April 2013 Seminar Updates

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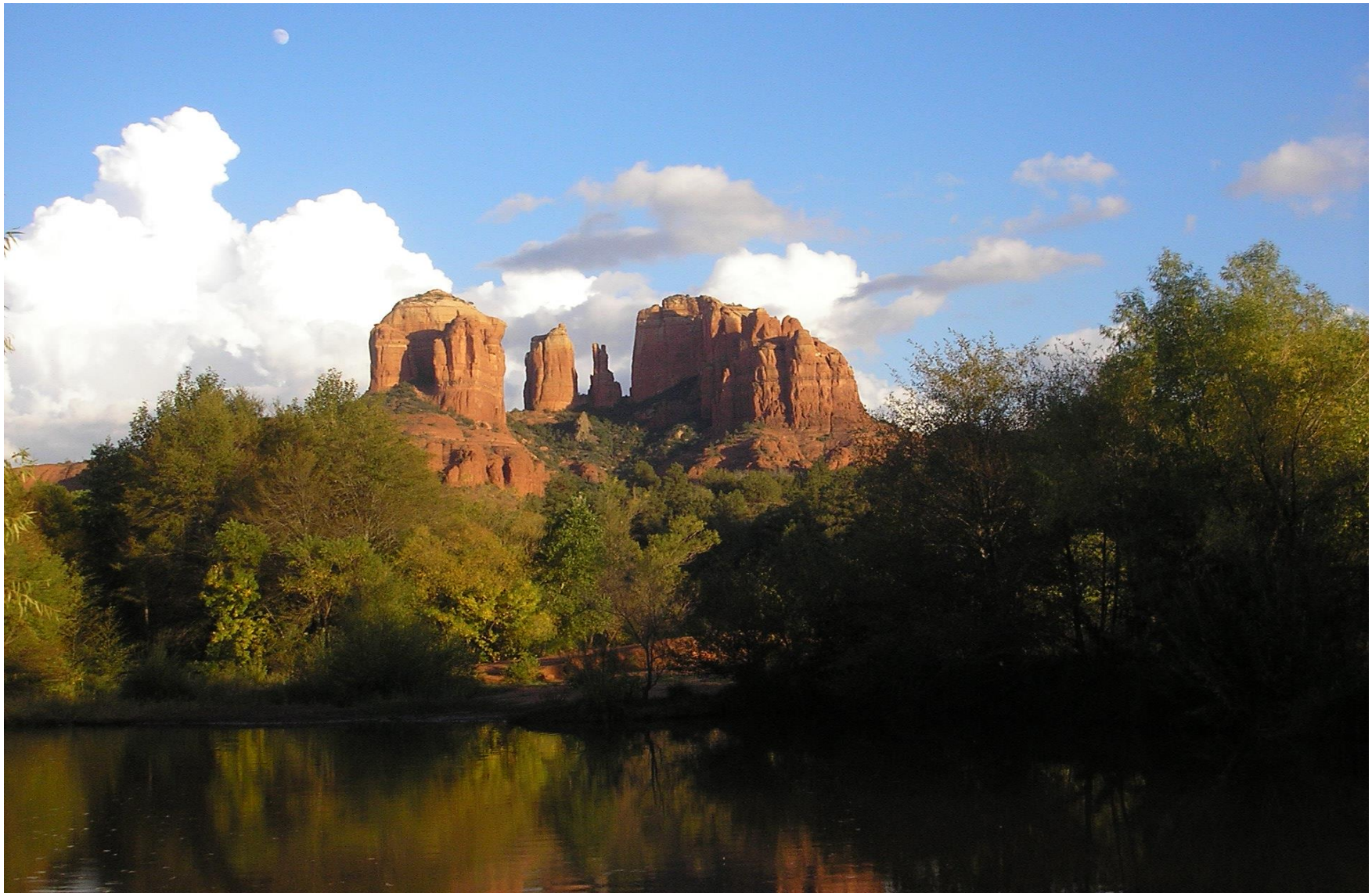

What Works Clearinghouse Finding On Social Skills Training

The WWC found after reviewing 46 studies of social skills training programs with preschool children with disabilities…," Social skills training was found to have no discernible effects on cognition and positive effects on social-emotional development and behavior for children with disabilities in early education settings"(p. 1).

What Works Clearinghouse (February, 7 2013). Early Childhood Intervention for Children with Disabilities: Social Skills Training. Washington, DC: Institute of Education Sciences, US Department of Education, 1-27. From website: http://ies.ed.gov/ncee/wwc/pdf/intervention_reports/wwc_socialskills_020513.pdf.

Exercise & Executive Functions

"Results suggest that *acute* physical exercise enhances executive functioning. The number of studies on *chronic* physical exercise is limited and it should be investigated whether *chronic* physical exercise shows effects on executive functions comparable to *acute* physical exercise. This is highly relevant in preadolescent children and adolescents, given the importance of well-developed executive functions for daily life functioning and the current increase in sedentary behaviour in these age groups."

Reference

Verburgh, L., Konigs, M, Scherder, E.J.A. and Oosterlaan, J. (March 6, 2013). Physical exercise and executive functions in preadolescent children, adolescents and young adults: a meta-analysis. British Journal of Sports Medicine, doi:10.1136/bjsports-2012-091441. From website: http://bjsm.bmj.com/content/early/2013/02/13/bjsports-2012-091441.abstract.

Exercise and AD/HD

"Following a single 20-minute bout of exercise, both children with ADHD and healthy match control children exhibited greater response accuracy and stimulus-related processing, with the children with ADHD also exhibiting selective enhancements in regulatory processes, compared with after a similar duration of seated reading. In addition, greater performance in the areas of reading and arithmetic were observed following exercise in both groups…These findings indicate that single bouts of moderately intense aerobic exercise may have positive implications for aspects of neurocognitive function and inhibitory control in children with ADHD" (p. 543).

Reference

Pontifex, M.B., Saliba, B.J., Raine, L.B., Picchetti, D.L. , and Hillman, C.H. (March, 2013). Exercise Improves Behavioral, Neurocognitive, and Scholastic Performance in Children with Attention-Deficit/Hyperactivity Disorder. Journal of Pediatrics, 162(3), 543-551. From website: http://www.jpeds.com/article/S0022-3476(12)00994-8/abstract.

Anxiety, Depression &AD/HD

"Both ADHD diagnosis and more ADHD symptoms were associated with more anxiety and depressive symptoms cross-sectionally as well as longitudinally. The longitudinal analyses showed that respondents with higher scores of ADHD symptoms reported an increase of depressive symptoms over six years whereas respondents with fewer ADHD symptoms remained stable…"

Anxiety, Depression & AD/HD

"It appears that the association between ADHD and anxiety/depression remains in place with aging. This suggests that, in clinical practice, directing attention to both in concert may be fruitful."

Reference

Michielsen M., Comijs H.C., Semeijn E.J., et al. (December 22, 2013). The Comorbidity of Anxiety and Depressive Symptoms In Older Adults With Attention-Deficit/Hyperactivity Disorder: A Longitudinal Study. Journal of Affective Disorders, Published On-Line. From website: http://www.unboundmedicine.com/medline/citation/23267726/The_comorbidity_of_anxiety_and_depressive_symptoms_in_older_adults_with_attention_deficit/hyperactivity_disorder:_A_longitudinal_study_.

Bipolar Disorder & AD/HD

"In ADHD+ patients, BD is associated with higher rate of mixed states, more severe psychopathology and more impaired familial functioning as well as higher rates of comorbid substance, alcohol and poly-drug abuse compared to BD patients without adult ADHD. Our findings suggest that ADHD symptoms in adults may influence clinical presentation, course and prognosis of BD. Further prospective research is needed to confirm our findings and to explore treatment implications for the management of BD."

Reference

Perugi G, Ceraudo G, Vannucchi G, et al. (December 22, 2012). Attention Deficit/Hyperactivity Disorder Symptoms in Italian Bipolar Adult Patients: A Preliminary Report. Journal of Affective Disorders, Published On-Line. From website: http://www.unboundmedicine.com/medline/citation/23267726/The_comorbidity_of_anxiety_and_depressive_symptoms_in_older_adults_with_attention_deficit/hyperactivity_disorder:_A_longitudinal_study_.

Attention & Autism

“Conclusions Our findings suggest that the co-occurrence of ADHD traits and autistic traits in adults is not determined by problems with hyperactivity, social skills, imagination or routine preferences. Instead, the association between those traits is due primarily to shared attention-related problems (inattention and attentional switching capacity). As the etiology of this association is purely genetic, biological pathways involving attentional control could be a promising focus of future studies aimed at unraveling the genetic causes of these disorders.”

Reference

Polderman T.J.C, Hoekstra, R.A., Vinkhuyzen A.A.E., Sullivan, P.F., van der Sluis, S. and Posthuma, D. (Decwember 21, 2012). Attentional Switching Forms a Genetic Link Between Attention Problems And Autistic Traits In Adults. Psychological Medicine, Published On-Line. From website: http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8788882.

Metadoxine and AD/HD

"Metadoxine ER was generally well tolerated, with nausea (17% [10/58] vs 0% [0/59]), fatigue (31% [18/58] vs 27% [16/59]), and headaches (29% [17/58] vs 39% [23/59]) being the most frequently reported adverse effects for the metadoxine ER and placebo groups, respectively…Findings suggest that metadoxine ER is a well-tolerated and effective treatment for adults with ADHD"(p. 1517".

Reference

Manor, I. et al. (December 2012). A randomized, double-blind, placebo-controlled, multicenter study evaluating the efficacy, safety, and tolerability of extended-release metadoxine in adults with attention-deficit/hyperactivity disorder. Journal of Clinical Psychiatry, 17(12), 1517-1523. From website: http://www.ncbi.nlm.nih.gov/pubmed/23290324.

Non-Medical Prescription Stimulant Use, Alcohol & ADHD

"Simultaneous use of NMPS and alcohol is high among NMPS users in our sample of undergraduate students. Simultaneous users are at increased risk of experiencing negative consequences. Thus, prevention and intervention efforts should include a focus on simultaneous NMPS and alcohol use."

Reference

Egan, K. et al. (December 27, 2012). Simultaneous Use Of Non-Medical Prescription Stimulants and Alcohol Among Undergraduate Students. Drug and Alcohol Dependence, Published On-Line. From website: www.ncbi.nlm.nih.gov/pubmed/23274057.

Cannabis, Alcohol & Stimulants

"Increases in skipping class were associated with both alcohol and cannabis use disorder, which were associated with declining GPA. The hypothesized relationships between these trajectories and NPS for studying were confirmed. These longitudinal findings suggest that escalation of substance use problems during college is related to increases in skipping class and to declining academic performance. NPS for studying is associated with academic difficulties. Although additional research is needed to investigate causal pathways, these results suggest that nonmedical users of prescription stimulants could benefit from a comprehensive drug and alcohol assessment to possibly mitigate future academic declines" (p. 1643)

Reference

Arria, A.M. et al. (March, 2013). Dispelling the myth of "smart drugs": cannabis and alcohol use problems predict nonmedical use of prescription stimulants for studying. Addictive Behavior, 38(3), 1643-1650. From website: http://www.ncbi.nlm.nih.gov/pubmed/23254212.

Sluggish Cognitive Tempo

"PI (Predominately Inattentive Type AD/HD, sic.) with high SCT had fewer problems with sustained attention, and more internalizing problems, anxiety/depression, and withdrawn/depressed behavior, and more executive problems with self-monitoring than the rest of the ADHD sample. Conclusion: This study supports revising subtype's criteria and further studying the hypothesis that ADHD with high SCT constitutes a separate clinical entity."

Reference

Capdevila-Brophy, C. et al. (May, 2012). ADHD Predominantly Inattentive Subtype With High Sluggish Cognitive Tempo: A New Clinical Entity? Journal of Attention Disorders, Published On-Line. From website: http://www.ncbi.nlm.nih.gov/pubmed/22653808.

ADHD & Borderline Personality Disorder

"There is a relationship between symptoms of childhood ADHD, BPD and depression in students. It is recommended to pay due attention to the comorbidity disorders such as BPD and depression in the treatment of ADHD disorder" (p. 68).

Mashhadi A, Soltani E, Akbari E, Farmani A. The Relationship between Childhood Attention Deficit/Hyperactivity Disorder and Adulthood Borderline Personality Disorder. Zahedan Journal of Research In Medical Sciences, 15(2), 68-73. From website: http://www.zjrms.ir/browse.php?a_code=A-10-891-1&slc_lang=en&sid=1.

ADHD and Criminality

"The ADHD group showed higher proportions of physical aggression, substance use, previous problems including aggression, sexual offences and property offences, birth problems and abuse in childhood. Effect sizes were small…Attention deficit hyperactivity disorder with conduct disorder is associated with a greater degree and history of problematic behaviour in offenders with intellectual disability" (p. 71).

Reference

Lindsay, W.R. et al (December 18, 2012). The Impact of Known Criminogenic Factors on Offenders with Intellectual Disability: Previous Findings and New Results on ADHD. Journal of Applied Research In Intellectual Disabilities, 26(1), 71-80. From website: http://onlinelibrary.wiley.com/doi/10.1111/jar.12011/abstract.

Vaccines & Autism

"We found no evidence indicating an association between exposure to antibody-stimulating proteins and polysaccharides contained in vaccines during the first 2 years of life and the risk of acquiring ASD, AD, or ASD with regression. We also detected no associations when exposures were evaluated as cumulative exposure from birth to 3 months, from birth to 7 months, or from birth to 2 years, or as maximum exposure on a single day during those 3 time periods. These results indicate that parental concerns that their children are receiving too many vaccines in the first 2 years of life or too many vaccines at a single doctor visit are not supported in terms of an increased risk of autism."

Reference

DeStefano, F., Price, C.S, and Weintraub, E.S. (April 1, 2013, In Press). Increasing Exposure to Antibody-Stimulating Proteins and Polysaccharides in Vaccines Is Not Associated with Risk of Autism. Journal of Pediatrics. From website: http://jpeds.com/article/S0022-3476(13)00144-3/fulltext.

Dogs & Autism

“In the presence of the dog, the participant exhibited more frequent and longer durations of positive behaviors (such as smiling and positive physical contacting) as well as less frequent and shorter durations of negative behaviors (such as aggressive manifestations)…”

Dogs & Autism

"…These findings are in accordance with previous experimental work and provide additional support for the assertion that dogs can prime autistic children for therapy. Ultimately, this study may contribute toward a change for full acceptance of canine-assisted therapy programs within the medical milieu. Additional studies using a similar research protocol on more autistic children will certainly help professionals to work on the most effective methods to individually serve this population through canine-assisted interventions" (p. 655).

Reference

Silva, K. et al (July, 2011). Can Dogs Prime Autistic Children for Therapy? Evidence from a Single Case Study. Journal of Alternative and Complimentary Medicine, 17(7), 655-659. From website: http://online.liebertpub.com/doi/abs/10.1089/acm.2010.0436

Solar Intensity & AD/HD

"In this study we found a lower prevalence of ADHD in areas with high SI for both U.S. and non-U.S. data. This association has not been reported before in the literature. The preventative effect of high SI might be related to an improvement of circadian clock disturbances, which have recently been associated with ADHD. These findings likely apply to a substantial subgroup of ADHD patients and have major implications in our understanding of the etiology and possibly prevention of ADHD by medical professionals, schools, parents, and manufacturers of mobile devices."

Reference

Arns, M., van der Heijden, K.B., Arnold, L.E., and Kenemans, J.L. (March 25, 2013). Geographic Variation in the Prevalence of Attention-Deficit/Hyperactivity Disorder: The Sunny Perspective. Biological Psychiatry. From website: http://www.biologicalpsychiatryjournal.com/article/S0006-3223(13)00175-3/abstract.

Sleep Apnea and AD/HD

"Youth with current SDB (sleep disorded breathing, sic.) exhibited hyperactivity, attention problems, aggressivity, lower social competency, poorer communication, and/or diminished adaptive skills" (p. 517).

Perfect MM; Archbold K; Goodwin JL; Levine-Donnerstein D; Quan SF. (April 1, 2013).Risk of behavioral and adaptive functioning difficulties in youth with previous and current sleep disordered breathing. Sleep, 36(4):517-525. from website: http://www.journalsleep.org/ViewAbstract.aspx?pid=28882.

Mindfulness & Working Memory

"Given that the ability to attend to a task without distraction underlies performance in a wide variety of contexts, training one's ability to stay on task should result in a similarly broad enhancement of performance. In a randomized controlled investigation, we examined whether a 2-week mindfulness-training course would decrease mind wandering and improve cognitive performance…"

Mindfulness & Working Memory

"…Mindfulness training improved both GRE reading-comprehension scores and working memory capacity while simultaneously reducing the occurrence of distracting thoughts during completion of the GRE and the measure of working memory. Improvements in performance following mindfulness training were mediated by reduced mind wandering among participants who were prone to distraction at pretesting. Our results suggest that cultivating mindfulness is an effective and efficient technique for improving cognitive function, with wide-reaching consequences."

Reference

Mrazek, M.D., Franklin, M.S., Phillips, D.T., Baird, B. and Schooler, J.W. (March 28, 2013). Mindfulness Training Improves Working Memory Capacity and GRE Performance While Reducing Mind Wandering. Psychological Science, doi: 10.1177/0956797612459659. From website: http://pss.sagepub.com/content/early/2013/03/27/0956797612459659.abstract.

Computer Training of Cognitive Skills

Good overview of computer programs to that train cognitive skills to children.

Wickeigren, I. (May/June, 2013). Calisthenics For a Child's Mind. Scientific American: Mind, 24(2), 38-45.

Literature Review of Computer Training of Cognitive Skills

"The findings from our review are clear. Working memory training has positive effects on tasks similar to those trained. In the studies we reviewed, training involved a variety of working memory tasks, and such training generalizes to other equivalent measures of working memory, but there is no evidence of a transfer to other less directly related tasks…"

Literature Review of Computer Training of Cognitive Skills

"…This lack of more general effects—suggests that working memory procedures cannot, based on the evidence to date, be recommended as suitable treatments for developmental disorders (such as ADHD or dyslexia)…In light of such evidence, it would seem very difficult to recommend the use of working memory training programs as a treatment for these disorders" (p. 4)

Reference

Melby-Lervag, M. and Hulme, C. (March, 2013). Can Working Memory Training Ameliorate ADHD and Other Learning Disorders? A Systematic meta-Analytic Review. ADHD Report, 21(2), 1-5.

Good Reference for Employers of Adults with AD/HD

Barkley, R.A. (March, 2013). Recommendations for Employers Concerning The Management of Employees with ADHD. ADHD Report, 21(2), 6-7, 13.

AD/HD and Allergic Rhinitis

"Our data showed that ADHD patients had an increased rate of AR. Therefore, psychiatrists should be more aware of the comorbidity of AR when treating ADHD patients."

Chou, P.H., Lin, C.C., Lin, C.H., Loh, E.W., Chan, C.H. and Lan, T.H. (December, 2012) Prevalence of allergic rhinitis in patients with attention-deficit/hyperactivity disorder: a population-based study. European Journal of Child and Adolescent Psychiatry, [e-published ahead of print]. From website: http://www.ncbi.nlm.nih.gov/pubmed/23274480.

Neuro-Imaging for AD/HD Diagnosis

"While non-imaging features gave highest performance in cross-validation, the addition of imaging features in sufficient numbers led to improved generalization to new data."

Bohland, J.W., Saperstein, S., Francisco, P., Rapin, J. and Grady, L. (December, 2012). Network, anatomical, and non-imaging measures for the prediction of ADHD diagnosis in individual subjects. Frontal System Neuroscience, doi: 10.3389/fnsys.2012.00078. From website: http://www.frontiersin.org/Systems_Neuroscience/10.3389/fnsys.2012.00078/abstract.

Neuro-Imaging for AD/HD Diagnosis

- **Barkley's take on the previous slide, " Results suggest that neuro-imaging features alone may not yet be satisfactory for clinical diagnosis" (p. 9).**

Barkley, R.A. (March, 2013). Can Neuro-Imaging Measures be Used to Predict ADHD? ADHD Report, 21(2), 9.

Impulsivity and The Medial Prefrontal Cortex

“The VBM analysis showed that impulsivity appears to be reliant on a network of cortical (medial prefrontal cortex and dorsolateral prefrontal cortex) and subcortical (ventral striatum) structures emphasizing the importance of brain networks associated with reward related decision-making in daily life as morphological biomarkers for impulsivity in a normal healthy population. While our results in healthy volunteers may not directly extend to pathological conditions, they provide an insight into the mechanisms of impulsive behaviour in patients with abnormalities in prefrontal/frontal-striatal connections, such as in drug abuse, pathological gambling, ADHD and Parkinson’s disease.”

Reference

Cho, S.S., Pellecchia, G., Aminian, K., Ray, N., Segura, B., Obeso, I. and Strafella, A.P. (December, 2012). Morphometric Correlation of Impulsivity in Medial Prefrontal Cortex. Brain Tomography, DOI 10.1007/s10548-012-0270-x. From website: http://link.springer.com/article/10.1007%2Fs10548-012-0270-x.

Frontal Lobe Epilepsy & AD/HD

"Analysis of epilepsy and ADHD-related factors indicated that the incidence of ADHD was 89.4% (76/85) in children with abnormal electroencephalogram (EEG) discharges on the most recent EEG, which was significantly higher than the ADHD incidence of 25% (19/76) in children with normal readings on the most recent EEG ($P < .01$). Children with frontal lobe epilepsy have a high incidence of ADHD. Sustained abnormal discharge on the electroencephalogram is associated with increased comorbidity of ADHD with frontal lobe epilepsy."

Reference

Zhang, D.-Q., Li, F.-H., Zhu, X.-B., Sun, R.-P. (December 26, 2012). Clinical Observations on Attention-Deficit Hyperactivity Disorder (ADHD) in Children With Frontal Lobe Epilepsy. Journal of Child Neurology, doi: 10.1177/0883073812470004. from website: http://jcn.sagepub.com/content/early/2012/12/25/0883073812470004.abstract.

Disorganization, Developmental Coordination Disorder & AD/HD

"A significantly increased rate of attention deficit in children with organizational deficit was identified. Attention deficit in children with specific motor disorder was exclusively associated with an organizational deficit. Organizational deficit in childhood is highly associated with attention deficit, and this association is particularly relevant in children with specific coordination disorder."

Reference

Lifshitz, N., Josman, N. and Tirosh, E. (December 26, 2013). Disorganization as Related to Discoordination and Attention Deficit. Journal of Child Neurology, doi: 10.1177/0883073812469295. From website: http://jcn.sagepub.com/content/early/2012/12/25/0883073812469295.abstract.

Adult AD/HD Heritability

"Our findings of moderate broad heritability estimates are consistent with previous literature on self-rated ADHD symptoms in older children, adolescents and adults and retrospective reports of self-rated childhood ADHD by adults but differ from studies of younger children with informant ratings" (p. 197).

Reference

Larsson, H., Asherson, P, , Chang, Z., Ljung, T., Friedrichs, B., Larsson, J.-O. and Lichtenstein, P. (January 2013). Genetic and environmental influences on adult attention deficit hyperactivity disorder symptoms: a large Swedish population-based study of twins. Psychological Medicine, 43(1), 197-207. From website: http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8781429.

TV, Electronic Games & Conduct

"TV but not electronic games predicted a small increase in conduct problems. Screen time did not predict other aspects of psychosocial adjustment."

Parkes, A., Sweeting, H., Wight, D and Henderson, M. (March 25, 2013). Do television and electronic games predict children's psychosocial adjustment? Longitudinal research using the UK Millennium Cohort Study .Archieves of Desease In Childhood, doi:10.1136/archdischild-2011-301508. From website: http://adc.bmj.com/content/early/2013/02/21/archdischild-2011-301508.

1-In-50 Children Have Autism

"Between 2007 and 2011–2012, the prevalence estimate for parent-reported ASD diagnoses among U.S. children aged 6–17 increased significantly, from 1.16% to 2.00%. Increases were observed in all age groups, and among boys aged 6–17" (p. 5).

1-In-50 Children Have Autism

“More than one-half of these children were classified by their parents as having ‘‘mild’’ ASD, and very few were classified as having ‘‘severe’’ ASD. Together, these findings suggest that the increase in prevalence of parent-reported ASD may have resulted from improved ascertainment of ASD by doctors and other health care professionals in recent years, especially when the symptoms are mild. Changes in the ascertainment of ASD could occur because of changes in ASD awareness among parents or health care professionals, increased access to diagnostic services, changes in how screening tests or diagnostic criteria are used, or increased special education placements in the community” (p. 5).

Reference

Blumburg, S.J. etal (March 20, 2013). Changes in Prevalence of Parent-reported Autism Spectrum Disorder in School-aged U.S. Children: 2007 to 2011–2012. National Health Statistics Reports; Number 65. Washington, DC.: Department of Health and Human Services, Centers for Disease Control and Prevention. From website: http://www.cdc.gov/nchs/data/nhsr/nhsr065.pdf.

Robots & Autism

“Our current work seeks to bridge this gap by developing an adaptive and individualized robot-mediated technology for children with ASD. The system is composed of a humanoid robot with its vision augmented by a network of cameras for real-time head tracking using a distributed architecture. Based on the cues from the child's head movement, the robot intelligently adapts itself in an individualized manner to generate prompts and reinforcements with potential to promote skills in the ASD core deficit area of early social orienting. The system was validated for feasibility, accuracy, and performance. Results from a pilot usability study involving six children with ASD and a control group of six typically developing (TD) children are presented” (p. 662).

Reference

Liu, C., Conn, K., Sarkar, N. and Stone, W. (September, 2008). Physiology-based affect recognition for computer-assisted intervention of children with Autism Spectrum Disorder. International Journal of Human Computer Studies, 66(9), 662-667. From Website: http://www.sciencedirect.com/science/article/pii/S1071581908000487.

Diversion of Stimulants

"Concerns about the nonmedical use of stimulant drugs used to treat ADHD are warranted, with nearly 10% of college students reporting this is a recent national survey; in some studies, the rates are far higher.

Although relatively infrequent use is most common, perhaps 20% of nonmedical users do so regularly and engage in intranasal routes of administration. Roughly 5% of nonmedical users may meet criteria for stimulant abuse or stimulant dependence and emergency department visits associated with nonmedical use are increasing.

In addition to nonmedical use, many individuals with prescriptions for ADHD medication occasionally misuse their medication by taking it in higher doses or with greater frequency than prescribed; some also use intranasally to 'get high' and/or in conjunction with other drugs or alcohol. As with nonmedical use, this is associated with higher rates of other substance use."

References

Rabiner, D. (March, 2013). Misuse & Abuse of ADHD Meds - An Updated Review. Attention Research Update.

Johnston, L.D., O'Malley, P.M., Bachman, J.G. and Schulenberg, J.E. (February 2012). Monitoring The Future: National Results On Adolescent Drug Use – Overview of key Findings, 2011. Washington, DC: The National Institute On Drug Abuse, National Institutes of Health.

Video Games & Dyslexia

"We tested reading, phonological, and attentional skills in two matched groups of children with dyslexia before and after they played action or nonaction video games for nine sessions of 80 min per day. We found that only playing action video games improved childrens reading speed, without any cost in accuracy, more so than 1 year of spontaneous reading development and more than or equal to highly demanding traditional reading treatments.

Attentional skills also improved during action video game training. It has been demonstrated that action video games efficiently improve attention abilities [14,15]; our results showed that this attention improvement can directly translate into better reading abilities, providing a new, fast, fun remediation of dyslexia that has theoretical relevance in unveiling the causal role of attention in reading acquisition" (p. 462).

References

Sandro Franceschini, Simone Gori, Milena Ruffino, Simona Viola, Massimo Molteni, Andrea Facoetti (February, 2013). Action Video Games Make Dyslexic Children Read Better. Current Biology, 23(6), 462-466. http://www.cell.com/current-biology/abstract/S0960-9822(13)00079-1.

Childhood Sleep & Memory

"When sleep followed implicit training on a motor sequence, children showed greater gains in explicit sequence knowledge after sleep than adults. This greater explicit knowledge in children was linked to their higher sleep slow-wave activity and to stronger hippocampal activation at explicit knowledge retrieval. Our data indicate the superiority of children in extracting invariant features from complex environments, possibly as a result of enhanced reprocessing of hippocampal memory representations during slow-wave sleep" (p.391).

Reference

Wilhelm, I., Rose, M., Imhof, K.I., Rasch, B., Buchel, Born, J. (March 3, 2013). The sleeping child outplays the adult's capacity to convert implicit into explicit knowledge. Nature Neuroscience, 16, 391-393. From website: http://www.nature.com/neuro/journal/v16/n4/full/nn.3343.html.