a single factor.

Conclusion: Handwriting difficulties are common in children with ADHD, and medication alone is not sufficient to resolve these challenges

J Child Adolesc Psychopharmacol. 2015;25:402-14.

THE EFFICACY AND SAFETY OF EVEKEO, RACEMIC AMPHETAMINE SULFATE, FOR TREATMENT OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER SYMPTOMS: A MULTICENTER, DOSE-OPTIMIZED, DOUBLE-BLIND, RANDOMIZED, PLACEBO-CONTROLLED CROSSOVER LABORATORY CLASSROOM STUDY.

Childress AC, Brams M, Cutler AJ, et al.

Objective: The study goal was to determine the efficacy and safety of an optimal dose of Evekeo, racemic amphetamine sulfate, 1:1 d-amphetamine and l-amphetamine (R-AMPH), compared to placebo in treating children with attention-deficit/hyperactivity disorder (ADHD) in a laboratory classroom setting.

Methods: A total of 107 children ages 6-12 years were enrolled in this multicenter, dose-optimized, randomized, double-blind, placebo-controlled crossover study. After 8 weeks of open-label dose optimization, 97 subjects were randomized to 2 weeks of double-blind treatment in the sequence of R-AMPH followed by placebo ($n=47$) or placebo followed by R-AMPH ($n=50$). Efficacy measures included the Swanson, Kotkin, Agler, M-Flynn, and Pelham (SKAMP) Rating Scale and Permanent Product Measure of Performance (PERMP) administered predose and at 0.75, 2, 4, 6, 8, and 10 hours postdose on 2 laboratory classroom days. Safety assessments included physical examination, chemistry, hematology, vital signs, and treatment-emergent adverse events (TEAEs).

Results: Compared to placebo, a single daily dose of R-AMPH significantly improved SKAMP-Combined scores ($p<0.0001$) at each time point tested throughout the laboratory classroom days, with effect onset 45 minutes postdose and extending through 10 hours. R-AMPH significantly improved PERMP number of problems attempted and correct ($p<0.0001$) throughout the laboratory classroom days. During the twice-daily dose-optimization open-label phase, improvements were observed with R-AMPH in scores of the ADHD-Rating Scale IV and Clinical Global Impressions Severity and Improvement Scales. TEAEs and changes in vital signs associated with R-AMPH were generally mild and not unexpected. The most common TEAEs in the open-label phase were decreased appetite (27.6%), upper abdominal pain (14.3%), irritability (14.3%), and headache (13.3%).

Conclusions: Compared to placebo, R-AMPH was effective in treating children aged 6-12 years with ADHD, beginning at 45 minutes and continuing through 10 hours postdose, and was well tolerated. Trial registration: ClinicalTrials.gov identifier: NCT01986062. <https://clinicaltrials.gov/ct2/show/NCT01986062>

Journal of Child and Family Studies. 2015 Jul;24:2174-81.

ACTING OUT TO ACTING ON: A PRELIMINARY INVESTIGATION IN YOUTH WITH ADHD AND CO-MORBID DISORDERS.

Murrell AR, Steinberg DS, Connally ML, et al.

The feasibility of using acceptance and commitment therapy (ACT) to foster increases in congruence between values and behaviors pertinent to those values was evaluated with adolescents. Participants were nine, primarily African American, school aged children (11–15 years) with comorbid attention-deficit/hyperactivity disorder, learning disorders, and behavior problems who were enrolled at a charter school in an urban, South-central area of the United States. Despite some feasibility obstacles, several significant Reliable Change Index scores on the Behavior Assessment Scale for Children—second edition and the Bull's-Eye Values Assessment were found and other results approached statistical significance in the desirable direction. These findings suggest that ACT may be feasible for increasing congruence between values and behavior, and may have potential clinical utility with acceptance and mindfulness based treatments in youth with comorbid psychological and behavioral problems

Journal of Child and Family Studies. 2015 Jul;24:2021-30.

THE INFLUENCE OF PARENTAL AND OFFSPRING AUTISM SPECTRUM DISORDER (ASD) AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) SYMPTOMS ON FAMILY CLIMATE.

van Steijn DJ, Oerlemans AM, van Aken MAG, et al.

There is a lack of knowledge of the influence of parental and offspring autism spectrum disorder (ASD) and/or attention-deficit/hyperactivity disorder (ADHD) symptoms on the quality of family climate. The number of affected children may play an important moderating role. 103 Families were recruited with at least one child with an ASD(+ADHD) diagnosis, one or more biological affected or unaffected siblings, and two participating biological parents. Parents and children were carefully screened for the presence of ASD and ADHD symptoms. Family climate (relationship and structure) was measured with the Dutch Family Environment Scale (FES). No overall differences were found between ASD, ASD + ADHD families and a norm group for family relationship and family structure. However, families with one affected child reported higher family relationship scores than the norm, whereas fathers and mothers of families with two or three affected children reported similar scores as the norm. Regarding the family structure index, fathers and mothers of families with one, two or three affected children reported similar scores as the norm data of the FES. As reported by both fathers and mothers, paternal and maternal ASD symptoms and paternal ADHD symptoms had a negative effect on family relationships, whereas predominately maternal ADHD had a negative impact on family structure. However, families with two or more affected children and families in which parents have increased ASD/ADHD symptoms may have more difficulties in maintaining a positive family climate

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Journal of Child Psychology and Psychiatry. 2015 Jul;56:801-13.

INCREASED REACTION TIME VARIABILITY IN ATTENTION-DEFICIT HYPERACTIVITY DISORDER AS A RESPONSE-RELATED PHENOMENON: EVIDENCE FROM SINGLE-TRIAL EVENT-RELATED POTENTIALS.

Saville CWN, Feige B, Kluckert C, et al.

BACKGROUND: Increased intra-subject variability (ISV) in reaction times (RTs) is a promising endophenotype for attention-deficit hyperactivity disorder (ADHD) and among the most robust hallmarks of the disorder. ISV has been assumed to represent an attentional deficit, either reflecting lapses in attention or increased neural noise. Here, we use an innovative single-trial event-related potential approach to assess whether the increased ISV associated with ADHD is indeed attributable to attention, or whether it is related to response-related processing.

METHODS: We measured electroencephalographic responses to working memory oddball tasks in patients with ADHD (N = 20, aged 11.3 ± 1.1) and healthy controls (N = 25, aged 11.7 ± 1.1), and analysed these data with a recently developed method of single-trial event-related potential analysis. Estimates of component latency variability were computed for the stimulus-locked and response-locked forms of the P3b and the lateralised readiness potential (LRP).

RESULTS: ADHD patients showed significantly increased ISV in behavioural ISV. This increased ISV was paralleled by an increase in variability in response-locked event-related potential latencies, while variability in stimulus-locked latencies was equivalent between groups. This result held across the P3b and LRP. Latency of all components predicted RTs on a single-trial basis, confirming that all were relevant for speed of processing.

CONCLUSIONS: These data suggest that the increased ISV found in ADHD could be associated with response-end, rather than stimulus-end processes, in contrast to prevailing conceptions about the endophenotype. This mental chronometric approach may also be useful for exploring whether the existing lack of specificity of ISV to particular psychiatric conditions can be improved upon

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Journal of Child Psychology and Psychiatry. 2015 Jul;56:782-91.

COGNITIVE IMPAIRMENTS ARE DIFFERENT IN SINGLE-INCIDENCE AND MULTI-INCIDENCE ADHD FAMILIES

Oerlemans AM, Hartman CA, de Bruijn YGE, et al.

BACKGROUND: We may improve our understanding of the role of common versus unique risk factors in attention-deficit/hyperactivity disorder (ADHD) by examining ADHD-related cognitive deficits in single- (SPX), and multi-incidence (MPX) families. Given that individuals from multiplex (MPX) families are likely to share genetic vulnerability for the disorder, whereas simplex (SPX) ADHD may be the result of sporadic (non-)genetic causes unique to the patient, we hypothesized that cognitive impairments may be different in SPX and MPX ADHD as indicated by (a) the presence of cognitive deficits in MPX, but not SPX unaffected siblings and (b) dissimilar cognitive profiles in SPX and MPX ADHD patients.

METHODS: Tasks measuring total IQ, verbal attention, executive functioning, motor functioning, and time estimation were administered to 31 SPX/264 MPX ADHD probands, 47 SPX/123 MPX unaffected siblings, and 263 controls, aged 6-19 years.

RESULTS: SPX unaffected siblings were unimpaired compared to controls, except for verbal working memory, whereas MPX unaffected siblings showed impairments on most cognitive domains. The cognitive profiles of SPX and MPX probands were highly similar, except that verbal attention, response inhibition and motor control deficits were more pronounced in MPX probands, and -compared to their unaffected siblings- impairments in IQ, visual working memory and timing abilities were more pronounced in SPX cases.

CONCLUSIONS: Our results support the hypothesis that a partly different cognitive architecture may underlie SPX and MPX forms of ADHD, which becomes evident when contrasting cognitive performances within families. Cognitive factors underlying MPX forms of ADHD are familial, whereas nonfamilial in SPX ADHD. SPX-MPX stratification may be a step forward in unraveling diverse causal pathways

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J Clin Psychiatry. 2014;75:e1278-e1283.

CORRELATES OF INCIDENT BIPOLAR DISORDER IN CHILDREN AND ADOLESCENTS DIAGNOSED WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Jerrell JM, McIntyre RS, Park Y-M.

Background: The greater severity and chronicity of illness in youths with co-occurring attention-deficit/hyperactivity disorder (ADHD) and bipolar disorder deserve further investigation as to the risk imparted by comorbid conditions and the pharmacotherapies employed.

Method: A retrospective cohort design was employed, using South Carolina's Medicaid claims dataset covering outpatient and inpatient medical and psychiatric service claims with International Classification of Diseases, Ninth Revision, Clinical Modification diagnoses and medication prescriptions between January 1996 and December 2006 for patients ≤ 17 years of age.

Results: The cohort included 22,797 cases diagnosed with ADHD at a mean age of 7.8 years; 1,604 (7.0%) were diagnosed with bipolar disorder at a mean age of 12.2 years. The bipolar disorder group developed conduct disorder (CD)/oppositional defiant disorder (ODD), anxiety disorder, and a substance use disorder later than the ADHD-only group. The odds of a child with ADHD developing bipolar disorder were significantly and positively associated with a comorbid diagnosis of CD/ODD (adjusted odds ratio [aOR] = 4.01), anxiety disorder (aOR = 2.39), or substance use disorder (aOR = 1.88); longer treatment with methylphenidate, mixed amphetamine salts, or atomoxetine (aOR = 1.01); not being African American (aOR = 1.61); and being treated with certain antidepressant medications, most notably fluoxetine (aOR = 2.00), sertraline (aOR = 2.29), bupropion (aOR = 2.22), trazodone (aOR = 2.15), or venlafaxine (aOR = 2.37) prior to the first diagnosis of mania.

Conclusions: Controlling for pharmacotherapy differences, incident bipolar disorder was more likely in individuals clustering specific patterns of comorbid psychiatric disorders, suggesting that there are different pathways to bipolarity and providing a clinical impetus for prioritizing prevention and preemptive strategies to reduce their hazardous influence

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J Clin Psychiatry. 2015;76:712-19.

A 4-YEAR FOLLOW-UP OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN A POPULATION SAMPLE.

Lecendreux M, Konofal E, Cortese S, et al.

Background: Prior follow-up studies of attention-deficit/hyperactivity disorder (ADHD) ascertained ADHD cases in clinical samples mostly from North America but rarely from European countries. They have provided a good deal of information about the persistence of ADHD and its impairments, but the degree to which these results generalize to population samples and to other countries is not certain. Prior studies have also not assessed predictors of new-onset ADHD in youth without ADHD.

Method: At baseline, 7,912 of 18 million telephone numbers were randomly selected from throughout France from October 2, 2008, through December 11, 2008. Among 4,186 eligible families, 1,012 (24.2%) were successfully recruited at baseline, when a telephone interview was administered to all families about a child in the 6- to 12-year age range. Four years later, we attempted to recruit the entire sample to assess the persistence of ADHD and its impairments and the emergence of new associated conditions.

Results: 86.5% of the families assessed at baseline were followed-up (N = 875). Participants who were and were not interviewed at follow-up did not differ on any clinical or demographic features. At follow-up, the prevalence of full or subthreshold ADHD was 65.8% for ADHD participants and 9.8% for those not having ADHD at baseline. Among the children who were not diagnosed with ADHD at baseline, 3.4% were diagnosed with ADHD at follow-up. Both the persistence of ADHD and new onsets of ADHD were significantly predicted by several baseline clinical features and by having a family history of ADHD (all P values < .05).

Conclusions: We replicated prior predictors of ADHD's persistence and provide new data about predictors of new ADHD onsets in the population. Our data about subthreshold ADHD support a dimensional conceptualization of the disorder and address the potential clinical utility of a subthreshold diagnostic category

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J Clin Psychopharmacol. 2015;35:414-21.

THE UNIQUE AND COMBINED EFFECTS OF REINFORCEMENT AND METHYLPHENIDATE ON TEMPORAL INFORMATION PROCESSING IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Luman M, Papanikolaou A, Oosterlaan J.

Temporal information processing and reward sensitivity are neurocognitive impairments key to attention-deficit/hyperactivity disorder (ADHD). The aim of this study was to examine the unique and combined impact of reinforcement and methylphenidate (MPH) on temporal information processing in children with ADHD. We predicted that both monetary reinforcement and MPH would ameliorate temporal information processing deficits in ADHD, and we expected that the combined effect of reinforcement and MPH would be most beneficial. Forty children (23 with ADHD and 27 typical controls, aged 8-12 y) performed a time production task under 3 conditions: reward, response cost, and feedback only. Children with ADHD also performed the task (in random order) with placebo, a low, a medium, and a high dose of MPH. Dependent variables were time production accuracy and variability. At baseline, children with ADHD displayed poor internal clock functioning compared with controls, as reflected by greater underestimations of the 1-second interval, and they showed poor motor output as reflected by increased timing variability. Reward and response cost improved motor output (timing variability), with similar effects for both groups. Methylphenidate increased performance (timing variability) compared with placebo, with a higher dose showing greater effects. Effect sizes of reinforcement and medication were medium to large. Contrary to expectations, MPH did not add to the reinforcement effect. The results of this study confirm the value of reward and response cost being similar to that of MPH to optimize (timing) performance of children with ADHD

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J Clin Psychopharmacol. 2015 Jun;35:350-51.

EXACERBATION OF TICS AFTER COMBINING ARIPIRAZOLE WITH PIMOZIDE: A CASE WITH TOURETTE SYNDROME.

Mazlum B, Zaimoğlu S, Öztıp DB

The letter presents a case report of a 15-year-old male adolescent was first admitted to our child psychiatry unit 2 years ago because of his motor tics and attention problems. His motor tics were dominant in the shoulder and body. Furthermore, the patient himself and his family complained of marked impulsivity and aggression that led to serious problems in the family. His health problems began with a seizure after a head trauma when he was 5 years old. Since his electroencephalographic examination had confirmed epileptiform abnormality, he was treated with valproic acid. His cranial magnetic resonance imaging was normal. One year after the initiation of valproic acid, risperidone treatment was added by the child neurologist for his behavioral problems and impulsivity. He was diagnosed with attention-deficit/hyperactivity disorder (ADHD) when he was 6 years old, and risperidone was replaced with methylphenidate. After an allergic reaction to methylphenidate, risperidone was started again at 1 mg/d. His motor tics began when he was 8 years old, including shoulder shrugging, neck stretching, and scraping his hand across the wall. There were no simultaneous vocal tics

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J Clin Psychopharmacol. 2015;35:480-81.

ACUTE DYSTONIA AFTER STIMULANT DISCONTINUATION IN 2 ADHD CHILDREN RECEIVING ARIPIRAZOLE.

Párraga HC, Sherman BC.

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J Dev Behav Pediatr. 2015 Jul;36:417-25.

PATIENT-CENTERED MEDICAL HOME AND FAMILY BURDEN IN ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Ronis SD, Baldwin CD, Blumkin A, et al.

OBJECTIVE: Attention-deficit hyperactivity disorder (ADHD) can impair child health and functioning, but its effects on the family's economic burden are not well understood. The authors assessed this burden in US families of children with ADHD, and the degree to which access to a patient-centered medical home (PCMH) might reduce this burden.

METHODS: We conducted cross-sectional analyses of 2005-2006 and 2009-2010 National Surveys of Children with Special Health Care Needs, focusing on families of children with ADHD. They defined family economic burden as (1) family financial problems (annual expenses for the child's health care or illness-related financial problems for the family) and/or (2) family employment problems (job loss, work time loss, or failure to change jobs to avoid insurance loss). Relative risk models assessed associations between PCMH and family economic burden, adjusted for child age, sex, ethnicity, ADHD severity, poverty status, caregiver education, and insurance.

RESULTS: In 2009, 26% of families reported financial problems because of the child's ADHD, 2.1% reported out-of-pocket expenses >5% of income, and 36% reported employment problems. Only 38% reported care that met all 5 criteria for a PCMH (similar to rates in 2005-2006). In multivariable analysis, care in a PCMH was associated with 48% lower relative risk (RR) of financial problems (RR = 0.52, $p < .001$) and 36% lower relative risk of employment problems (RR = 0.64, $p < .001$). Among PCMH components, family-centered care and care coordination were more strongly associated with lower burden.

CONCLUSIONS: The economic burdens of families with ADHD are significant but may be alleviated by family-centered care and care coordination in a medical home

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J Pediatr Urol. 2015;11:141.

INCONTINENCE IN CHILDREN WITH TREATED ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Niemczyk J, Equit M, Hoffmann L, et al.

Introduction Attention-deficit/hyperactivity disorder (ADHD) and incontinence (nocturnal enuresis, daytime urinary incontinence and fecal incontinence) are common disorders in childhood. Both disorders are strongly associated with each other.

Objective ADHD can affect compliance to incontinence therapy in a negative way; it can also affect outcome. The aim of the present study was to assess the prevalence of incontinence, age of bladder and bowel control, and psychological symptoms in children having treatment for ADHD compared to a control group.

Study design Forty children having treatment for ADHD (75% boys, mean age 11.4 years) and 43 matched controls (60.5% boys, mean age 10.7 years) were assessed. Their parents filled out questionnaires to assess: child psychopathology (Child Behavior Checklist), incontinence (Parental Questionnaire: Enuresis/Urinary Incontinence; Encopresis Questionnaire - Screening Version) and symptoms of the lower urinary tract (International-Consultation-on-Incontinence-Questionnaire - Pediatric Lower Urinary Tract Symptoms). The ICD-10 diagnoses and children's IQ were measured by standardized instruments (Kinder-DIPS, Coloured Progressive Matrices/Standard Progressive Matrices).

Results Rates of incontinence in the ADHD group (5% nocturnal enuresis, 5% daytime urinary incontinence, 2.5% fecal incontinence) did not differ significantly from incontinence rates in the control group (4.7% daytime urinary incontinence). More children in the ADHD group had Child Behavior Checklist scores in the clinical range. Further ICD-10 disorders were present in eight children with ADHD and in one control child. More children with ADHD had delayed daytime and nighttime bladder control, as well as delayed bowel control, than the controls. Rates of incontinence and psychological symptoms in children with attention-deficit/hyperactivity disorder and the controls ADHD group (n = 40) Control group (n = 43) Subtypes of incontinence Any incontinence n (%) 4 (10.0) 2 (4.7) NE n (%) 2 (5.0) DUI n (%) 2 (5.0) 2 (4.7) FI n (%) 1 (2.5) Clinically relevant CBCL scores CBCL total score >90th percentile n (%) 23 (57.5) 1 (2.3) CBCL Externalizing score >90th percentile n (%) 19 (47.5) CBCL Internalizing score >90th percentile n (%) 16 (40.0) 4 (9.3) ADHD, Attention-deficit/hyperactivity disorder; CBCL, Child Behavior Checklist; DUI, daytime urinary incontinence; FI, fecal incontinence; NE, nocturnal enuresis.

Discussion The present study showed that if children are treated for their ADHD, according to standard practice guidelines, incontinence rates are similar to those without ADHD. More children with ADHD reached continence at a later age than the controls, which could be an indicator of maturational deficits in the central nervous system. Additionally, children with ADHD showed higher rates of clinically relevant psychological symptoms.

Conclusion This study provides further information of the association between ADHD and incontinence. Treatment of ADHD may be associated with positive effects on incontinence outcomes. Therefore, children with ADHD should always be screened for incontinence problems and children with incontinence problems should also be screened for ADHD if symptoms of hyperactivity, inattention and/or impulsivity are also present

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J Pediatr. 2015;166:862-69.

LOW AND HIGH BIRTH WEIGHT AND THE RISK OF CHILD ATTENTION PROBLEMS.

Van Mil NH, Steegers-Theunissen RPM, Motazed E, et al.

Objective To study the prospective association between birth weight and attention problems and to explore the role of maternal body mass index (BMI) in this association.

Study design In 6015 children of a population-based cohort (Rotterdam, The Netherlands, 2001-2005), information on birth weight was collected and gestational age-adjusted SDS were calculated. At age 6 years, parents assessed attention problems with the Child Behavior Checklist. We used linear regression to study the association of birth weight with attention problem score and examined the modification of this association by maternal early pregnancy BMI.

Results The observed association between birth weight and attention problem score was curvilinear (adjusted β per birth weight SDS $²$: 0.02, 95% CI 0.00; 0.03, P = .008); the turning point

equals 3.6 kg at term. In analyses of the extreme tails of the birth weight distribution, the associations with attention problem score disappeared after adjustment for socioeconomic confounders. Maternal early pregnancy BMI moderated the association of child birth weight with attention problem score (P interaction = .007, with curvilinear term in model).

Conclusions Higher birth weight was related to less attention problems but from a birth weight of about 3.6 kg or more, a higher birth weight did not reduce the risk of attention problems any further. However, in children of obese mothers (BMI >30 kg/m²), high birth weight may increase the risk of attention problems

J Psychiatry Neurosci. 2015;40:280-87.

MICROSTRUCTURAL ABNORMALITIES OF THE BRAIN WHITE MATTER IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER.

Chen L, Huang X, Lei D, et al.

Background: Attention-deficit/hyperactivity disorder (ADHD) is an early-onset neurodevelopmental disorder with multiple behavioural problems and executive dysfunctions for which neuroimaging studies have reported a variety of abnormalities, with inconsistencies partly owing to confounding by medication and concurrent psychiatric disease. We aimed to investigate the microstructural abnormalities of white matter in unmedicated children and adolescents with pure ADHD and to explore the association between these abnormalities and behavioural symptoms and executive functions.

Methods: We assessed children and adolescents with ADHD and healthy controls using psychiatric interviews. Behavioural problems were rated using the revised Conners's Parent Rating Scale, and executive functions were measured using the Stroop Colour-Word Test and the Wisconsin Card Sorting test. We acquired diffusion tensor imaging data using a 3 T MRI system, and we compared diffusion parameters, including fractional anisotropy (FA) and mean, axial and radial diffusivities, between the 2 groups.

Results: Thirty-three children and adolescents with ADHD and 35 healthy controls were included in our study. In patients compared with controls, FA was increased in the left posterior cingulum bundle as a result of both increased axial diffusivity and decreased radial diffusivity. In addition, the averaged FA of the cluster in this region correlated with behavioural measures as well as executive function in patients with ADHD. Limitations: This study was limited by its cross-sectional design and small sample size. The cluster size of the significant result was small.

Conclusion: Our findings suggest that white matter abnormalities within the limbic network could be part of the neural underpinning of behavioural problems and executive dysfunction in patients with ADHD

J Am Acad Child Adolesc Psychiatry. 2015;54:660-67.

THINNER MEDIAL TEMPORAL CORTEX IN ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND THE EFFECTS OF STIMULANTS.

Schweren LJS, Hartman CA, Heslenfeld DJ, et al.

Objective Attention-deficit/hyperactivity disorder (ADHD) has been associated with widespread changes in cortical thickness (CT). Findings have been inconsistent, however, possibly due to age differences between samples. Cortical changes have also been suggested to be reduced or to disappear with stimulant treatment. We investigated differences in CT between adolescents/young adults with and without ADHD in the largest ADHD sample to date, the NeuroIMAGE sample. Second, we investigated how such differences were related to age and stimulant treatment.

Method Participants (participants with ADHD = 306; healthy controls = 184, 61% male, 8-28 years of age, mean age = 17 years) underwent structural magnetic resonance imaging. Participants and pharmacies provided detailed information regarding lifetime stimulant treatment, including cumulative intake and age of treatment initiation and cessation. Vertexwise statistics were performed in Freesurfer, modeling the main

effect of diagnosis on CT and its interaction with age. Effects of stimulant treatment parameters on CT were modeled within the sample with ADHD.

Results After correction for multiple comparisons, participants with ADHD showed decreased medial temporal CT in both left ($p < .008$) and right ($p < .038$) hemispheres. These differences were present across different ages and were associated with symptoms of hyperactivity and prosocial behavior. There were no age-by-diagnosis interaction effects. None of the treatment parameters predicted CT within ADHD.

Conclusion Individuals with ADHD showed thinner bilateral medial temporal cortex throughout adolescence and young adulthood compared to healthy controls. We found no association between CT and stimulant treatment. The cross-sectional design of the current study warrants cautious interpretation of the findings

MMW-Fortschritte der Medizin. 2015;157:22.

NEUROFEEDBACK IN ADHD: DECISIVE IS THE MOTIVATION OF THE CHILDREN.

Oberhofer E.

Ned Tijdschr Geneeskd. 2015;159:A8395.

SUMMARY OF THE DUTCH COLLEGE OF GENERAL PRACTITIONERS' (NHG) PRACTICE GUIDELINE 'ADHD IN CHILDREN'.

van Avendonk MJ, Hassink-Franke LJ, Stijntjes F, et al.

The diagnosis of ADHD may be considered if a child is hyperactive, impulsive or inattentive, and if this behaviour results in evidently impaired functioning in multiple settings. Children with behavioural problems and slightly impaired functioning may benefit from patient information, education and parenting advice. From the age of 6 years, children can be offered diagnostic testing and professional support within the primary care setting, provided sufficient knowledge and expertise is available and there is collaboration with other health care providers. Management of a child with ADHD but no comorbid psychiatric disorder, consists of a step-by-step plan including education, parent and teacher guidance and, optionally, behavioural therapy for the child. In consultation with parents, child and other therapists, methylphenidate can be prescribed if behavioural interventions are not sufficiently effective. Children taking medication for ADHD should be monitored periodically, including assessment of the effectiveness and side effects

Nephro-Urology Monthly. 2015;7.

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN UNDERGOING PERITONEAL DIALYSIS.

Yousefichaijan P, Sharafkhah M, Vazirian S, et al.

Background: Attention-deficit/hyperactivity disorder (ADHD) is the most common childhood psychiatric disorder. This disorder is more prevalent in some chronic disease.

Objectives: The aim of this study was to investigate ADHD in children with end-stage renal disease (ESRD) undergoing continuous ambulatory peritoneal dialysis (CAPD) and to compare the results with those of healthy children.

Patients and Methods: This case-control study was conducted for six months (December 22, 2013 to June 21, 2014) on five to 16-year-old children, visiting the Pediatric Dialysis Unit of Amirkabir Hospital, Arak, Iran, and Taleghani Hospital, Kermanshah, Iran. A total of 100 children with ESRD who had undergone CAPD for at least six months and 100 healthy children were included in this study as case and control groups, respectively. ADHD was diagnosed by Conner's Parent Rating Scale-48 (CPRS-48) and DSM-IV-TR criteria, and was confirmed through consultation by psychologist. Data were analyzed by Binomial test in SPSS 18.

Results: The ADHD inattentive type was observed in 16 cases (16%) with CAPD and five controls (5%) ($P = 0.01$). Moreover, ADHD hyperactive-impulsive type was observed in 27 cases (27%) with CAPD and seven controls (9%) ($P = 0.002$). Despite these significant differences, no children were diagnosed with ADHD combined type among all subjects.

Conclusions: Inattentive type and hyperactive-impulsive type of ADHD are more prevalent in children with ESRD undergoing CAPD. Therefore screening methods for ADHD is necessary in these patients

Neuropsychology. 2015.

LACK OF GLOBAL PRECEDENCE AND GLOBAL-TO-LOCAL INTERFERENCE WITHOUT LOCAL PROCESSING DEFICIT: A ROBUST FINDING IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER UNDER DIFFERENT VISUAL ANGLES OF THE NAVON TASK.

Song Y, Hakoda Y.

Objective: The Navon effect (Navon, 1977) is an automatic tendency to process the global picture prior to local details when processing compound patterns. However, several recent studies have reported that this effect is lacking in attention-deficit/hyperactivity disorder (ADHD). Although previous research has shown that the Navon effect is strongly affected by visual angles, whether this phenomenon will also be observed in ADHD is yet to be understood. We examine the lack of the Navon effect in ADHD under various visual angles to ensure that this phenomenon is not an artifact of saliency.

Method: By employing three different visual angles for the local stimuli, global and local processing of Navon-type hierarchical letters was examined in participants with ADHD ($n = 15$) and a comparison group ($n = 17$).

Results: ADHD participants presented with a lack of the Navon effect without local processing deficit regardless of visual angle, in comparison to non-ADHD participants.

Conclusion: A lack of global precedence and global-to-local interference without local processing deficit can be generalized in ADHD. This suggests that people with ADHD experience difficulties in processing the "whole picture," and it also challenges the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; American Psychiatric Association, 2013) criteria of ADHD in which the failure to pay close attention to details was emphasized. Moreover, the current results have important implications for understanding ADHD and could also have significant clinical value

Neurosciences (Riyadh). 2015 Apr;20:137-44.

SYSTEMATIC REVIEW OF THE EPIDEMIOLOGY OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN ARAB COUNTRIES.

Alhraiwil NJ, Ali A, Househ MS, et al.

OBJECTIVE: To assess the epidemiology of attention deficit hyperactivity disorder (ADHD) in Arab countries, and identify gaps for future research.

METHODS: We searched PubMed from July 1978 to July 2014 and reviewed local journals with cross-referencing. The keywords we used were ADHD, diagnosis, prevalence, incidence, factor, diagnosis, rate, risk, and each of the names of the 22 Arab countries (Jordan, Egypt, Lebanon, Saudi Arabia, and so on). Studies were eligible for inclusion if they investigated the epidemiology of ADHD in any Arab country, and were published in English. The search was conducted from 2nd to 5th August 2014 in King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

RESULTS: A total of 22 articles were included in the review. Twenty studies were cross-sectional and found the prevalence of ADHD ranged between 1.3-16%, prevalence of hyperactive type ADHD between 1.4-7.8%, and the prevalence of inattention type between 2.1-2.7%. Only 2 case-control studies investigated potential risk factors. Evidence extracted from these studies shows a significant association between ADHD and male gender, previous psychiatric illness in the family, vitamin D deficiency, poor school performance, sleep problems, and nocturnal enuresis.

CONCLUSION: The prevalence of ADHD in Arab countries is comparable to reports in North America, Africa, and other countries of the Middle East. Longitudinal studies are needed to investigate the prognosis and determinants of this condition in the Arab world

No To Hattatsu. 2015 Jan;47:23-27.

A NATIONWIDE SURVEY ON THE USES OF MELATONIN AND RAMELTEON IN JAPANESE CHILDREN.

Fukumizu M, Hayashi M, Miyajima T, et al.

OBJECTIVE: We carried out a questionnaire survey to investigate the uses of melatonin and ramelteon in Japanese children.

METHODS: We sent a questionnaire to councilors of the Japanese Society of Child Neurology by e-mail, and sent the same questionnaire to members of the Japanese Society of Pediatric Psychiatry and Neurology by postal mail.

RESULTS: During the first phase of the survey, 220 responses were obtained, and 45% of the respondents prescribed melatonin. Imported supplements and chemical reagents were used by 64% and 29% of melatonin prescribers, respectively. Some prescribed melatonin without patient consent or institutional approval. In patients with pervasive developmental disorder, cerebral palsy, attention-deficit hyperactivity disorder, Rett syndrome, and visual disturbance, melatonin was prescribed by 37%, 29%, 10%, 6%, and 6% of the respondents, respectively. In terms of sleep disorders, melatonin was prescribed by 49% and 42% of respondents in patients with circadian rhythm disorders and insomnia, respectively. Ramelteon was prescribed by 52% of respondents. Regarding types of target diseases and sleep disorders, the use of ramelteon differed little from that of melatonin. In the second phase of the survey on the use of melatonin, 23 doctors prescribed the drug for 254 patients. The daily effective dose ranged from 0.2 mg to 8 mg in patients aged 2 months to 37 years. In more than 60% of the patients who took melatonin, PDD was diagnosed. In the patients with melatonin for insomnia, 90% and 25% had difficulty falling asleep and disorders in circadian rhythm, respectively.

CONCLUSIONS: Both melatonin and ramelteon were widely prescribed in Japanese children. Melatonin tended to be used without sufficient ethical consideration in Japan, indicating the necessity of melatonin as medicine. Then, careful determination of an applicable dose are required in future studies

Paediatr Anaesth. 2015.

A COMPARISON OF THE POSTOPERATIVE PAIN EXPERIENCE IN CHILDREN WITH AND WITHOUT ATTENTION-DEFICIT HYPERACTIVITY DISORDER (ADHD).

Rosander S, Nause-Osthoff R, Voepel-Lewis T, et al.

Background: Children with attention-deficit hyperactivity disorder (ADHD) may experience pain differently compared to other children, yet the evidence is equivocal regarding whether pain is heightened or dampened. This prospective observational study, therefore, was designed to compare the postoperative pain experiences in children with and without ADHD.

Methods: Children aged 7-17 years with a diagnosis of ADHD (n = 119) who were scheduled for a surgical procedure requiring postoperative pain management and a matched cohort of children without ADHD were recruited (n = 122). Postoperative pain scores and analgesic use were recorded for 1 week, as was parents' estimate of their child's return to normal activity.

Results: There were no differences in highest pain scores between children with ADHD (3.3 -| 2.5, 0-10 numerical rating scale) and those without (2.8 -| 1.9). Postoperative opioid use was also similar on day 1 following surgery (0.12 -| 0.3 mg-Åkg⁻¹ vs 0.08 mg-Åkg⁻¹ -| 0.1 morphine equivalents, respectively). Children with ADHD, however, had a significantly longer return to normal activity (4.9 -| 3.8 vs 3.8 -| 3.0 days; P < 0.05).

Conclusions: Results suggest that there were no differences in the postoperative pain experiences of children with and without ADHD. However, the observation that children with ADHD took longer to return to baseline activity will be important in educating parents regarding their child's postoperative experience

Paediatr Anaesth. 2015.

PROCEDURAL SEDATION FOR MRI IN CHILDREN WITH ADHD.

Kitt E, Friderici J, Kleppel R, et al.

Background: Attention-deficit hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood, affecting 5-8% of children. It has been observed that these children have poor sedation experiences; however, to date there is minimal research on procedural sedation in this population. Aim: To examine whether children with ADHD required larger doses of propofol for magnetic resonance imaging (MRI) sedation.

Methods: The hospital's administrative billing database was used to identify all billing codes for MRI brain scans (with and without contrast) in children aged between 5 and 12 years over the preceding 5.5 years. The hospital's electronic medical record database provided baseline demographics. The sedation record was reviewed for propofol dose, psychostimulant use, and prescribed dose. All children received a standard weight-based dose of midazolam prior to receiving the necessary amount of propofol. Primary outcome was the dose of propofol administered (mg-kg⁻¹) to achieve adequate sedation.

Results: A total of 258 procedures met the inclusion criteria. The sample was 52% male, 74% White, 7.8% Black, 7.8% Hispanic, 4.3% Asian, and 6.2% other. ADHD was documented for 49 procedures with a prevalence of 18.5%. Patients with ADHD were older, more likely to be male, Hispanic, or to report race as 'Refused/Unknown'. Indications for MRI for patients with ADHD varied significantly, with 'Behavioral' and 'Neurocutaneous' being significantly overrepresented in the ADHD group. The average sedative dose for all patients was 2.8 mg-kg⁻¹ (95% CI 2.62-2.94). Sedative dose was similar among children with and without ADHD diagnosis.

Conclusions: Our study illustrates that children with ADHD do not have higher sedative requirements to achieve a successful brain MRI

Patient Preference Adherence. 2015;9:877-85.

CLINICAL UTILITY OF GUANFACINE EXTENDED RELEASE IN THE TREATMENT OF ADHD IN CHILDREN AND ADOLESCENTS.

Bello NT.

Attention deficit hyperactivity disorder (ADHD) is the most common psychiatric illness in children and adolescents. Several stimulant medications, such as methylphenidate and amphetamine derivatives, are available to treat ADHD in pediatric patients. Nonstimulant medications are more preferred by some parents, other caregivers, and patients because they lack the abuse potential of stimulant medications. In the US, one available nonstimulant option is guanfacine extended release (XR). As a selective α_2A adrenergic receptor, guanfacine acts on the central noradrenergic pathways and cortical noradrenergic targets to improve working memory and attention. The XR formulation of guanfacine, compared with the immediate-release formulation, is more effective for the long-term management of ADHD and is associated with fewer adverse effects. Available data also indicate that guanfacine XR is superior to atomoxetine and is as effective as the nonselective α_2 adrenergic receptor agonist, clonidine XR. The most common adverse effects associated with guanfacine XR are somnolence, fatigue, bradycardia, and hypotension. Somnolence is the most often cited reason for discontinuation. Guanfacine XR is also labeled for use as an adjuvant to stimulant treatment for ADHD. A similar profile of adverse effects as reported with monotherapy is reported when guanfacine XR is added on to stimulant therapy with somnolence as the most commonly reported adverse event. This review discusses the clinical

efficacy and patient preference of guanfacine XR based on available published data on the safety, relative effectiveness, and tolerance of this medication to treat ADHD

Pediatr Clin North Am. 2015 Jun;62:687-701.

ADVANCES IN TOURETTE SYNDROME: DIAGNOSES AND TREATMENT.

Serajee FJ, Mahbulul Huq AH.

Tourette syndrome (TS) is a childhood-onset neurodevelopmental disorder characterized by multiple motor tics and at least one vocal or phonic tic, and often one or more comorbid psychiatric disorders. Premonitory sensory urges before tic execution and desire for "just-right" perception are central features. The pathophysiology involves cortico-striato-thalamo-cortical circuits and possibly dopaminergic system. TS is considered a genetic disorder but the genetics is complex and likely involves rare mutations, common variants, and environmental and epigenetic factors. Treatment is multimodal and includes education and reassurance, behavioral interventions, pharmacologic, and rarely, surgical interventions

Pediatrics. 2015 May;135:e1198-e1209.

MATERNAL PREPREGNANCY BODY MASS INDEX AND CHILD PSYCHOSOCIAL DEVELOPMENT AT 6 YEARS OF AGE.

Jo H, Schieve LA, Sharma AJ, et al.

BACKGROUND: Both obesity and developmental disabilities have increased in recent decades. Limited studies suggest associations between maternal prepregnancy obesity and child neurodevelopment.

METHODS: The Infant Feeding Practices Study II, a US nationally distributed longitudinal study of maternal health and infant health and feeding practices, was conducted from 2005 to 2007. In 2012, mothers were recontacted for information on their children's health and development. We examined associations between maternal prepregnancy BMI and child psychosocial development in 1311 mother-child pairs included in this follow-up study. Children's development was assessed by maternal report of child psychosocial difficulties from the Strengths and Difficulties Questionnaire, past developmental diagnoses, and receipt of special needs services.

RESULTS: Adjusting for sociodemographic factors, children of obese class II/III mothers (BMI >35.0) had increased odds of emotional symptoms (adjusted odds ratio [aOR] 2.24; 95% confidence interval [CI], 1.27-3.98), peer problems (aOR 2.07; 95% CI, 1.26-3.40), total psychosocial difficulties (aOR 2.17; 95% CI, 1.24-3.77), attention-deficit/hyperactivity disorder diagnosis (aOR 4.55; 95% CI, 1.80-11.46), autism or developmental delay diagnosis (aOR 3.13; 95% CI, 1.10-8.94), receipt of speech language therapy (aOR 1.93; 95% CI, 1.18-3.15), receipt of psychological services (aOR 2.27; 95% CI, 1.09-4.73), and receipt of any special needs service (aOR 1.99; 95% CI, 1.33-2.97) compared with children of normal weight mothers (BMI 18.5-24.9). Adjustment for potential causal pathway factors including pregnancy weight gain, gestational diabetes, breastfeeding duration, postpartum depression, and child's birth weight did not substantially affect most estimates.

CONCLUSIONS: Children whose mothers were severely obese before pregnancy had increased risk for adverse developmental outcomes

Pediatrics. 2015 Apr;135:e927-e938.

COMORBIDITY OF PHYSICAL AND MENTAL DISORDERS IN THE NEURODEVELOPMENTAL GENOMICS COHORT STUDY.

Merikangas KR, Calkins ME, Burstein M, et al.

OBJECTIVES: To examine patterns of associations between a broad range of mental and physical conditions by using a large, systematically obtained pediatric registry.

METHODS: The sample included 9014 youth ages 8 to 21 years (4349 males and 4665 females; 3585 aged <13 years, 3678 aged 13 to 18 years, and 1751 aged 19 to 21 years) from the Philadelphia Neurodevelopmental Cohort identified through pediatric clinics at the Children's Hospital of Philadelphia

health care network by the Center for Applied Genomics. Measures were as follows: physical condition based on electronic medical records and interview data on 42 physical conditions of 14 organ systems/specialties and mental disorders based on an abbreviated version of the structured Kiddie-Schedule for Affective Disorders and Schizophrenia psychiatric diagnostic interview.

RESULTS: There was a direct association between the severity of the physical condition and most classes of mental disorders, as well as with functional impairment. Models adjusted for sociodemographic correlates, other physical and mental disorders, and false discovery and revealed broad patterns of associations between neurodevelopmental disorders with behavior disorders (odds ratio [OR]: 1.5; 95% confidence interval [CI]: 1.3-1.8; $P < .004$) and attention-deficit/hyperactivity disorder (OR: 3.1; 95% CI: 2.7-3.6; $P < .0001$), and neurologic/central nervous system conditions (OR: 1.3; 95% CI: 1.1-1.9; $P < .05$) with mood disorders and attention-deficit/hyperactivity disorder (OR: 1.3; 95% CI: 1.1-1.5; $P < .001$), and autoimmune/inflammatory conditions with mood disorders (OR: 1.4; 95% CI: 1.1-1.8, $P < .05$).

CONCLUSIONS: Findings show the strong overlap between physical and mental conditions and their impact on severity and functional impairment in youth. Specific patterns of comorbidity have important implications for etiology. Prospective tracking of cross-disorder morbidity will be important to establish more effective mechanisms for prevention and intervention

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Pediatrics. 2015 Feb;135:384-95.

PROMOTING OPTIMAL DEVELOPMENT: SCREENING FOR BEHAVIORAL AND EMOTIONAL PROBLEMS.

Weitzman C, Wegner L.

By current estimates, at any given time, approximately 11% to 20% of children in the United States have a behavioral or emotional disorder, as defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Between 37% and 39% of children will have a behavioral or emotional disorder diagnosed by 16 years of age, regardless of geographic location in the United States. Behavioral and emotional problems and concerns in children and adolescents are not being reliably identified or treated in the US health system. This clinical report focuses on the need to increase behavioral screening and offers potential changes in practice and the health system, as well as the research needed to accomplish this. This report also (1) reviews the prevalence of behavioral and emotional disorders, (2) describes factors affecting the emergence of behavioral and emotional problems, (3) articulates the current state of detection of these problems in pediatric primary care, (4) describes barriers to screening and means to overcome those barriers, and (5) discusses potential changes at a practice and systems level that are needed to facilitate successful behavioral and emotional screening. Highlighted and discussed are the many factors at the level of the pediatric practice, health system, and society contributing to these behavioral and emotional problems

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Peritoneal Dialysis International. 2010;30:S143.

ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN UNDERGOING PERITONEAL DIALYSIS.

Yousefi CP, Vazirian S, Seyed Zade SA, et al.

Objectives: Attention deficit/ Hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. This disorder is more prevalent in some chronic diseases. ADHD may have high prevalence in children with end stage renal disease (ESRD) undergoing peritoneal dialysis, due to negative body image. The aim of this study was evaluation of ADHD in children undergoing peritoneal dialysis at least for 6 months.

Methods: 30 peritoneal dialysis children (between 5 to 16 years) and 30 healthy children were enrolled in this case control study. ADHD was diagnosed by Conners Rating Scale and DSM IV criteria and was confirmed by psychologist consult. Data were analyzed by chi-square tests and SPSS statistics 15.

Results: 9 children (30%) of 30 children in peritoneal dialysis group (case group) and 1 child (3%) of 30 children in healthy group (control group) were affected to attention deficit ($p=0.006$). 8 children (26%) of 30 children in case group and no child in control group were affected to hyperactivity disorder.

Conclusions: ADHD is more prevalent in ESRD patient undergoing peritoneal dialysis. Therefore screening methods for ADHD is necessary in these patients

PLoS ONE. 2015;10.

SOCIOECONOMIC ASSOCIATIONS WITH ADHD: FINDINGS FROM A MEDIATION ANALYSIS.

Russell AE, Ford T, Russell G.

Background: Children from disadvantaged socioeconomic backgrounds are at greater risk of a range of negative outcomes throughout their life course than their peers; however the specific mechanisms by which socioeconomic status relates to different health outcomes in childhood are as yet unclear.

Aims: The current study investigates the relationship between socioeconomic disadvantage in childhood and attention deficit/hyperactivity disorder (ADHD), and investigates putative mediators of this association in a longitudinal population-based birth cohort in the UK.

Methods: Data from the Avon Longitudinal Study of Parents and Children was used (n = 8,132) to explore the relationship between different measures of socioeconomic status at birth-3 years and their association with a diagnosis of ADHD at age 7. A multiple mediation model was utilised to examine factors occurring between these ages that may mediate the association.

Results: Financial difficulties, housing tenure, maternal age at birth of child and marital status were significantly associated with an outcome of ADHD, such that families either living in financial difficulty, living in council housing, with younger or single mothers' were more likely to have a child with a research diagnosis of ADHD at age 7. Financial difficulties was the strongest predictor of ADHD (OR 2.23 95% CI 1.57-3.16). In the multiple mediation model, involvement in parenting at age 6 and presence of adversity at age 2-4 mediated 27.8% of the association.

Conclusions: Socioeconomic disadvantage, conceptualised as reported difficulty in affording basic necessities (e.g. heating, food) has both direct and indirect impacts on a child's risk of ADHD. Lower levels of parent involvement mediates this association, as does presence of adversity; with children exposed to adversity and those with less involved parents being at an increased risk of having ADHD. This study highlights the importance of home and environmental factors as small but important contributors toward the aetiology of ADHD

Postgrad Med. 2014 Sep;126:196-98.

SUBOPTIMAL DOSING OF STRATTERA (ATOMOXETINE) FOR ADHD PATIENTS.

Clemow DB.

To raise awareness, this article provides a commentary on the frequent underdosing of atomoxetine for the treatment of adult attention-deficit/hyperactivity disorder (ADHD) that may be associated with poor patient outcomes. Data suggest an adequate atomoxetine dose for sufficient duration is important for ADHD symptom improvement. Despite the recommended 80 mg/day target dose, real-world data show that an approximately 60 mg/day average adult atomoxetine dose is utilized. This article discusses the factors that may contribute to this suboptimal dosing. Atomoxetine dose titration, setting patient expectations, and the importance of keeping the patient at target dose for an adequate length of time (about 4-6 weeks) prior to judging efficacy are also discussed

Psychiatr Hung. 2014;29:410-17.

QUALITY OF LIFE OF NEWLY DIAGNOSED, TREATMENT NAIVE CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT HYPERACTIVITY DISORDER.

Velo S, Keresztesy A, Miklosi M, et al.

INTRODUCTION: Attention-deficit hyperactivity disorder (ADHD) is one of the most prevalent childhood psychiatric disorder, it affects around 3-12% of the children. ADHD is associated with numerous social and

emotional impairments. Quality of life (QoL) studies of children with ADHD established low QoL in the most cases. Our aim was to examine QoL of children with ADHD according to the following aspects: age, children's self-report and parentproxy report, and we also would like to compare them with healthy control group along several dimensions of QoL.

METHODS: The clinical group consist of a treatment naive group of children with ADHD, who were just diagnosed in the Vadaskert Hospital. The healthy control group consist of children from elementary schools. The children of control group do not have ADHD and do not stand under psychological or psychiatric treatment. In our study we applied Mini International Neuropsychiatric Interview Kid and Interventat Lebensqualität Kindern und Jugendlichen questionnaire.

RESULTS: Compared children with ADHD to healthy control group they have significantly lower QoL at many areas (school, peer realtions, generally) due their self report. By parent's proxy report children with ADHD have lower QoL according to all of the QoL domains. Parents of children with ADHD reported significantly lower QoL for their children in the most areas (school, family, peer realtion, mental state, generally) then the affected children. Adolescent with ADHD have lower QoL in 3 domains (school, peer relations, generally) than children with ADHD, while children with ADHD have lower QoL in one dimension (being alone) compared with adolescents with ADHD.

CONCLUSION: Based on our results children with ADHD compared to healthy control group have lower QoL in many dimensions and there are age-related differences in the assessment of QoL. Additionally, our study draw the attention to the differences of QoL assessment between children and parents

Psychiatry Res Neuroimaging. 2015.

NEURAL CORRELATES OF VISUOSPATIAL WORKING MEMORY IN ATTENTION-DEFICIT/HYPERACTIVITY DISORDER AND HEALTHY CONTROLS.

van EH, Weeda WD, Heslenfeld DJ, et al.

Impaired visuospatial working memory (VSWM) is suggested to be a core neurocognitive deficit in attention-deficit/hyperactivity disorder (ADHD), yet the underlying neural activation patterns are poorly understood. Furthermore, it is unclear to what extent age and gender effects may play a role in VSWM-related brain abnormalities in ADHD. Functional magnetic resonance imaging (fMRI) data were collected from 109 individuals with ADHD (60% male) and 103 controls (53% male), aged 8-25 years, during a spatial span working memory task. VSWM-related brain activation was found in a widespread network, which was more widespread compared with N-back tasks used in the previous literature. Higher brain activation was associated with higher age and male gender. In comparison with controls, individuals with ADHD showed greater activation in the left inferior frontal gyrus (IFG) and the lateral frontal pole during memory load increase, effects explained by reduced activation on the low memory load in the IFG pars triangularis and increased activation during high load in the IFG pars opercularis. Age and gender effects did not differ between controls and individuals with ADHD. Results indicate that individuals with ADHD have difficulty in efficiently and sufficiently recruiting left inferior frontal brain regions with increasing task difficulty

Psychiatry Res Neuroimaging. 2015.

MORPHOLOGICAL ABNORMALITIES IN PREFRONTAL SURFACE AREA AND THALAMIC VOLUME IN ATTENTION DEFICIT/HYPERACTIVITY DISORDER.

Batty MJ, Palaniyappan L, Scerif G, et al.

Although previous morphological studies have demonstrated abnormalities in prefrontal cortical thickness in children with attention deficit/hyperactivity disorder (ADHD), studies investigating cortical surface area are lacking. As the development of cortical surface is closely linked to the establishment of thalam-ocortical connections, any abnormalities in the structure of the thalamus are likely to relate to altered cortical surface area. Using a clinically well-defined sample of children with ADHD (n=25, 1 female) and typically developing controls (n=24, 1 female), we studied surface area across the cortex to determine whether

children with ADHD had reduced thalamic volume that related to prefrontal cortical surface area. Relative to controls, children with ADHD had a significant reduction in thalamic volume and dorsolateral prefrontal cortical area in both hemispheres. Furthermore, children with ADHD with smaller thalamic volumes were found to have greater reductions in surface area, a pattern not evident in the control children. Our results are further evidence of reduced lateral prefrontal cortical area in ADHD. Moreover, for the first time, we have also shown a direct association between thalamic anatomy and frontal anatomy in ADHD, suggesting the pathophysiological process that alters surface area maturation is likely to be linked to the development of the thalamus

Psychiatry Res Neuroimaging. 2015.

CORTICAL THICKNESS DIFFERENCES IN THE PREFRONTAL CORTEX IN CHILDREN AND ADOLESCENTS WITH ADHD IN RELATION TO DOPAMINE TRANSPORTER (DAT1) GENOTYPE.

Fernández-Jaén A, López-Martín S, Albert J, et al.

Several lines of evidence suggest that the dopamine transporter gene (DAT1) plays a crucial role in attention deficit hyperactivity disorder (ADHD). Concretely, recent data indicate that the 10-repeat (10R) DAT1 allele may mediate neuropsychological functioning, response to methylphenidate, and even brain function and structure in children with ADHD. This study aimed to investigate the influence of 10R DAT1 on thickness of the prefrontal cortex in children and adolescents with ADHD. To this end, brain magnetic resonance images were acquired from 33 patients with homozygosity for the 10R allele and 30 patients with a single copy or no copy of the allele. The prefrontal cortex of each MRI scan was automatically parceled into regions of interest (ROIs) based on Brodmann areas (BA). The two groups were matched for age, gender, IQ, ADHD subtype, symptom severity, comorbidity and medication status. However, patients with two copies of the 10R allele exhibited significantly decreased cortical thickness in right BA 46 relative to patients with one or fewer copies of the allele. No other prefrontal ROI differed significantly between the two groups. Present findings suggest that cortical thickness of right lateral prefrontal cortex (BA 46) is influenced by the presence of the DAT1 10 repeat allele in children and adolescents with ADHD

Psychoanal Study Child. 2012;66:109-21.

TREATING CHILDREN WITH AFFECT DYSREGULATION. DISCUSSION OF DR. WENDY OLESKER'S ANALYSIS OF MATT. Yanof JA.

This paper is a discussion of Dr. Wendy Olesker's sensitive analytic treatment of an impulsive, affectively dysregulated, preschool child. Drawing on her knowledge and understanding of developmental interference, trauma, and conflict, Dr. Olesker uses a variety of nonverbal, interpretative, developmental, and play techniques during the analysis to help this boy progress in his development. She also works with the parents collaboratively as part of the therapeutic process. Because Dr. Olesker's description of Matt might easily fit a diagnosis of Attention Deficit Hyperactivity Disorder, it is suggested that child analysts recognize the usefulness of considering child analysis when they are evaluating or treating children with this diagnosis

Psychol Med. 2015 Jul;45:2057-71.

EMOTIONAL RESPONSE INHIBITION IN CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER: NEURAL AND BEHAVIOURAL DATA.

López-Martín S, Albert J, Fernández-Jaén A, Carretié L

Background: Although both emotion and response inhibition are thought to be important in attention-deficit/hyperactivity disorder (ADHD), little is known about the neural mechanisms that underlie the interaction between these two processes in patients with this disorder. This study aimed at examining how emotional contexts affect inhibitory control in children with ADHD.

Method: A total of 24 ADHD children and 24 healthy comparison subjects performed a modified go/no-go task during three different emotionally laden contexts: negative, neutral and positive. To explore the timing and the underlying neural substrates of emotion-modulated response inhibition, event-related potentials were measured and further analysed both at the scalp and at the voxel level.

Results: Patients with ADHD showed greater activation of inhibition-related neural mechanisms (i.e. no-go P3 amplitudes and orbitofrontal cortex activity) to maintain a similar level of performance as healthy comparison subjects, especially during the emotionally arousing contexts (negative and positive).

Conclusions: This study provides plausible neural mechanisms for the difficulty that ADHD children have in controlling their behaviour in highly emotional situations. Such emotional contexts might increase the need for top-down inhibitory control and put ADHD children at greater risk for impulsive behaviours and emotional dysregulation.

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Rev Colomb Psiquiatr. 2015;44:77-86.

DIFFERENTIAL EFFECTS OF ATTENTION DEFICIT/HYPERACTIVITY DISORDER SUBTYPES IN EVENT-RELATED POTENTIALS.

Tamayo-Orrego L, Osorio FA, Quintero Giraldo LP, et al.

Background To better understand the neurophysiological substrates in attention deficit/hyperactivity disorder (ADHD), a study was performed on of event-related potentials (ERPs) in Colombian patients with inattentive and combined ADHD.

Methods A case-control, cross-sectional study was designed. The sample was composed of 180 subjects between 5 and 15 years of age (mean, 9.25 $\pm$ 2.6), from local schools in Manizales. The sample was divided equally in ADHD or control groups and the subjects were paired by age and gender. The diagnosis was made using the DSM-IV-TR criteria, the Conners and WISC-III test, a psychiatric interview (MINIKID), and a medical evaluation. ERPs were recorded in a visual and auditory passive oddball paradigm. Latency and amplitude of N100, N200 and P300 components for common and rare stimuli were used for statistical comparisons.

Results ADHD subjects show differences in the N200 amplitude and P300 latency in the auditory task. The N200 amplitude was reduced in response to visual stimuli. ADHD subjects with combined symptoms show a delayed P300 in response to auditory stimuli, whereas inattentive subjects exhibited differences in the amplitude of N100 and N200. Combined ADHD patients showed longer N100 latency and smaller N200-P300 amplitude compared to inattentive ADHD subjects.

Conclusions The results show differences in the event-related potentials between combined and inattentive ADHD subjects

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Revista Neurociencias. 2015;23:190-204.

METHYLPHENIDATE IN CHILDREN IN BRAZIL: CRITICAL ANALYSIS OF SCIENTIFIC PUBLICATIONS FROM 2004 TO 2014.

Martins FAG, Ladislau +, Vilchez MK, et al.

Introduction. Attention Deficit and Hyperactivity Disorder (ADHD) compromises academic performance, social and family relationships in 3 to 7% of Brazilian schoolchildren. Methylphenidate is a mild central nervous system stimulant used to treatment ADHD, with short and long-term effects already described but others are not yet known.

Objective. To analyze the Brazilian scientific literature on the effects of Methylphenidate in children diagnosed with ADHD.

Method. Systematic review with selection and quality appraisal of included studies performed by independent reviewers.

Inclusion criteria: Brazilian articles addressing students diagnosed with ADHD and in use of Methylphenidate.

Exclusion criteria: articles published before 2004 or with samples with other age groups or that did not assess the effects of Methylphenidate usage.

Results. Seventeen articles were included, five with moderate and three with high methodological quality.

Conclusions. The evidentiary base produced in Brazil lacks better methodological quality. The production of moderate to high-quality shows heterogeneity of the effects of Methylphenidate. It is necessary to undertake clinical trials and cohorts studies with greater samples, follow-up time, and inclusion of various subtypes of ADHD, and use of more objective methods to evaluate Methylphenidate's effects in schoolchildren and that also address antidependency effect

Seishin Shinkeigaku Zasshi. 2014;116:921-35.

TRENDS OF PSYCHOTROPIC MEDICATION USE AMONG CHILDREN AND ADOLESCENTS IN JAPAN DATA FROM THE NATIONAL INSURANCE CLAIMS DATABASE BETWEEN 2002 AND 2010 .

Okumura Y, Fujita J, Matsumoto T.

Context: Despite evidence of an increase in the number of young patients receiving mental health treatment, most psychotropic medications have not been approved for the treatment of children and adolescents by the Ministry of Health, Labour and Welfare. There is little data available on psychotropic medication use in children and adolescents in Japan.

OBJECTIVE: To establish the prevalence of psychotropic medications and multiclass psychotropic polypharmacy in outpatients aged 18 years or younger in Japan between 2002 and 2010.

DESIGN: We used the national insurance claims database from the 2002-2010 Survey of Medical Care Activities in Public Health Insurance in Japan.

OUTCOME MEASURES: Prevalence of psychotropic prescription and psychotropic polypharmacy.

RESULTS: Our study dataset comprised 233,399 outpatient visits. Among patients aged 6-12 years between 2002-2004 and 2008-2010, there was a significant increase in the prevalence of ADHD medications (Odds Ratio [OR] 1.84; 95% Confidence Interval [CI] 1.33, 2.56) and antipsychotics (OR 1.58 95% CI 1.06, 2.34), and a significant decrease in the prevalence of sedative-hypnotics (OR 0.67; 95% CI 0.46, 0.99). Among patients aged 13-18 years, there was a significant increase in the prevalence of ADHD medications (OR 2.49; 95% CI 1.34, 4.62), anti-psychotics (OR 1.43 ; 95% CI 1.20, 1.70), and antidepressants (OR 1.37; 95% CI 1.09, 1.72). Medications that were most frequently involved used in combination of two or more psychotropic agents were mood stabilizer (93%), followed by antidepressants (77%), sedative-hypnotics (62%), antipsychotics (61%), and ADHD medications (17%).

CONCLUSION: Our study revealed an increase in the use of off-label antipsychotics and antidepressants among children and adolescents. Therefore, there is an urgent need for clinical trials to evaluate the efficacy of psychotropic medications for use in children and adolescents, and the development of a clinical database to monitor the associated long-term risks and benefits

Sleep Medicine Clinics. 2015.

RESTLESS LEGS SYNDROME/WILLIS-EKBOM DISEASE AND GROWING PAINS IN CHILDREN AND ADOLESCENTS.

Simakajornboon N, Dye TJ, Walters AS.

Recent studies have shown that restless legs syndrome (RLS) and periodic limb movement disorder (PLMD) are common in pediatric population. The diagnostic criteria for Pediatric RLS have recently been updated to simplify and integrate with newly revised adult RLS criteria. Management of RLS and PLMD involves pharmacologic and nonpharmacologic interventions. Children with low iron storage are likely to benefit from iron therapy. Although, there is limited information on pharmacologic therapy, there are emerging literatures showing the effectiveness of dopaminergic medications in the management of RLS and PLMD in children. This article covers clinical evaluation of RLS and PLMD in children and the relationship with growing pains

Sleep Med Rev. 2015.

THE USE OF ACTIGRAPHY IN THE MONITORING OF SLEEP AND ACTIVITY IN ADHD: A META-ANALYSIS.

De Crescenzo F, Licchelli S, Ciabattini M, et al.

Attention deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. There is an increasing need to find objective measures and markers of the disorder in order to assess the efficacy of the therapies and to improve follow-up strategies. Actigraphy is an objective method for recording motor activity and sleep parameters that has been used in many studies in ADHD. Our meta-analysis aimed to assess the current evidence on the role of actigraphy in both the detection of changes in motor activity and in sleep patterns in ADHD. A systematic review was carried out to find studies comparing children with unmedicated ADHD versus controls, using actigraphic measures as an outcome. The primary outcome measures were "sleep duration" and daytime "activity mean". As secondary outcome measures we analyzed "sleep onset latency", "sleep efficiency" and "wake after sleep onset". Twenty-four studies comprising 2179 children were included in this review. We show evidence that ADHD compared to typically developing children present a higher mean activity during structured sessions, a similar sleep duration, and a moderately altered sleep pattern. This study highlights the role of actigraphy as an objective tool for the ambulatory monitoring of sleep and activity in ADHD

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Social Cognitive and Affective Neuroscience. 2015 Jul;10:945-51.

EFFECT OF BRAIN STRUCTURE AND FUNCTION ON REWARD ANTICIPATION IN CHILDREN AND ADULTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER COMBINED SUBTYPE.

Kappel V, Lorenz RC, Streifling M, et al.

Attention deficit hyperactivity disorder (ADHD) is associated with decreased ventral-striatal responsiveness during reward anticipation. However, previous research mostly focused on adults with heterogeneous ADHD subtype and diverse drug treatment status while studies in children with ADHD are sparse. Moreover, it remains unclear to what degree ADHD is characterized by a delay of normal brain structure or function maturation. We therefore attempt to determine whether results from structural and functional magnetic resonance imaging (fMRI) are associated with childhood and adult ADHD combined subtype (ADHD-CT). This study used fMRI to compare VS structure and function of 30 participants with ADHD-CT (16 adults, 14 children) and 30 controls (20 adults, 10 children), using a monetary incentive delay task. Joint analyses of structural and functional imaging data were conducted with Biological Parametric Mapping. Reward anticipation elicited decreased ventral-striatal responsiveness in adults but not in children with ADHD-CT. Children and adults with ADHD showed reduced ventral-striatal volume. Taking these gray matter differences into account, the results remained the same. These results suggest that decreased ventral-striatal responsiveness during reward anticipation is present in adults but not in children with ADHD-CT, irrespective of structural characteristics. The question arises whether ventral-striatal hypoactivity is an ADHD correlate that develops during the course of illness.

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The Lancet Psychiatry. 2015;2:661-66.

CHILDHOOD: A SUITABLE CASE FOR TREATMENT?

Singh I, Wessely S.

We examine the contemporary debate on attention deficit hyperactivity disorder, in which concerns about medicalisation and overuse of drug treatments are paramount. We show medicalisation in attention deficit hyperactivity disorder to be a complex issue that requires systematic research to be properly understood. In particular, we suggest that the debate on this disorder might be more productive and less divisive if longitudinal, evidence-based understanding of the harms and benefits of psychiatric diagnosis and misdiagnosis existed, as well as better access to effective, non-drug treatments. If articulation of the values

that should guide clinical practice in child psychiatry is encouraged, this might create greater trust and less division

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The Lancet Psychiatry. 2015.

EFFECT OF DRUGS ON THE RISK OF INJURIES IN CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER: A PROSPECTIVE COHORT STUDY.

Dalsgaard S, Leckman JF, Mortensen PB, et al.

Background: Injuries represent the largest disease burden and most common cause of death in children. Attention deficit hyperactivity disorder (ADHD) is associated with increased mortality, with accidents being the most common cause of death in ADHD. However, it is not known whether pharmacological treatment has any modifying effect on the risk of injuries in children and adolescents with ADHD.

Methods: Using Danish national registers, we followed a cohort of 710 120 individuals, including 4557 individuals diagnosed with ADHD before age 10 years. Using a quasi-experimental, difference-in-difference design, we estimated the odds ratios (ORs) for injuries and the mean change in prevalence rates of injuries and emergency ward visits before and after treatment, with matched untreated children with ADHD at the same age serving as controls.

Findings: Children with ADHD were more likely to sustain injuries, compared with children without ADHD, at age 10 years (adjusted OR=1.29, 95% CI 1.22–1.37) and at age 12 years (adjusted OR=1.30, 1.23–1.37). From age 5 to 10 years, the prevalence of injuries in children with ADHD who were treated with ADHD drugs decreased from 19% to 14%, compared with a prevalence of about 17% in non-treated children with ADHD. This corresponded to an adjusted difference-in-difference reduction in prevalence of injuries at age 10 years of 31.5% (8.2–54.8) and 43.5% (18.1–69.0) at age 12 years due to treatment. Pharmacological treatment also reduced the prevalence of emergency ward visits at age 10 years (28.2%, 6.3–50.1) and age 12 years (45.7%, 25.8–65.7).

Interpretation: Children with ADHD had an increased risk of injuries compared with other children. Treatment with ADHD drugs reduced the risk of injuries by up to 43% and emergency ward visits by up to 45% in children with ADHD. Taken together with previous findings of accidents being the most common cause of death in individuals with ADHD, these results are of major public health importance.

Funding: The Lundbeck Foundation, the Danish Council for Independent Research, Centre For Integrated Register-based Research at Aarhus University, the Region of Southern Denmark Research Foundation, and Wørzner's Foundation.

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Z Kinder Jugendpsychiatr Psychother. 2015 Mar;43:101-14.

HYPERKINETIC DISORDERS IN CHILDHOOD AND ADOLESCENCE- AN ANALYSIS OF KINDERAGATE 2009-2012.

Stegmann B, Rexroth CA, Wenzel-Seifert K, et al.

OBJECTIVE: This contribution evaluates the prevalence, medication use as well as age and sex distribution in inpatients with hyperkinetic disorders at the KinderAGATE hospitals for 2009-2012.

METHOD: The age, sex, leading diagnosis, prescribed medication, and dosage of each patient were recorded anonymously twice a year. They provide an outstanding epidemiological basis for the observation of the actual situation in child and adolescent psychiatry.

RESULTS: Compared to our patient collective, patients diagnosed with hyperkinetic disorders (25.5% Pat) were on average 2 years younger and received psychopharmacological treatment more often (statistically significant). Although male patients are dominant here (84.3% HPat, mean age 9.9 years vs. 15.7% HPat, 10.1 years), the same proportion of female and male patients received psychostimulant treatment (48.0% vs. 52.2%). Besides methylphenidate, amphetamine, and atomoxetine, the antipsychotics risperidone, pipamperone, and quetiapine were noticeably often prescribed.

CONCLUSION: Methylphenidate remains the drug of first choice in the treatment of ADHD. There is an upward trend in the proportion of patients being treated with antipsychotics, though this is not statistically

significant. Because of the discrepancy between the available evidence and prescription practice in child and adolescent psychiatry, there is still a great demand for studies regarding long-term efficacy and side effects

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Z Kinder Jugendpsychiatr Psychother. 2015 Mar;43:123-31.

MINDFULNESS-BASED INTERVENTION IN ATTENTION-DEFICIT-/HYPERACTIVITY DISORDER (ADHD).

Schmiedeler S.

This paper reviews the current literature on mindfulness-based interventions in the treatment of attention-deficit/hyperactivity disorder (ADHD). Mindfulness means paying attention and being aware of the experiences occurring in the present moment, and it is usually developed by the practice of meditation. Research shows that mindfulness training is associated with improved attention systems and self-regulation, and that it therefore fosters those skills that are underdeveloped in individuals with ADHD. Although only few studies have investigated the effectiveness of mindfulness training in ADHD (many of which showing methodological limitations), the findings do suggest that mindfulness may be useful in ADHD interventions

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Z Kinder Jugendpsychiatr Psychother. 2015 Mar;43:91-100.

THE AWMF-GUIDELINES FOR HYPERKINETIC DISORDERS IN THERAPEUTIC PRACTICE- KNOWLEDGE, FAMILIARITY, UTILIZATION, AND ATTITUDE OF PSYCHOTHERAPISTS AND PHYSICIANS.

Isensee C, Hagmayer Y, Rothenberger A, et al.

OBJECTIVE: The AWMF-Guidelines for Hyperkinetic Disorders (ADHD) provide psychotherapists and physicians with guidance concerning diagnostics and treatment for one of the most common disorders in children and adolescents. To date, however, it is unclear how these guidelines are being applied by practicing therapists (both physicians and psychotherapists) and what they consider to be its pros and cons. This study proposes (1) to analyze the differences between the estimation of ADHD-guidelines by users and nonusers, their corresponding attitudes, experiences, and evaluations of context factors; and (2) to analyze whether users and nonusers differ in their therapeutic practice.

METHODS: 71 therapists participated in a nonrepresentative online survey.

RESULTS: The hypothesis was confirmed that, on average, users had a more positive attitude toward and experience with guideline-driven treatment than did nonusers. The results also show a small positive effect of guideline use on treatment quality. However, the methods employed by users and nonusers only moderately corresponded with the recommendations of the guidelines.

CONCLUSIONS: It was shown that the ADHD guideline is only rarely being used, even under advantageous conditions, and that a practice-oriented form of the guideline does not exist until now

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Z Kinder- Jugendpsychiatr Psychother. 2015;43:275-88.

GUIDED SELF-HELP INTERVENTIONS FOR PARENTS OF CHILDREN WITH ADHD - CONCEPT, REFERRAL AND EFFECTIVENESS IN A NATIONWIDE TRIAL. AN OBSERVATIONAL STUDY.

Mokros L, Benien N, et al .

Objectives: The effects of guided self-help interventions for parents of children with ADHD have already been proven in randomized controlled trials. The objective of this study was to assess the effectiveness of this novel form of intervention under routine care conditions in a nationwide trial.

Method: Registered pediatricians as well as child and youth psychiatrists enrolled 274 children between 6 and 12 years old (83.6% male) diagnosed with ADHD to a self-help program for parents of children with ADHD. The program lasted for 1 year and consisted of eight booklets with advice for parenting children with ADHD as well as complementary telephone consultations (14 calls, up to 20 minutes each). The

course of the ADHD symptoms and the comorbid symptoms as well as the development of the child's individual problems were assessed in a pre-post design.

Results: 63% of the enrolled parents adhered to the program until the end. The families who cancelled the program did not differ concerning the severity of ADHD symptoms, but they did more often show an impaired familial and social background, and their children received pharmacological treatment more often. Three-fourths of the children who completed the program had received pharmacological treatment at the beginning of the program. The children had more severe ADHD symptoms than a clinical control group. During the intervention, ADHD symptoms as well as psychosocial functioning improved with large effect sizes of $d > 0.9$. Additionally, comorbid oppositional and emotional symptoms decreased.

Conclusions: These results indicate that guided self-help programs for families with children with ADHD are effective, also as an addition to pharmacological treatment

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Z Psych Psychol Psychother. 2015;63:187-96.

ADHD IN ADOLESCENTS AND YOUNG ADULTS.

Merkt J, Petermann F.

Adolescence (16 to 21 years) is accompanied by new developmental tasks and risks. Due to their hyperactivity, impulsivity and inattention adolescents with ADHD are vulnerable for adverse development. An analysis of the literature shows that substance abuse and delinquency are the themes most often researched in adolescents with ADHD. Other developmental tasks that are risky for adolescents with ADHD are: developing independence from parents, starting marriage and family life, friendships with peers, starting a career, and accepting one's physique. Developmental tasks that have been accomplished successfully can be protective or compensatory and could be used as a resource. For young adults with ADHD who seek help of a psychiatrist for the first time, diagnosing ADHD is the challenge. For adolescents who received a diagnosis of ADHD in childhood the main problem is the continuation of care, albeit low compliance in some cases. Independent of the timing of the diagnosis adolescents with ADHD are vulnerable. They need assistance in the transition from child to adult mental health service and structured support to accomplish important developmental tasks of adolescence

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Zh Evol Biokhim Fiziol. 2015 Mar;51:77-87.

OXYGEN-DEPENDENT ENERGY DEFICIT AS RELATED TO THE PROBLEMS OF ONTOGENETIC DEVELOPMENT DISORDERS AND HUMAN SOCIOBIOLOGICAL ADAPTATION (THEORETICAL AND APPLIED ASPECTS).

Ilyukhina VA, Kataeva GV, Korotkov AD, et al.

The review states and argues theoretical propositions on the pathogenetic role of pre- and perinatal hypoxic-ischemic brain damage in the formation of sustained oxygen-dependent energy deficit underlying in further ontogenesis the following neurobiological abnormalities: a) a decline in the level of health and compensatory-adaptive capacities of the organism, b) disorders of the psycho-speech development and adaptive behavior in children, c) early development of neuropsychic diseases, g) addition of other types of brain energy metabolism (including glucose metabolism) disorders in chronic polyetiologic diseases young and middle-aged individuals. We highlight and theoretically substantiate the integrated physiological parameters of the oxygen-dependent energy deficit types. We address the features of abnormalities in neuroreflectory and neurohumora regulatory mechanisms of the wakefulness level and its vegetative and hemodynamic provision in different types of energy deficit in children with DSMD, ADHD and school maladjustment. The use of the state-of-the-art neuroimaging techniques significantly increased the possibility of the disintegration of regulatory processes and cognitive functions in children with psycho-speech delays and in a wide range of chronic polyetiologic diseases

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CLINICAL REVIEW

The use of actigraphy in the monitoring of sleep and activity in ADHD: A meta-analysis

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SUMMARY

Attention deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood. There is an increasing need to find objective measures and markers of the disorder in order to assess the efficacy of the therapies and to improve follow-up strategies. Actigraphy is an objective method for recording motor activity and sleep parameters that has been used in many studies in ADHD.

Our meta-analysis aimed to assess the current evidence on the role of actigraphy in both the detection of changes in motor activity and in sleep patterns in ADHD.

A systematic review was carried out to find studies comparing children with unmedicated ADHD versus controls, using actigraphic measures as an outcome. The primary outcome measures were "sleep duration" and daytime "activity mean". As secondary outcome measures we analyzed "sleep onset latency", "sleep efficiency" and "wake after sleep onset".

Twenty-four studies comprising 2179 children were included in this review. We show evidence that ADHD compared to typically developing children present a higher mean activity during structured sessions, a similar sleep duration, and a moderately altered sleep pattern.

This study highlights the role of actigraphy as an objective tool for the ambulatory monitoring of sleep and activity in ADHD.

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Introduction

Attention deficit and hyperactivity disorder (ADHD) is among the most prevalent childhood psychiatric disorders, with an estimated prevalence rate of 5% [1]. The scientific community agrees that ADHD is a complex and multifactorial disorder and that it is not the result of one clear or single cause. The most frequently cited aetiological hypotheses are genetic, neurochemical, neurobiological, and environmental [2].

According to the diagnostic and statistical manual of mental disorders, fifth edition (DSM-5) [3], ADHD is characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development with onset before the age of 12 y. More specifically, the DSM-5 diagnosis of ADHD requires six symptoms of hyperactivity and impulsivity or six symptoms of inattention, while for older adolescents and adults (age 17 and older), at least five symptoms are required. Manifestations of ADHD must be present in more than one setting (e.g., home and school, work) and persist for at least six months [3]. The DSM-5 defines three ADHD clinical presentations based on symptom count: combined presentation, predominantly inattentive presentation and predominantly hyperactive/impulsive presentation. The ICD-10 [4] uses the specific diagnostic term of hyperkinetic disorder (HKD) to describe the

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Glossary of terms

ADDES-H	attention-deficit disorders evaluation scale – home version
ADDES-S	attention-deficit disorders evaluation scale – school version
ADHD	attention-deficit/hyperactivity-disorder
ADHDRS	attention-deficit/hyperactivity-disorder rating scale
APA	American psychiatric association
CBCL	child behavior checklist
CI	confidence interval
CGI-S	clinical global impression – severity of illness
CPRS	Conner's parent rating scale
CPT	continuous performance test
CSHQ	children's sleep habits questionnaire
CSI	child symptom inventory-parent and teacher
CSP-Q	child sleep questionnaire – parent version
CTQ	Conner's teacher questionnaire
CTRS	Conner's teacher rating scale
DISC IV	diagnostic interview schedule for children
DSM-5	diagnostic and statistical manual of mental disorders 5th edition
ESS	Epworth sleepiness scale
FBB-HKS	questionnaire for teacher – hyperkinetic syndrome
HKD	hyperkinetic disorder
ICD-10	international classification of diseases 10th Edition
ISI-C	insomnia severity index for children
K-ARS	ADHD rating scale, korean edition
K-DIPS	diagnostisches interview fur psychische storungen im kindesalter

K-SADS-PL	kiddie-sads-present and lifetime version
MFFT	matching familiar figure test
MPH	methylphenidate
MSLT	multiple sleep latency test
NEPSY	developmental neuropsychological assessment
NES	neurobehavioral evaluation
N.R.	not reported
PACS	parental account of childhood symptoms
PIAT	Peabody individual achievement test-revised
PICS	parent interview for child symptoms
PPVT-R	Peabody picture vocabulary test revised
PSG	polysomnography
P-YRMS	parent version of the young mania rating scale
RCPM	Raven's colored progressive matrices
SLAQ	sleep lab adaptation questionnaire
QUADAS	quality assessment of diagnostic accuracy studies
SMD	standardized mean differences
SD	standard deviation
SSD	stop signal delays
SWAN-F	symptoms and normal behavior questionnaire
TBI	traumatic brain injury
TD	typically developing
TRF	teacher report form
TTI	teacher telephone interview
WAIS-III	Wechsler adult intelligence scale 3rd edition
WHO	world health organization
WISC-III	Wechsler intelligence scale for children third edition
WISC IV	Wechsler intelligence scale for children fourth edition
WPPSI	Wechsler primary and preschool intelligence test
WRAT-R	wide range achievement test revised

syndrome, which comes close to meeting the criteria for the combined clinical presentation of DSM-5. Specifically, HKD requires symptoms of impaired attention, hyperactivity and impulsivity in more than one setting (e.g., academic, social, and occupational).

The current clinical understanding of ADHD does not require performance of any screen or test [5] and the assessment includes both a medical and a psychological clinical evaluation based on DSM-5 [3] or ICD-10 [4] criteria. The clinical evaluation of ADHD is multidimensional to capture its situational variability, its associated features, and its impact on home, school, and social functioning. The multi-method assessment approach should include: general medical history; DSM-5 or ICD-10 based parent and child interviews (e.g., Kiddie schedule for affective disorders and schizophrenia for school-age children—present and lifetime, K-SADS-PL [6]); parent- and teacher-completed child behavior rating scales (e.g., Conners third edition [7]); individually administered neuropsychological and intelligence testing (e.g., Wechsler intelligence scale for children –fourth edition [8]); educational achievement testing and screening for learning disabilities; assessment for coexisting psychiatric disorders including oppositional defiant disorder, conduct disorder, mood disorder, anxiety disorder, obsessive compulsive disorder, abuse; general assessment for coexisting medical conditions; educational and psychosocial evaluation. Other assessments might be warranted for further evaluations including: blood lead level, thyroid hormones, genetics consultation/testing, neurology consultation/electroencephalography [9,10]. At present, the diagnosis is based on subjective measures and there is an increasing need to find objective measures

and markers that overcome the existing differences in definitions and that help to monitor the clinical evolution of individuals with ADHD.

Treatment of ADHD may involve behavioral interventions, school-based interventions, psychological interventions or medication (psychostimulants) alone or in combination. Psychostimulants, such as methylphenidate (MPH), amphetamines and/or various amphetamine and dextro-amphetamine preparations are the most common types of medication that have been shown to be effective for treating ADHD. The treatment strategies for children with ADHD vary according to age [9]. Behavioral interventions include modifications in the physical and social environment that are designed to change behavior using rewards, positive reinforcement, and non-punitive consequences [9,11]. Behavioral interventions are preferred to medication as the initial intervention for preschool children with ADHD but medications may be used as an adjunct to behavioral interventions for preschool children (four through five y) who fail to respond to behavioral interventions alone. Combination therapy uses both behavioral/psychological interventions and medication. In a systematic review and a meta-analysis, combination therapy was more effective than behavior/psychological therapy alone in improving core symptoms of ADHD but no more effective than medication treatment alone [12,13]. Parenting programs give parents simple and practical strategies to help them manage their children's behavior, and prevent problems. School-based interventions may include the provision of tutoring or resource room support, classroom modifications, accommodations, or behavioral interventions [9].

If left untreated, ADHD is associated with long-term educational and social disadvantage [14]. Indeed, children affected by ADHD are at greater risk for comorbid antisocial behavior, poor academic or vocational performance, substance misuse, and other psychiatric disorders such as anxiety and depression [15]. Moreover in ADHD there is a higher incidence of sleep onset insomnia [10], night awakenings, delayed sleep phase and increased nocturnal activity [16,17] and ADHD symptoms often overlap with those observed in children suffering from sleep deprivation [18]. However, studies examining the association between ADHD or its symptoms and sleep disturbances have yielded inconsistent results [19]. Using subjective (e.g., questionnaires) and objective (neurophysiological) measures, several studies have attempted to clarify the links between ADHD and sleep disorders. Studies using subjective measures (e.g., sleep questionnaires completed by parents) found that children with ADHD have more sleep disturbances compared with typically developing (TD) children, while studies using objective measures (e.g., polysomnography [PSG] and actigraphy) lead to inconsistent results [20]. The heterogeneity of results might be due to the use of medication and the night-to-night variability of sleep [21].

Actigraphy is a non-invasive objective method for recording motor activity and sleep parameters by means of an electronic device worn on the body. The main motor activity parameter assessed by actigraphy is the “activity mean”. Sleep parameters are derived from night-time activity scores. The main sleep parameters are “sleep duration”, which is the sleep time excluding all periods of wakefulness; “sleep onset latency”, which is the time in minutes from getting into bed to actigraphically defined sleep onset (this usually happens after the first 10 min interval of activity below the threshold set for determining wakefulness); “sleep efficiency”, which is the ratio of total sleep time, to nocturnal time in bed; “wake after sleep onset”, which is the period of wakefulness after sleep onset. The actigraph allows a patient’s activity information to be obtained either in an experimental setting or in a natural setting for a prolonged and continuous period. In recent years, actigraphy has become a major assessment tool, especially in sleep research, sleep medicine, and proved to be reliable [22], valid [23], and cost-effective [24]. In a previous meta-analysis of randomized clinical trials we already evaluated the use of actigraphy as a measure of monitoring activity mean and sleep patterns in children with ADHD treated by MPH [25]. Our results suggested that actigraphy might be a valuable tool for prescribing clinicians who must balance the efficacious effects on hyperactivity against the adverse effects on sleep that MPH may have. However, we recognized that these initial results needed a measure of comparison, since the data comparing actigraphic measures in ADHD versus healthy controls had never been pooled. This implied that we did not have a reliable estimate of the difference between a child with ADHD and a TD child.

The present study therefore is aimed at systematically reviewing and quantitatively synthesizing the current evidence on the role of actigraphy in the detection of changes in activity and sleep patterns in ADHD compared with TD children. Our hypothesis is that actigraphy is a valid measure of the mean activity level and a tool for monitoring its impact on sleep patterns, which could contribute to the clinical diagnosis of ADHD.

Methods

Literature search

A literature search of the PubMed/MEDLINE, CINAHL, ISI web of knowledge, Cochrane library, Psychology and behavioral sciences

collection databases was carried out to find relevant peer reviewed articles comparing actigraphic measures in children with ADHD versus TD children. A search algorithm based on a combination of the terms: (ADHD OR attention deficit OR ‘hyperactivity disorder’) AND (actigrap* OR actimet* OR actograp* OR actomet* OR accelerometer) was used. No lower date limit was used and the search was continued until July 2014. To expand our search, reference lists of the retrieved articles were also screened for additional studies (the search strategy is available in the [supplementary material as document S1](#)).

Study selection

All studies or subsets of studies in children with ADHD having an actigraphic assessment for both sleep and activity were eligible for inclusion.

The exclusion criteria were: a) articles not within the field of interest of this review; b) review articles, editorials or letters, comments, conference proceedings; c) case reports; d) studies dated before 1990 if the system used for the diagnosis did not use operationalized criteria, but only disease names with no diagnostic criteria (i.e., ICD-9); e) studies with patients aged more than 18 y; f) studies in children with ADHD on a pharmacological treatment; g) studies without a control group of TD children; h) studies without a proper diagnosis of ADHD; i) studies on children with ADHD and a serious concomitant medical illness.

Two researchers (SL and MC) independently reviewed the titles and the abstracts of the retrieved articles, applying the inclusion and exclusion criteria mentioned above. The same two researchers then independently reviewed the full-text version of the articles to confirm their eligibility for inclusion. Disagreements were resolved in a consensus meeting or by a third reviewer (FDC). Considerable care was taken to exclude duplicate publications.

Data extraction

For each included study, information was collected systematically and independently by the two researchers mentioned above about the publication (author names, journal, year of publication, country of origin), the patient and the comparison characteristics (gender, age, how the diagnosis was made, the outcomes of the study, actigraphic methodological features). Data were then extracted independently and entered into RevMan 5.3 software by two review authors (MC, FDC).

Outcome measures

The primary outcome measures were the analyses of “sleep duration” and of “activity mean”. As secondary outcomes, we analysed “sleep latency”, “sleep efficiency” and “wake after sleep onset”, which are considered less reliable parameters for actigraphy [22].

Quality assessment

The methodological quality and potential sources of bias for each study were assessed by using the quality assessment of diagnostic accuracy studies (QUADAS) [26]. This instrument consists of eleven items. The first of them assesses the representative spectrum; the second, fourth, fifth and sixth item examine the applicability of an appropriate reference standard; the third item assesses the presence of a delay between the tests; the seventh and eighth items assess the blinding; the ninth indicates whether relevant clinical information was available

during the interpretation of results; the tenth item examines whether all the results were reported; while the eleventh item assesses whether all the withdrawals from the study were explained. Two authors scored independently (SL, MC), and differences were resolved by consensus or by a third reviewer (FDC). Moreover, funnel plots were visually checked to exclude the presence of publication bias.

Data analysis

Consistent with meta-analytic recommendations [27], we synthesized and analysed our set of studies. This procedure involved the following steps: a) calculating standardized mean difference (SMD) effect sizes for each comparison with confidence intervals (95%); b) determining an overall effect size; c) estimating heterogeneity.

Data for each study were expressed as standardized mean difference, since differences on actigraphic devices and on storage rates used suggested we should think of them as different measurement scales, using the random effects model which is more conservative than the fixed-effects model. To check for the existence of publication bias, visual inspection of the data was completed using funnel plots, and any potential outliers were identified within each domain. Qualitative data have been presented descriptively.

The I^2 index was used to assess the heterogeneity of effect sizes [28]. Its value lies between 0 and 100 and estimates the percentage of variation among effect sizes that can be attributed to heterogeneity. A significant I^2 suggests that the effect sizes analysed are not estimating the effect size of the same population. Following Higgins et al. [28], we discussed I^2 thresholds of 25%, 50% and 75% to differentiate low, moderate and high heterogeneity. In interpreting SMD values, we considered SMD “small” if < 0.40 , “moderate” from 0.40 to 0.70 and “large” if > 0.7 [27]. In order to address heterogeneity, to estimate outliers and to examine the robustness of the results, we performed a sensitivity analysis using the jackknife method for the primary outcomes [29].

Moreover, we decided to perform a separate sensitivity analysis on the activity mean during the 24 h and during structured experimental sessions.

Results

Selected studies

The literature search generated 354 articles. Reviewing titles and abstracts, articles were excluded applying the criteria mentioned above: 268 studies were excluded because they were not within the field of interest of this review and 86 articles were retrieved in full text. Of these, 25 studies were excluded because some of the participants or all of them were on pharmacological treatment; 16 studies were excluded due to lack of TD control population or no control population at all; three were letters to the editor; 12 were studies with a population without a proper ADHD diagnosis; four studies were with subjects older than 18 y; one study was with children with developmental coordination disorder and comorbid ADHD and one study was not on humans (references of the excluded studies are available in the [supplementary material as document S2](#)).

Finally, 24 studies comprising 2179 participants were included in a qualitative synthesis [17,19,30–51]. Of these 19 studies (eight assessing activity mean and eleven studies assessing sleep parameters) comprising a total of 1323 children (631 ADHD and 692 TD) were included in the quantitative analysis (see flow chart as Fig. 1).

Study characteristics

The characteristics of the included studies are presented in Table 1. Almost all the studies retrieved were in English, but one was in German [47]. The majority of participants were male, with a mean age of nine years, one study included children between three and four years [30] and one study included adolescents with a mean age of 15.1 y for ADHD and 14.1 y for controls [38].

The methodological aspects of actigraphic devices are presented in Table 2. Actigraphic devices varied and the specific types of device were not always reported. Actigraphic devices were worn in most studies on the non-dominant wrist, but some reported their use on the ankles or on the waist. The storage rate used was not always reported, but for the most, it was around 1 min epoch. When the actigraph was used to detect activity mean, the device was continuously used during 24 h only in two studies [39,42], while for the rest of the studies it was on average used only for a couple of hours during experimental sessions.

Primary outcomes

Effect sizes with 95% confidence intervals for each parameter from each individual study plus the pooled results from the meta-analyses are shown in Tables 3–7. The primary outcomes are shown in Tables 3 and 4. The meta-analysis indicates that children with ADHD have a moderately increased activity mean compared to TD (SMD = 0.65 [0.45, 0.84], $P < 0.00001$). There is homogeneity among the studies ($I^2 = 19\%$) and the jackknife analysis (see Table S3) confirms the robustness of this result. The sensitivity analysis dividing the results of the activity mean during the 24 h and during structured experimental sessions highlights that only two small studies reported an activity mean during the 24 h [39,42] and the pooled meta-analysis does not show a statistical difference between ADHD and TD children. However reaching statistically significant results would have been difficult due to the size of the studies (28 ADHD compared to 28 TD children), which resulted in a wide confidence interval (SMD = 0.24 [−0.29, 0.77]). We found instead that results are highly suggestive towards the use of actigraphy during structured experimental sessions, with a strong increase of activity mean and a clear homogeneity among the studies (SMD = 0.71 [0.51, 0.90]); $I^2 = 15\%$).

Notably, we had to exclude Rapport et al. (2009) [41] from the analyses, since it presented results as a sum of three actigraphic devices. Its results highlight a much higher activity mean in ADHD compared with TD children (SMD = 2.43 [1.31, 3.56]).

The meta-analysis of sleep duration is not significant and indicates that there is no evidence that children with ADHD compared to TD have different sleep duration. There is homogeneity among the studies ($I^2 = 7\%$), while the jackknife analysis (see Table S4) suggests a possible small reduction in sleep duration for ADHD children.

Secondary outcomes

The secondary outcomes are shown in Tables 5–7. The meta-analysis of sleep latency shows a significant and moderate increase in ADHD compared to TD children (SMD = 0.51 [0.10, 0.92]). The high heterogeneity ($I^2 = 79\%$) creates a larger confidence interval in the random effects model, but the estimate remains significant ($P = 0.01$). The sleep efficiency parameter also indicates a moderate effect with a lower score in ADHD (SMD = −0.69 [−1.32, −0.05]). Notwithstanding the high heterogeneity ($I^2 = 89\%$), the results remain statistically significant ($P = 0.03$). On the other hand there is no evidence of a statistically significant difference in

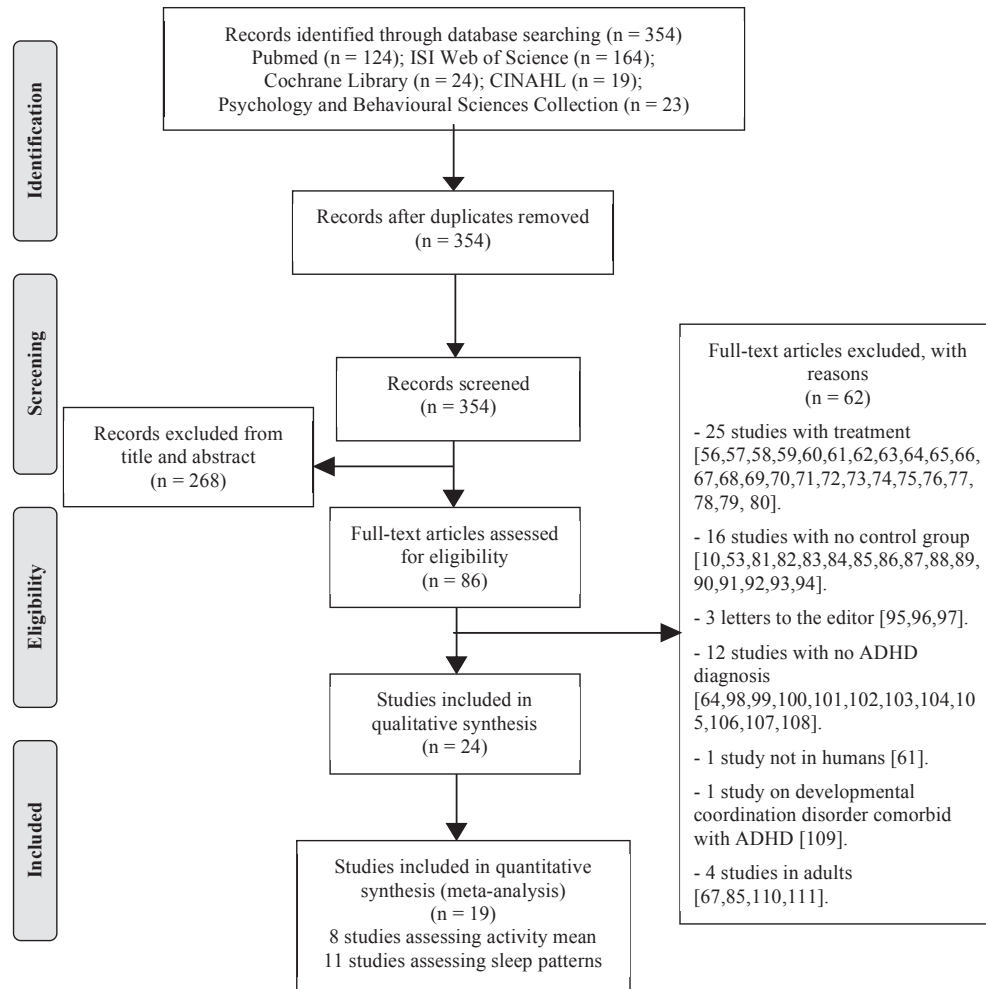


Fig. 1. Flow chart. References of the excluded studies are available in the [supplementary material as document S2](#).

wakefulness between ADHD and TD children judging from the wake after sleep onset data (SMD = 0.06 [−0.16, 0.28]; $I^2 = 45\%$).

Quality assessment

Assessment of the methodological quality of included articles according to the QUADAS criteria is reported in Table 8. Three of the criteria were met by all studies. None of the studies had representative spectrum and reference standard results and index test results were not blinded. Withdrawals were considered insufficiently explained only in one study [41]. The reference standard was not considered acceptable if in the original article it was not accurately reported that all the participants had a visit to an appropriate mental health professional. Visual inspection of the funnel plots was not suggestive of publication bias.

Post-hoc analysis

Since ADHD prevalence was found to be higher in males in various clinical studies with a ratio as high as 10 to 1 [52,53], we decided to perform a subgroup analysis to differentiate studies with 100% males for both patients with ADHD and healthy controls from studies with males and females and to analyze if gender had any impact on the activity mean. For the studies investigating the activity mean, only Tsujii et al. [42] and Alderson et al. [34] had 100% males for both patients with ADHD and healthy controls. The

pooled population of males comprised 29 patients with ADHD versus 29 healthy controls (SMD = 0.79 [−0.51, 2.09]). The pooled population of studies with males and females, without Tsujii et al. [42] and Alderson et al. [34], for the activity mean comprised 305 patients with ADHD versus 237 healthy controls (SMD = 0.67 [0.49, 0.84]). This subgroup analysis shows that there is no significant difference in activity mean between patients with ADHD and healthy controls, if we take only studies in males. However, the large confidence interval and the small population included do not allow more in depth considerations. Therefore, at this stage we cannot exclude a gender effect and more research is needed to investigate this issue.

Discussion

The results show evidence for a higher activity mean in ADHD compared to TD children, as expected, while there is no evidence for altered sleep duration. The secondary outcomes show that sleep latency and sleep efficiency appear altered in ADHD while wakefulness periods are not significantly different compared to TD children.

The results of the meta-analysis of activity mean are clear and robust. The low heterogeneity and the jackknife analysis support a finding of higher motor activity in ADHD. The clinical usefulness of this finding is demonstrated in other studies through the positive correlation of the activity mean with poorer levels of performance

Table 1
Included studies.

Study	Participants	Gender (%males)	Age, y (SD)	Diagnostic assessment	Outcomes
<i>Miyahara M et al. 2014</i>	93 ADHD 76 Controls	71%	ADHD: 3.73 Controls: 3.69	ADHDRS WPPSI Mental health professionals (pediatricians, neurologists, school psychologists)	Actigraphy NEPSY
<i>Moreau V et al. 2014</i>	41 ADHD 41 Controls	58.5%	ADHD: 9.74 (1.68) Controls: 9.56 (1.62)	CBCL CPRS K-SADS-PL	Actigraphy CBCL CSHQ ISI-C Sleep diary
<i>Bessey M et al. 2013</i>	25 ADHD 25 Controls	88%	ADHD: 8.8 (1.8) Controls: 8.8 (1.9)	CPRS CTRS	Actigraphy SLAQ
<i>Wiebe S et al. 2013</i>	20 ADHD 46 Controls	64%	ADHD: 9.2 (1.6) Controls: 8.7 (1.1)	CBCL CPRS DISC IV	Actigraphy Polysomnography ESS MSLT Sleep log
<i>Alderson M et al. 2012</i>	11 ADHD 11 Controls	100%	ADHD: 8.64 (1.29) Controls: 9.45 (1.44)	K-SADS- PL CBCL TRF CSI WISC III-IV (QI > 85) DSM-IV	Actigraphy SSD Choice task Control condition (Microsoft Paint)
<i>Langevin R et al. 2012</i>	5 ADHD + NTP 5 ADHD 5 Controls	80%	Total: 8.13		Actigraphy Sleep agenda SWAN-F
<i>Gruber R et al. 2011</i>	11 ADHD 32 Controls	63%	ADHD: 8.7 (1.3) Controls: 8.8 (1.3)	DISC-IV CBCL CPRS WISC-IV (QI > 80)	Actigraphy Polysomnography ESS Sleep log CPT
<i>Kam HJ et al. 2011</i>	10 ADHD 7 Controls	53%	ADHD: 7.2 (0.63) Controls: 7.5 (0.53)	CBCL K-ARS K-SADS-PL	Actigraphy
<i>Mullin BC et al. 2011</i>	13 BD 14 ADHD 21 Controls	58%	BD: 14.4 (2.1) ADHD: 15.1 (2.1) Controls: 14.1 (2.0)	K-SADS- PL P- YMRS	Actigraphy Sleep diary
<i>Licht CA et al. 2009</i>	9 ADHD 9 Controls	83%	ADHD: 9.33 (1.00) Controls: 9.11 (1.17)	PPVT-R (>85) Barkley's ADHD Clinical parent interview ADDES-S ADDES-H	Actigraphy
<i>Owens J et al. 2009</i>	107 ADHD 46 Controls	69%	ADHD: 10.2 (2.0) Controls: 10.3 (2.6)	ADHDRS K-SADS PL CGI S WISC IV (QI > 80)	Actigraphy Electronic diaries
<i>Rapport MD et al. 2009</i>	12 ADHD 11 Controls	100%	Total: 9.04 (1.36)	K-SDAS PL CBCL TRF CSI WISC III-IV Clinical Interview	Actigraphy Phonologic working memory task Visuospatial working memory task Controls (Microsoft Paint)
<i>Tsuji N et al. 2009</i>	18 ADHD 10 PDD + hyperactivity (3 Asperger, 7 unspecified PDD) 18 Controls	100%	ADHD: 9.33 (1.41) PDD: 9.2 (1.75) Controls: 9.17 (1.2)	CBCL TRF WISC III (QI > 70)	Actigraphy
<i>Wood AC et al. 2009</i>	116 ADHD (combined type) 119 Siblings 218 Controls	82%	ADHD: 11.90 (2.74) Siblings: 11.51 (2.85) Controls: 12.76	PACS CPRS CTRS	Actigraphy
<i>Halperin JM et al. 2008</i>	98 ADHD 85 Controls	100%	ADHD: 18.30 (1.60) Controls: 18.51 (1.66)	K-SADS PL	Actigraphy WAIS III Stroop color-word test CPT
<i>Hvolby A et al. 2008</i>	45 ADHD 64 other psychiatric diagnoses 97 Controls	74%	ADHD: 8.4 Psychiatric control group: 8.6 Controls: 8	K-SADS PL ADHD- RS	Actigraphy, Sleep diaries
<i>Gruber R et al. 2004</i>	24ADHD 25 Controls	100%	ADHD: 8.94 (1.25) Controls: 8.83 (1.01)	K-SADS PL	Actigraphy Sleep Habits Questionnaire NES
<i>Salbach H et al. 2002</i>	31 ADHD 31 Controls	—	ADHD: 9.1 Controls: 9.6	ICD 10 Achenbach teachers questionnaire CTRS DIPS	Actigraph Delay Gratification Test (DGT) Continuous Performance Test (CPT) TRF CTRS

Table 1 (continued)

Study	Participants	Gender (%males)	Age, y (SD)	Diagnostic assessment	Outcomes
Corkum P et al. 2001	25 ADHD 25 Controls	80%	ADHD: 9.12 (1.42) Controls: 9.72 (1.31)	Parent and teacher interviews Child assessment	Actigraphy CSP-Q Sleep diaries
Dane AV et al. 2000	20 ADHD-I 22 ADHD-C 22 Controls	76.5%	ADHD I: 9.28 (1.44) ADHD C: 9.11 (1.47) Controls: 9.14 (1.38)	Clinical diagnostic protocol PICS TTI Ontario Child Health Study Scale	Actigraphy IOWA Conner's rating scale
Gruber R et al. 2000	38 ADHD 64 Controls	100%	ADHD: 9.6 (2.7) Controls: 9.4 (1.7)	ADHD Symptom checklist CBCL	Actigraphy Daily sleep logs
Konrad K et al. 2000	31 ADHD 27 TBI 26 Controls	68%	ADHD: 10.5 (1.6) TBI: 10.6 (1.7) Controls: 10.2 (1.2)	K-DIPS PICS FBB-HKS	Stop signal task Delayed response task Actigraphy
Inoue K et al. 1998	20 ADHD 52 Controls	100%	ADHD: 9 Controls: 9.5	DSM-III-R	CPT WISC-R MFFT Actigraphy
Halperin JM et al. 1992	31 ADHD 53 Patients No ADHD 18 Controls	81%	ADHD: 9.6 (1.83) No ADHD: 10.1 (1.7) Controls: 9.1 (1.8)	CBCL CTQ	Actigraphy RCPM PPVT-R WRAT-R PIAT-R CPT

Note: **ADDES-H** = attention-deficit disorders evaluation scale, home version; **ADDES-S** = attention-deficit disorders evaluation scale, school version; **ADHDRS** = attention-deficit/hyperactivity disorder rating scale; **BD** = bipolar disorder; **CBCL** = child behavior checklist; **CGI S** = clinical global impression- severity of illness; **CPT** = continuous performance test; **CPRS** = Conners' parent rating scales; **CTRS** = Conners' teacher rating scale; **CSHQ** = children's sleep habits questionnaire; **CSI** = child symptom inventory-parent and teacher; **CSP-Q** = child sleep questionnaire, parent version; **CTQ** = Conner's teacher questionnaire; **DISC IV** = diagnostic interview schedule for children; **ESS** = Epworth sleepiness scale; **FBB-HKS** = questionnaire for teacher e hyperkinetic syndrome; **ISleC** = insomnia severity index for children; **K-ARS** = ADHD rating scale, korean edition; **K-DIPS** = diagnostisches interview fur psychische storungen im kindesalter; **K-SADS-PL** = kiddie-sads-present and lifetime version; **MFFT** = matching familiar figure test; **Microsoft paint** = the paint program served as pre- and postconditions to control for potential within-day fluctuations in activity level (es. fatigue effects); **MSLT** = multiple sleep latency test; **NEPSY** = developmental neuropsychological assessment; **NES** = neurobehavioral evaluation: finger tapping, digit span forward, digit span backward, reaction time, symbol- digit substitution task, CPT; **P-YMRS** = parent version of the Young mania rating scale; **PACS** = parental account of childhood symptoms; **PDD** = pervasive developmental disorder; **PIAT** = Peabody individual achievement test-revised; **PICS** = parent interview for child symptoms; **PPVT-R** = Peabody picture vocabulary test-revised; **RCPM** = Raven's colored progressive matrices; **SLAQ** = sleep lab adaption questionnaire; **SSD** = stop-signal delays; **SWAN- F** = symptoms and normal behavior questionnaire; **TBI** = traumatic brain injury; **TRF** = teacher report form; **TTI** = teacher telephone interview; **WAIS- III** = Wechsler adult intelligence scale, third edition; **WISC-III** = Wechsler intelligence scale for children- III; **WISC-IV** = Wechsler intelligence scale for children-IV; **WPPSI** = Wechsler primary and preschool intelligence test; **WRATR** = wide range achievement test-revised.

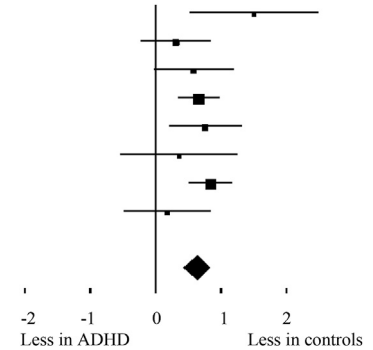
Table 2
Methodological aspects of actigraphic devices in studies included.

Study	Type of device	Where worn	When recorded	Storage rate used
Miyahara M et al. 2014	AM7164; Actigraph, Fort Walton Beach, FL	Non dominant ankle, waist	Experimental session	N.R.
Moreau V et al. 2014	AW-64 Mini-Mitter	Wrist	5 nights	0.5 min epoch
Bessey M et al. 2013	Basic Mini Motionlogger; Ambulatory Monitoring Inc., NY	Wrist	6 nights + sleep lab	N.R.
Wiebe S et al. 2013	AW-64 Mini-Mitter	Non dominant wrist	5 nights	1 min epoch
Alderson M et al. 2012	Basic Mini Motionlogger; Ambulatory Monitoring Inc., NY	Non dominant wrist	Experimental session	1 min epoch
Langevin R et al. 2012	AW-64 Mini-Mitter	Non dominant wrist	2 measuring times, 5 weekdays each	N.R.
Gruber R et al. 2011	AW-64 Mini-Mitter	N.R.	24 h	1 min epoch
Kam HJ et al. 2011	LIG NEX1 Co., Ltd., Yangin, Korea	Non dominant wrist	During a school lesson	1 min epoch
Mullin BC et al. 2011	AW-64 Mini-Mitter	Non dominant wrist	4 nights	1 min epoch
Licht CA et al. 2009	Computer science and Applications (CSA)/Manufacturing Technology, Inc.	Waist	14 d (8–15) 24 h a day	1 min epoch
Owens J et al. 2009	AW-64 Mini-Mitter	Non dominant wrist	3 visits in 10–24 nights	1 min epoch
Rapport MD et al. 2009	Basic Mini Motionlogger; Ambulatory Monitoring Inc., NY	Non dominant wrist, ankles	Experimental session	1 min epoch
Tsujii N et al. 2009	Mini Motionlogger; Ambulatory Monitoring Inc., NY	Non dominant wrist	1 wk at school	1 min epoch
Wood AC et al. 2009	MTI Health services Version 323 Health One Technology, Pensacola, FL	Dominant leg, waist	2 h with a 25 min break	1 min epoch
Halperin JM et al. 2008	CSA activity monitor	Non dominant ankle, waist	Experimental session	1 min epoch
Hvolby A et al. 2008	Mini Motionlogger; Ambulatory Monitoring, Inc, Ardsley, NY	Dominant wrist	5 nights	N.R.
Gruber R et al. 2004	Mini Motionlogger; Ambulatory Monitoring Inc. Ardsley, NY	Non dominant wrist	5 nights	1 min epoch
Salbach H et al. 2002	N.R.	N.R.	N.R.	N.R.
Corkum P et al. 2001	Mini Motionlogger; Ambulatory Monitoring Inc., NY	Non dominant wrist	7 nights	1 min epoch
Dane AV et al. 2000	Ambulatory Monitoring Inc. 1996	Non dominant wrist	2 h period and a second 2 h interval	1 min epoch
Gruber R et al. 2000	N.R.	N.R.	5 nights	N.R.
Konrad K et al. 2000	Cambridge Neurotechnology, Version 2.56	Preferred arm	Experimental session	0.25 min epoch
Inoue K et al. 1998	N.R.	Waist	Experimental session	1 min epoch
Halperin JM et al. 1992	N.R.	Waist	Experimental session	N.R.

N.R. = not reported.

Table 3
Activity mean.

Study	ADHD			TD			Weight	Std. Mean difference IV, random, 95% CI	Std. Mean difference IV, random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Alderson M et al. 2012	4751.5	2579.9	11	1753.9	818.4	11	5.0%	1.51 [0.54, 2.48]	
Dane AV et al. 2000	224.8	15.8	42	218.6	25.9	22	15.6%	0.31 [−0.21, 0.83]	
Halperin JM et al. 1992	32.0	16.0	31	22.5	16.0	18	12.4%	0.58 [−0.01, 1.18]	
Halperin JM et al. 2008	1.7	0.4	98	1.4	0.3	85	36.1%	0.66 [0.36, 0.96]	
Konrad K et al. 2000	5203.0	2293.0	31	3611.0	1772.0	26	14.5%	0.76 [0.22, 1.30]	
Licht CA et al. 2009	411.5	129.5	10	365.2	117.6	10	6.0%	0.36 [−0.53, 1.24]	
Miyahara M et al. 2014	487.13	362.57	93	236.96	183.71	76	24.5%	0.84 [0.53, 1.16]	
Tsujii N et al. 2009	214.5	14.4	18	210.6	26.7	18	10.4%	0.18 [−0.48, 0.83]	
Total (95% CI)			334			266	100.0%	0.65 [0.45, 0.84]	



Notes: ADHD = attention deficit/hyperactivity disorder; CI = confidence interval; IV = inverse variance method; SD = standard deviation; TD = typically developing. Heterogeneity: $\tau^2 = 0.02$; $\chi^2 = 8.68$, $df = 7$ ($P = 0.28$); $I^2 = 19\%$. Test for overall effect: $Z = 6.41$ ($P < 0.00001$).

and lower levels of functioning [54,55]. The sensitivity analysis shows strong evidence of a large effect during structured experimental sessions. As a whole, these findings suggest that actigraphy might be used by the clinician in the monitoring of activity during structured sessions (e.g., during psychological tests in outpatient setting) and suggest that more research is warranted to understand whether children with ADHD move more than TD children throughout the whole day.

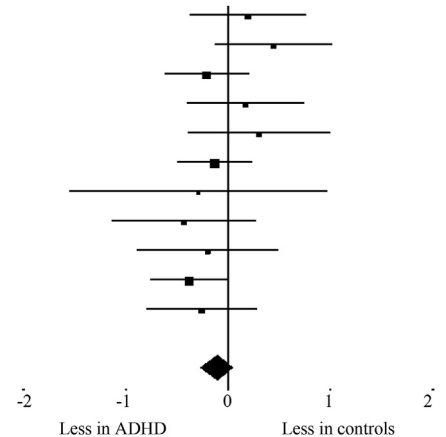
Sleep duration is not significantly different between ADHD and TD children and there is homogeneity between the studies ($I^2 = 7\%$). However, the jackknife analysis on sleep duration is significant (SMD = -0.10 [$-0.15, -0.05$]) and this means that some evidence for lower sleep duration in ADHD might derive from more and larger studies (see Table S4). Nevertheless, we believe that the sample analysed by our meta-analysis (297 ADHD and 426 TD) is

sufficiently large and that although important for research purposes, smaller differences in sleep duration are unlikely to be clinically meaningful.

The secondary outcomes indicate an altered pattern of sleep. As we expected, the secondary outcomes present with high heterogeneity and are less reliable than the primary ones. This is because actigraphy is not very sensitive for wakefulness periods [56] and sleep efficiency is intimately correlated to wake after sleep onset. Indeed sleep latency presents with a high heterogeneity, but it is not considered as a very reliable parameter in actigraphy [22]. In order to address heterogeneity we used the random effects model, which is more conservative than the fixed effects model. Notwithstanding this, the significant results tell us that by using actigraphy we might find an altered sleep pattern in ADHD children, even if they do not present with sleep problems and even if

Table 4
Sleep duration.

Study	ADHD			TD			Weight	Std. Mean difference IV, random, 95% CI	Std. Mean difference IV, random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Bessey M et al. 2013	571.0	42.2	25	562.2	47.6	25	8.0%	0.19 [−0.36, 0.75]	
Corkum P et al. 2001	569.6	33.0	25	552.9	41.0	25	7.9%	0.44 [−0.12, 1.00]	
Gruber R et al. 2000	514.3	44.5	38	522.0	30.4	64	14.5%	−0.21 [−0.61, 0.19]	
Gruber R et al. 2004	537.7	27.4	24	532.0	36.8	25	7.9%	0.17 [−0.39, 0.73]	
Gruber R et al. 2011	487.7	27.2	11	478.8	29.5	32	5.4%	0.30 [−0.39, 0.99]	
Hvolby A et al. 2008	555.0	42.0	45	560.0	36.0	97	18.1%	−0.13 [−0.48, 0.22]	
Langevin R et al. 2012	9.4	0.2	5	9.5	0.5	5	1.7%	−0.29 [−1.54, 0.96]	
Moreau V et al. 2014	475.6	36.9	10	490.6	33.3	41	5.2%	−0.43 [−1.13, 0.26]	
Mullin BC et al. 2011	424.2	67.3	14	436.9	58.3	21	5.5%	−0.20 [−0.88, 0.48]	
Owens J et al. 2009	517.0	46.1	80	533.8	40.0	45	16.9%	−0.38 [−0.75, −0.01]	
Wiebe S et al. 2013	474.6	33.6	20	484.1	37.6	46	8.9%	−0.26 [−0.78, 0.27]	
Total (95% CI)			297			426	100.0%	−0.10 [−0.26, 0.06]	



Notes: ADHD = attention deficit/hyperactivity disorder; CI = confidence interval; IV = inverse variance method; SD = standard deviation; TD = typically developing. Heterogeneity: $\tau^2 = 0.01$; $\chi^2 = 10.79$, $df = 10$ ($P = 0.37$); $I^2 = 7\%$. Test for overall effect: $Z = 1.20$ ($P = 0.23$).

Table 5
Sleep latency.

Study	ADHD			TD			Weight	Std. Mean difference IV, random, 95% CI	Std. Mean difference IV, random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Bessey M et al. 2013	31.66	24.43	25	22.05	16.82	25	12.6%	0.45 [−0.11, 1.01]	
Corkum P et al. 2001	22.4	9.0	25	25.2	14.0	25	12.7%	−0.23 [−0.79, 0.32]	
Gruber R et al. 2011	43.01	23.32	11	30.26	20.4	32	11.1%	0.59 [−0.11, 1.29]	
Hvolby A et al. 2008	26.3	16.3	45	13.5	8.9	97	14.8%	1.08 [0.71, 1.46]	
Moreau V et al. 2014	38.26	13.83	10	20.81	10.07	41	10.5%	1.58 [0.82, 2.34]	
Mullin BC et al. 2011	28.7	18.0	14	20.8	12.1	21	11.2%	0.52 [−0.16, 1.21]	
Owens J et al. 2009	31.44	23.07	80	32.94	17.39	45	14.9%	−0.07 [−0.44, 0.30]	
Wiebe S et al. 2013	32.1	15.9	20	25.3	19.0	46	13.0%	0.37 [−0.16, 0.90]	
Total (95% CI)			230			332	100.0%	0.51 [0.10, 0.92]	

Notes: ADHD = attention deficit/hyperactivity disorder; CI = confidence interval; IV = inverse variance method; SD = standard deviation; TD = typically developing.
Heterogeneity: $\tau^2 = 0.27$; $\chi^2 = 33.29$, $df = 7$ ($P < 0.0001$); $I^2 = 79\%$.
Test for overall effect: $Z = 2.44$ ($P = 0.01$).

Table 6
Sleep efficiency.

Study	ADHD			TD			Weight	Std. Mean difference IV, random, 95% CI	Std. Mean difference IV, random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Bessey M et al. 2013	83.35	10.42	25	79.9	10.76	25	14.7%	0.32 [−0.24, 0.88]	
Gruber R et al. 2000	93.5	3.9	38	93.1	4.1	64	15.5%	0.10 [−0.30, 0.50]	
Gruber R et al. 2004	62.3	10.75	24	93.3	9.34	25	12.8%	−3.03 [−3.87, −2.19]	
Gruber R et al. 2011	76.49	4.0	11	79.22	4.45	32	13.8%	−0.62 [−1.32, 0.08]	
Moreau V et al. 2014	78.21	3.37	10	82.03	3.71	41	13.6%	−1.03 [−1.75, −0.31]	
Mullin BC et al. 2011	80.2	6.1	14	82.8	4.7	21	13.9%	−0.48 [−1.17, 0.21]	
Owens J et al. 2009	84.0	5.0	80	86.0	4.0	45	15.7%	−0.43 [−0.80, −0.06]	
Total (95% CI)			202			253	100.0%	−0.69 [−1.32, −0.05]	

Notes: ADHD = attention deficit/hyperactivity disorder; CI = confidence interval; IV = inverse variance method; SD = standard deviation; TD = typically developing.
Heterogeneity: $\tau^2 = 0.64$; $\chi^2 = 53.41$, $df = 6$ ($P < 0.00001$); $I^2 = 89\%$.
Test for overall effect: $Z = 2.12$ ($P = 0.03$).

Table 7
Wake after sleep onset.

Study	ADHD			TD			Weight	Std. Mean difference IV, random, 95% CI	Std. Mean difference IV, random, 95% CI
	Mean	SD	Total	Mean	SD	Total			
Bessey M et al. 2013	95.27	57.8	25	111.47	58.31	25	9.9%	−0.27 [−0.83, 0.28]	
Corkum P et al. 2001	15.1	7.3	25	16.6	6.6	25	9.9%	−0.21 [−0.77, 0.34]	
Gruber R et al. 2000	2.7	1.6	38	3.0	1.7	64	14.1%	−0.18 [−0.58, 0.22]	
Gruber R et al. 2004	2.2	1.3	24	1.8	1.3	25	9.8%	0.30 [−0.26, 0.87]	
Hvolby A et al. 2008	2.7	1.2	45	2.8	0.8	97	15.7%	−0.11 [−0.46, 0.25]	
Moreau V et al. 2014	65.44	20.69	10	63.27	15.75	41	7.4%	0.13 [−0.56, 0.82]	
Mullin BC et al. 2011	56.3	17.4	14	55.5	19.2	21	7.7%	0.04 [−0.63, 0.72]	
Owens J et al. 2009	56.7	19.64	80	44.49	17.93	45	15.0%	0.64 [0.26, 1.01]	
Wiebe S et al. 2013	87.4	27.1	20	84.4	21.8	46	10.6%	0.13 [−0.40, 0.65]	
Total (95% CI)			281			389	100.0%	0.06 [−0.16, 0.28]	

Notes: ADHD = attention deficit/hyperactivity disorder; CI = confidence interval; IV = inverse variance method; SD = standard deviation; TD = typically developing.
Heterogeneity: $\tau^2 = 0.05$; $\chi^2 = 14.44$, $df = 8$ ($P = 0.07$); $I^2 = 45\%$.
Test for overall effect: $Z = 0.54$ ($P = 0.59$).

Table 8

Table of bias.

	Representative spectrum?	Acceptable reference standard?	Acceptable delay between tests?	Partial verification avoided?	Differential verification avoided?	Incorporation avoided?	Reference standard results blinded?	Index test results blinded?	Relevant clinical information?	Uninterpretable results reported?	Withdrawals explained?
<i>Miyahara M et al. 2014</i>	–	?	+	–	–	+	–	–	+	+	+
<i>Moreau V et al. 2014</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Bessey M et al. 2013</i>	–	?	+	?	+	+	–	–	+	+	+
<i>Wiebe S et al. 2013</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Alderson M et al. 2012</i>	–	+	+	+	+	+	–	–	+	?	+
<i>Langevin R et al. 2012</i>	–	+	+	+	?	+	–	–	+	–	+
<i>Gruber R et al. 2011</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Kam HJ et al. 2011</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Mullin BC et al. 2011</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Licht CA et al. 2009</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Owens J et al. 2009</i>	–	+	+	+	+	+	–	–	+	–	+
<i>Rapport MD et al. 2009</i>	–	+	+	+	+	+	–	–	+	+	–
<i>Tsujii N et al. 2009</i>	–	?	+	?	+	+	–	–	+	+	+
<i>Wood AC et al. 2009</i>	–	?	+	+	?	+	–	–	+	–	+
<i>Halperin JM et al. 2008</i>	–	+	+	+	+	+	–	–	+	?	+
<i>Hvolby A et al. 2008</i>	–	?	+	+	?	+	–	–	+	+	+
<i>Gruber R et al. 2004</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Salbach H et al. 2002</i>	–	+	+	+	+	+	–	–	+	–	+
<i>Corkum P et al. 2001</i>	–	?	+	+	+	+	–	–	+	?	+
<i>Dane AV et al. 2000</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Gruber R et al. 2000</i>	–	–	+	–	–	+	–	–	+	–	+
<i>Konrad K et al. 2000</i>	–	+	+	+	+	+	–	–	+	+	+
<i>Inoue K et al. 1998</i>	–	?	?	?	?	+	–	–	+	+	+
<i>Halperin JM et al. 1992</i>	–	?	+	+	+	+	–	–	+	?	+

“+” = low risk of bias; “–” = high risk of bias; “?” = unclear risk of bias.

not pharmacologically treated. Moreover, actigraphic studies have shown that night-to-night variability in sleep schedule measures (e.g., sleep onset, sleep duration) is easy to differentiate between ADHD and control groups [17,46].

This meta-analysis has some limitations. Firstly, even if on the one hand statistical analyses indicate that our sample size was sufficient for the detection of significant effects for the activity mean in experimental sessions, on the other hand if we take into account only the small studies on the 24 h activity mean the size of our sample is underpowered. Therefore for the activity mean in the 24 h we suggest our results be considered with caution. Secondly, our results may be considered difficult to generalise due to the fact that the original studies used different actigraphic devices and that there is high variability among different actigraphs. However we used the SMD and the random effect model in order to be able to address this heterogeneity. Thirdly, the majority of the included studies had sleep problems or other medical conditions as exclusion criteria. Therefore it should be highlighted that our meta-analysis is valid for a subgroup of children with ADHD without medical comorbidities. Fourthly, the actigraphs are not the gold standard to evaluate sleep problems. Indeed we know that actigraphy allows the reliable, continuous recording of a child's sleep in his or her own bed, but does not allow recording of sleep architecture. However, actigraphs are handy, and in ADHD they can be easily used for the monitoring of sleep and activity in outpatient settings.

In conclusion, we think that clinicians might use actigraphy in ADHD children for the monitoring of sleep patterns and for motor activity during structured experimental sessions and for the monitoring of motor activity and sleep patterns during treatment with MPH [25], while we have only limited evidence to support the use of actigraphy in the diagnosis or as a screening tool in ADHD [37].

In this meta-analysis, we have reviewed whether actigraphy shows consistency for the monitoring of motor activity and sleep in ADHD children. We believe these findings open up new perspectives on assessment, management and therapeutic follow up in ADHD.

Practice points

In patients with ADHD actigraphy may be useful to:

1. Monitor activity mean and its clinical evolution in an outpatient setting;
2. Monitor sleep problems, mainly sleep latency and efficiency.

Research agenda

In patients with ADHD there is a need for studies which:

1. Examine if actigraphy is efficient as a monitoring tool of activity and sleep in ambulatory setting;
2. Investigate actigraphic motor activity during 24 h;
3. Explore whether altered actigraphic parameters should be treated and if yes, how.

Conflicts of interest

The authors declare no conflict of interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.smr.2015.04.002>.

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CLINICAL FOCUS: NEUROLOGICAL AND PSYCHIATRIC DISORDERS ORIGINAL RESEARCH

Transition to adult mental health services for young people with attention deficit hyperactivity disorder in Italy: parents' and clinicians' experiences

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Abstract

Objective. The aim of this study was to describe the experiences of parents and clinicians in relation to the transition from child and adolescent neuropsychiatric services (CANPS) to adult services for people with attention deficit hyperactivity disorder (ADHD) in Italy. **Methods.** Parents of people with ADHD who reached the transition boundary for CANPS were sampled from the A.I.F.A. association (Italian Association of ADHD Families). We thematically analyzed informative and qualitative questionnaires completed by parents and clinicians. **Results.** Parents' ($n = 24$) and clinicians' ($n = 27$) experiences differed slightly on challenges and unmet needs, whereas clinicians agreed on the variables required for an optimal transition process. Poor transition and multiple barriers to such care were identified. Specifically, far fewer people received services, especially public health services, after reaching the age of 18, and perceived barriers included problems with user access, limited transition protocols, poor service coordination, and possible lack of ADHD-related knowledge on the part of adult practitioners. **Conclusions.** Care continuity in mental healthcare remains a need to be prioritized and better defined also for ADHD patients (and their parents). Parents' and clinicians' experiences are more likely to be positive if transition management is characterized by a gradual preparation, a period of parallel care, and commonly acknowledged, clear information on available services and how to access them. Identifying the needs and barriers of the people representing the different roles (clinicians, parents, and users) involved in the transition to adult mental health services is of particular importance in designing effective, shared transfer planning procedures.

Keywords:

Attention deficit disorder, health service use, mental health services, transition to adult care

History

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurobiological disorder characterized mainly by clinical manifestations such as difficulty in paying attention, impulsive behavior, and a heightened level of physical activity, occurring more frequently and intensely than in other children of the same age or developmental level. In Italy the reported prevalence rates range from 1.3 to 7.0 [1-5]. Evidence from studies suggests that ADHD, albeit with differing estimated rates, does persist into adulthood [6,7] with a range of various clinical manifestations [8,9]. This results in the need for care continuity, especially for patients with a continuation of ADHD symptoms that might lead to a higher risk of driving accidents, substance misuse, divorce rates, and frequent job changing [8-10]. Although transition resulted as a key component of care also for ADHD patients [11], there is little empirical evidence on the transition processes of these patients from pediatric to adult mental services [12-17].

Despite the fact that the Italian Government's policy emphasizes the need for a close cooperation between child and adult mental health services, there are no specific references or recommendations addressing the issues involving ADHD patients. Recent specific NICE guidelines for the management of the transition for people with ADHD provide key recommendations, proposing a good practice pathway that includes shared planning between services, reassessment at school-leaving age, meetings involving pediatric and adult mental health services, and patient and parental involvement in transition planning [11].

Internationally, the transition from pediatric to adult services is an emerging healthcare need [18]. The fact that there is a need to identify the views of the different figures involved in order to design effective and shared referral interventions or services has also been acknowledged [19,20]. Studies exploring this issue in mental healthcare show that there are often differences between users', parents' and clinicians' perspectives. The transition to adult services often

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results in poor patient and parent satisfaction and loss to follow-up for young adults with mental diseases [21-24]. The experiences of young people, parents, and clinicians suggest joint-working as a frequent, shared need, given the reported lack of two-way communication as a major impediment to a successful transition process [22,23]. Moreover, flexibility concerning transition age thresholds is seen as a key component of good transition by both patients and parents [21-23]. Studies evaluating parents' perspectives show that parents would like to be more involved in their child's care as the child transitions to an adult service, and feel left out or feel they have no one with whom to discuss their worries about their children. This specific need could be related to the different cultural philosophies between child and adult systems, with the first being more family-oriented, inclusive, and holistic than adult services, and the second being focused more exclusively on the individual [25].

This paper reports on a qualitative study of the experiences of parents of people with ADHD who reached the adult age, and the perspectives of child psychiatrists concerning the transition from Child and Adolescent Neuropsychiatric Services (CANPS) to adult services in Italy.

Materials and methods

This study is part of the "Sharing diagnostic-therapeutic approaches for ADHD in Lombardy" project aimed to ensure appropriate ADHD management for every child and adolescent once the disorder is suspected and reported, and includes commonly acknowledged care management procedures as well as educational initiatives for healthcare workers (child psychiatrists and psychologists) who provide assistance to ADHD patients and their families. In addition to the qualitative study reported here, the project comprised a previously reported evaluation describing healthcare management and continuity for young adults with ADHD who crossed the age boundary for pediatric services, providing data on transition protocols, the population served, and potential referral rates to adult mental healthcare in the same context (Lombardy Region) [13].

Sample

Parents of adolescents with ADHD who reached adulthood were identified by the mailing list of the Lombardy Section of the A.I.F.A. (Italian ADHD Association of Families). A.I.F.A. is a non-profit association funded in 2002 by a group of Italian parents of ADHD children, whose main objective is to help parents through lobbying and various educational initiatives.

The clinician sample was recruited from the healthcare network of all 34 CANPS of the Lombardy Region in Italy. Italian healthcare is provided free or at a nominal charge through a network of 148 local health units (LHU). Children are assigned to a family pediatrician until they are 6 years old; afterward, the parents can choose to remain with that pediatrician until the child is 14 years old or to register the child with a general practitioner (GP). All adolescents >14 years of age are assigned to a GP. CANPS are part of the

LHU and provide care at the hospital and community levels for children and adolescents with neurologic and/or psychiatric disorders and for their families. They are separate from adult mental health services and work mainly on an outpatient basis and in close connection with educational and social services. Regional health authorities are responsible for the accreditation of 18 of the 34 CANPS as specialized hubs (tier three) of the CANPS network on ADHD ("ADHD Centers"). All CANPS are able to provide care for children with ADHD and their families, whereas ADHD Centers are responsible for confirming uncertain diagnoses and verifying the appropriateness of the therapeutic plan prescribed [26,27].

Transition questionnaire

A literature review on the transition from pediatric to adult mental health services was undertaken through searches of Medline, EMBASE, PsychINFO, The Cochrane Library, and reports and publications from various national health departments. Based on this review, a questionnaire was developed to collect information on the pathways of care for ADHD patients aged 18 or older, the needs and barriers related to the transition process, and the potential practices to better manage the transition process. The pilot questionnaire was discussed with experts working in the child and adolescent mental health field and families external to the project setting in order to help establish face and content validity. An amended version was developed and was again reviewed, leading to the final questionnaire (see supplementary material).

Data collection

Thirty-six ADHD families, members of the A.I.F.A. association, and the clinician teams of the 34 identified CANPS were mailed a letter explaining the aim of the survey and were asked to complete the attached questionnaire. The head neuropsychiatrist of each CANPS was asked to complete the questionnaire in consultation with his/her multidisciplinary team active in 2011, whereas the families were kindly asked to answer to the questionnaire only if their child had already reached the age of 18 in 2011.

Results

Participants

Questionnaires were completed by 24 of 36 (67%) parents of ADHD patients aged 18 or older and by child psychiatrists from 27 of the 34 (79%) CANPS across the Lombardy Region.

The transition process

The median age of the 24 young adults with ADHD was 20 years 7 months (range 18-22 years) and 21 (87%) were male. Nineteen patients had an ADHD of Combined subtype, whereas three showed the Inattentive and 1 the Hyperactive-Impulsive subtypes; 14 (58%) had at least one comorbid

mental health disorder. Most young adults from our sample population ($n = 22$) lived in the family home, had limited self-care autonomy, and tended not to be employed (four were employed), despite high educational levels. Two-thirds of the young adult patients were attending a school of high educational level. Half of subjects achieved an optimal level on personal and social autonomy. Concerning treatment and service use prior to, and following the age of 18, there was a decrease in both the rate of subjects undergoing treatment and those in care. At the time of our research, according to questionnaires received from parents, four patients were being treated with a combination of pharmacotherapy and psychological therapy, three with pharmacotherapy only, and eight with psychoeducational interventions. The remaining nine young adults were not receiving any treatment, although their families felt they needed it. With regard to the use of the services, there was a reduction in access to the CANPS and a slight increase in the use of the adult mental health services. Three ADHD patients (12%) continued to attend the CANPS, five (21%) were monitored by a psychiatrist working in a public adult mental health service, and four (17%) by mental health specialists in their private offices. Of these, none had been referred to the adult service by CANPS clinicians. Nine patients (38%) were not undergoing care in any of the mental healthcare services and three (12%) resulted as having been discharged by services because of good symptom controls.

Needs and barriers

Several needs must be fulfilled to overcome the difficulties encountered by parents and clinicians. Main difficulties and unmet needs related to transition pathways were summarized (Table 1).

The most important emerging issue was the care gap that occurred at the age of 18, and the related difficulties identified by parents mostly concerned the process of preparing for the transition, such as lack of information on available services and no help in accessing them. As could be expected,

the clinicians' perspective consequently reflected, as the key issues, the difficulty in finding appropriate adult services, the high rate of unaccepted referrals, and, as reported also by parents, scarce knowledge on ADHD on the part of adult mental health service practitioners. CANPS psychiatrists also identified poor communication and lack of shared protocols between services as additional obstacles to transition. Other findings that emerged were the CANPS clinicians' perception that adult service practitioners had limited knowledge of ADHD in adults, and the parents' need to receive more information about ways to access appropriate adult services.

Practices to better manage the transition process

Clinician participants had thoughts on how the transition from CANPS to adult mental health services could be achieved and improved. For the majority of the clinicians the variables related to an optimal transition were the following: an adult community mental health service as the service to refer adult patients to, 18 years as the age by which the transition should normally be completed, age as the main factor in the decision to begin transition, shared information on transition especially with parents and patients, and duration of the transition process of between 2 and 6 months, with parallel care and parental involvement in the process (Table 2). These modalities for managing the transition process mostly overlap with European recommendations from the NICE guidelines [11] for the transition of ADHD patients to adult services (Table 3).

Discussion

Transition problems occur in diverse healthcare systems across different continents [28,29]. Findings from this research suggest that, also in our healthcare context, both mental health services and parents of young adults with ADHD need prompt and solid support to improve the management of the transition. Although there are few reference documents or specific recommendations on the process of

Table 1. Main barriers and needs reported by parents ($n = 24$) and CANPS clinician teams ($n = 27$).

Barriers		Needs	
Parents (n)	Clinician teams (n)	Parents (n)	Clinician teams (n)
Families have to find and choose services needed (21)	Little knowledge on the ADHD disorder on the part of adult services (19)	Information about transition process and transition plan (17)	Shared transition protocols and planning with adult services (17)
Lack of information about services available (19)	Referrals not accepted by adult services (23)	Referral to adult services by CANPS (21)	Access to ADHD drug therapies (23)
Lack of help in accessing services (20)	Poor communication between services (21)	Parallel care (16)	Mapping of adult services specialized on ADHD (25)
Care gaps at age 18 (21)	Difficult in identifying needed adult services (25)	Increased education and employment opportunities (22)	Shared knowledge on clinical characteristics of ADHD in adults (18)
Little knowledge on the ADHD disorder on the part of adult services (15)	Lack of sharing of transition planning between services (18)	Support for families (23)	
No transition carried out despite requirement for continuing care (9)		Public behavioral therapy provision (17)	
		Access continuity to drug therapy (19)	

Abbreviations: ADHD = Attention deficit hyperactivity disorder; CANPS = Child and adolescent neuropsychiatric services.

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Table 2. Practices for managing the transition process based on clinicians' perspectives and experiences.

Variables of the transition process		Clinician teams (N = 27) n (%)
Adult services to refer patients to	Adult Mental Health Service	17 (63)
	ADHD Child and Adolescent Reference Center	2 (7)
	Private Psychiatrist	3 (11)
	Don't know	5 (19)
Transition age	16 yrs	3 (11)
	17 yrs	4 (15)
	18 yrs	18 (67)
	19 yrs	2 (7)
Criteria for transitioning	Age	20 (74)
	Clinical characteristics	12 (44)
Referral method	Letter	7 (26)
	Telephone	9 (33)
	Email	5 (19)
	Other (appointment, protocol)	11 (41)
Shared information about transition	Patients	21 (78)
	Parents	22 (81)
	Other figure (teachers, social services, psychologists)	9 (33)
Transition timing	2 – 6 months	20 (74)
	12 months	1 (8)
	Don't know	6 (17)
Parallel care	Yes (2–4 joint appointments)	15 (55)
	No	12 (45)
Parental involvement	Yes	20 (74)
	No	7 (26)

Abbreviation: ADHD = Attention deficit hyperactivity disorder.

Table 3. NICE guidelines for the management of the transition for people with ADHD.

Main recommendations
People with ADHD should be transferred to adult services if they continue to have significant symptoms of ADHD or other coexisting conditions. Transition should be planned in advance by both referring and receiving services. If needs are severe and/or complex, use of the care programme approach should be considered. People with ADHD receiving treatment and care from CAMHS or paediatric services should be reassessed at school-leaving age to establish the need for continuing treatment into adulthood. If treatment is necessary, arrangements should be made for a smooth transition with details of the treatment and services that the young person will require. Precise timing of arrangements may vary locally but should usually be completed by the time the young person is 18 years. During the transition to adult services, a formal meeting involving CAMHS and/or paediatrics and adult psychiatric services should be considered, and full information provided to the young person about adult services. For young people aged 16 years and older, the care programme approach should be used as an aid to transfer between services. The young person, and when appropriate the parent or career, should be involved in the planning. After transition to adult services, adult healthcare professionals should carry out a comprehensive assessment of the person with ADHD that includes personal, educational, occupational and social functioning, and assessment of any coexisting conditions, especially drug misuse, personality disorders, emotional problems and learning difficulties.

Adapted from NICE guidelines (CG72) [11].

Abbreviation: ADHD = Attention deficit hyperactivity disorder; CAMHS = Child and adolescent mental health service.

transition to adult services for people with mental disorders, the current Lombardy Region policy and the more recent national policy emphasize the need for closer cooperation between adult mental health services and CANPS to bridge the gap. More specifically, these policies promote an approach aimed at improving the interface between services as these currently exist, just as other healthcare system experiences suggest [30–33].

The transition from adolescence to adulthood is also a challenging time. It is a time of profound physiological,

psychological, and social change, and adolescents with mental disorders face greater challenges as they transition to adulthood than their peers with or without other disabilities [34,35]. In this regard, parents requested greater family support and training, not only for the transition, intended as the passage from one service to another, but also for other events concerning change that occur concurrently. Moreover, parent responses not only focused on the transition process, which should be informed, planned by CANPS, and consist of a period of parallel care, but also specifically revealed that

adult ADHD patients' needs consist of free access to psychological therapy and continuous psychopharmacological therapy. CANPS clinicians, on the other hand, suggested that sharing transition protocols and ADHD knowledge between CANPS and adult mental services could lead to more successful transitions. Thus, good practice models for health-care transition should be designed in the context of also developmental and institutional transitions occurring in adolescence, marked by joint responsibilities in a multidisciplinary work sector [36-39].

In our opinion, the concept of transition must be considered as a process during development, rather than as something that happens strictly at a fixed age and according to country or healthcare system policies. In the Italian healthcare system the rigid age cut-off and low rate of referrals may have resulted in an obstructed passage from the CANPS to the adult services and, in practice, in a considerable care gap that often involves the interruption of ongoing psychological and pharmacological treatments that have previously been prescribed. Although flexibility concerning transition age thresholds is seen as a key component in ensuring care continuity in both patients and parents [21-23], a key issue is the lack of consensus on service use age cut-offs, in particular in mental healthcare. Hence, instead of rigid age demarcations between services, it may be better for services to be flexible and consider the developmental needs of individuals [24,40].

The CANPS of the Lombardy Region, in their suggestions for an optimal transition, agreed widely with the European guidelines for reaching an optimal starting goal [11]. Several problems were identified in the transition process, including the difficulty of services in working together. In our opinion, future steps should therefore focus on creating formal protocols that are jointly defined and shared by CANPS and adult mental health services. Unfortunately, the existence of protocols does not necessarily avoid care discontinuity [31]. This suggests that, even though protocols may have been written with both policy and clinical practice in mind, educational and social initiatives are needed as well.

Although it would be useful for all practitioners involved in the transition of young people with ADHD to be trained to properly inform patients and families, the perception of there being limited knowledge on the part of practitioners might result from the underlying ideological, conceptual, clinical, and cultural differences between child and adult mental health services rather than from a disorder-specific lack of information on the part of the latter [37,41,42]. In this regard, an assessment of the perspectives of clinicians also working in the adult mental health services, as well of patients and GPs, would yield important information, and the results could be compared with the perspectives of the parents and CANPS practitioners that participated.

Limitations

Results should be interpreted in the context of some limitations. First, the sample size is small and the methodological approach is qualitative and analytic so the parents' and clinicians' perspectives that emerged may not be fully

representative of the experience of all people with ADHD in transition. Second, although the Lombardy Region is the most populated and economically important region in Italy, all data are coming from a single region of Italy, and this may affect the generalizability and comparability of the reported findings within and between different geographical settings. Third, because of the large differences in health systems and in the approach and organization of mental care services, generalization of the results to a worldwide scenario is inappropriate. Lastly, the experiences of young patients with ADHD with the service transition process were not explored, although to our knowledge this is the first survey that gathers and compares the opinions of transition from both clinicians and parents, with previous studies typically focusing only on the opinions of clinicians [12-14,17].

Conclusion

Despite the fact that government policy in the Lombardy Region explicitly requires services to develop and implement transition policies between child and adult mental health services [43], care continuity often remains poor and there is a remarkably low rate of referral to adult services for young people with ADHD. It is important that the mental healthcare needs and outcomes of these patients and their parents become a health priority. According to the parents' and clinicians' experiences and needs that emerged, defined protocols, adequate allocation of resources, appropriate training initiatives and involvement of patients and families should be improved to better manage the transition process and to avoid the healthcare gap.

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Ethical principles: This research was approved by the Institutional Review Board of the IRCCS - Istituto di Ricerche Farmacologiche "Mario Negri", Milan, Italy, and written informed consent was obtained for all patients.

Declaration of interest

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

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Supplementary material available online

Supplementary material



DETERMINA 13 luglio 2015

Rettifica della determina 27 aprile 2015, n. 488/2015 concernente l'inserimento del medicinale per uso umano «Metilfenidato (Ritalin)» nell'elenco dei medicinali erogabili a totale carico del Servizio sanitario nazionale, ai sensi della legge 23 dicembre 1996, n. 648, per il trattamento del disturbo da deficit dell'attenzione e iperattività (ADHD) negli adulti già in trattamento farmacologico prima del compimento del diciottesimo anno di età. (Determina n. 860/2015). (15A05618) (GU Serie Generale n.168 del 22-7-2015)

IL DIRETTORE GENERALE

Vista la determina datata 27 aprile 2015 concernente l'inserimento del medicinale «metilfenidato (Ritalin)» nell'elenco dei medicinali erogabili a totale carico del Servizio sanitario nazionale ai sensi della legge 23 dicembre 1996, n. 648, alle seguenti condizioni: per il trattamento del disturbo da deficit dell'attenzione e iperattività (ADHD) negli adulti già in trattamento farmacologico prima del compimento del diciottesimo anno di età;

Ritenuto di dover rettificare la dicitura «metilfenidato (Ritalin)» con quella relativa al solo principio attivo «metilfenidato»;

Rettifica:

Art. 1

Nella determinazione citata in premessa ove scritto: METILFENIDATO (RITALIN), leggasi: «metilfenidato».

Art. 2

La presente determinazione ha effetto dal giorno successivo alla sua pubblicazione nella Gazzetta Ufficiale della Repubblica italiana.
Roma, 13 luglio 2015

Il direttore generale: Pani

Per ricevere la newsletter iscriversi al seguente indirizzo:
<http://crc.marionegri.it/bonati/adhdnews/subscribe.html>

Iniziativa nell'ambito del Progetto di Neuropsichiatria dell'Infanzia e dell'Adolescenza
(Delibera n. 406 - 2014 Progetti NPI)

Il Progetto è realizzato con il contributo, parziale, della Regione Lombardia
(in attuazione della D.G. sanità n. 3798 del 08/05/2014)

Capofila Progetto: UONPIA Azienda Ospedaliera "Spedali Civili di Brescia"
"Percorsi diagnostico-terapeutici per l'ADHD".