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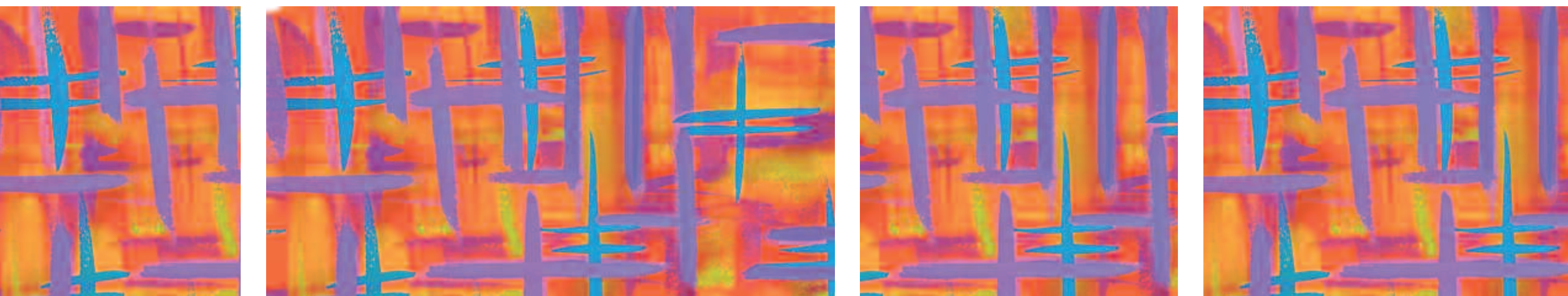
Comorbidity and Adult ADHD Newsletter June 2011 Issue #2: Executive Functioning



Executive function self-reporting – not EF tests – more accurately predicts adult difficulties in hyperactive kids

A new study found that, compared to executive function (EF) tests, EF self-reporting is a better predictor of impairment in major life activities and occupational functioning at adult follow-up.[1] In this study, EF was assessed by both self-reporting and testing using self-and other-rated impairment in 10 domains of major life activities and 12 measures of occupational impairment. According to the researchers, ADHD was associated with more EF impairment in daily life activities than was evident on EF tests. The study's results in favor of EF ratings also supported the increasingly widespread view that ADHD is an EF disorder and that EF deficits contribute to impairment in major life activities even if this is far less evident from widely used EF tests.

The investigators studied hyperactive (H; N = 135) and community control children (C; N = 75) followed to adulthood (mean age 27 years). The H cases were subdivided into those whose ADHD did persist (ADHD–P) and into those whose ADHD did not persist (ADHD–NP) using modified DSM-IV criteria. Self-reported EF deficits were more severe on all 5 EF scales in the ADHD–P than both the ADHD–NP and C groups and on 3 scales in the ADHD–NP compared to C groups. Most ADHD–P cases fell in the clinically impaired range on self-reported EF as did a substantial minority of ADHD–NP cases but few were so classified on the EF tests. Impairments in occupational functioning were predicted by the EF ratings to a greater degree than by the EF tests.

How to best assess executive function impairments associated with ADHD has been a source of controversy in the field of psychiatry.[2] Research on EF in ADHD historically has relied on tests of EF as the sole source for documenting the presence of deficits.[3] Some researchers measure EF impairments associated with ADHD using a battery of neuropsychological tests, such as the Wisconsin Card Sort or Stroop Color Word Test, that have long been used by clinicians for assessing traumatic brain injuries or schizophrenia.[4] When such measures have been used to assess patients with ADHD, only about 30% show significant impairment of EF, leading some to conclude that EF impairment is a comorbidity associated with ADHD in only about a third of cases and possibly less than that.[5] Conversely, other researchers have disputed that neuropsychological EF tests are not adequate for assessing EFs because they do not assess for the integration of cognitive functions, a critical element of EF.[6]

The conclusion that EF tests are only weakly related to the severity of ADHD – if at all – disregards the supposition that EF tests are serving as the sole indicator of EF deficits. Reasons exist to dispute that premise: First, most EF tests were not originally developed to assess EF or its constructs but have been borrowed from other areas of psychological research (i.e., schizophrenia, brain damage, etc).[7] Second, research involving children having various neurological disorders including frontal lobe injuries and traumatic brain injury finds low or no significant relationships between ratings of everyday EF and EF tests.[8] The variance shared between any single EF test and EF ratings in such studies plummets below 10% while even the best combination of EF tests shares less than 20% of the variance with EF ratings. Third, research reveals low or no relationships between EF tests and measures of daily functional ability in the elderly, such as self care tasks or larger everyday responsibilities like managing money.[9] Such findings imply that EF tests are not evaluating the same construct(s) as EF ratings, cannot serve as the sole source as to how poorly individuals use EF in their daily life activities, and so may not serve as the sole basis for concluding that disorders, such as ADHD, may not involve deficits in EF.

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Statement of need

Longitudinal studies following children with attention deficit hyperactivity disorder (ADHD) into adulthood reveal impairments in various major life activities, particularly in executive functioning.[1] When children with ADHD progress to adulthood, they tend to have lower occupational status and annual salaries than control groups followed to adulthood. They also tend to have worse employer-rated job performance, more job dismissals, and rapidly changing jobs. They tend to be less adequate in fulfilling work demands, less likely to be working independently and to complete tasks, and less likely to be getting along well with supervisors as rated by employers. Furthermore, they have poorer performances at job interviews and certain tasks at work are too difficult for them.[2]

While the literature has defined executive functioning (EF) in a variety of ways, 2 descriptions stand out. Pennington stated that EF "is defined as the ability to maintain an appropriate problem-solving set for attainment of a future goal."[3] They include the components of: "a) an intention to inhibit a response or to defer it to a later more appropriate time; b) a strategic plan of action sequences; and c) a mental representation of the task, including the relevant stimulus information encoded in memory and the desired future goal-state." A different approach was described by Lezar who said EFs "consist of those capacities that enable a person to engage successfully in independent, purposive, self-serving behavior.[4] They differ from cognitive functions in a number of ways. Questions about executive functions ask how and whether a person goes about doing something (e.g., Will you do it and if so, how?); questions about cognitive functions are generally phrased in terms of what or how much (e.g., How much do you know? What can you do?)."

On the neurobiological level, recent advances have improved our understanding of ADHD and how it related to EF. The higher-order association cortices in the temporal and parietal lobes and prefrontal cortex (PFC) interconnect to mediate aspects of attention.[5] The parietal association cortices are important for orienting attentional resources in time and space, while the temporal association cortices analyze visual features critical for identifying objects/places. These posterior cortices are engaged by the physical characteristics of a stimulus, such as movement and color. Conversely, the PFC is critical for regulating attention. The PFC is important for screening distractions, sustaining attention and shifting/dividing attention in a task-appropriate manner. The PFC is significant in regulating behavior/emotion, especially for inhibiting inappropriate emotions, impulses and habits. Significantly, the PFC is needed for allocating and planning to achieve goals and organizing behavior and thought, the regulatory abilities referred to as executive functions. The intent of this issue is to explore the interconnection between executive functioning and ADHD, and to approach their relationship more accurately from a therapeutic standpoint.

Citations

1. Barkley RA. Executive Functioning and *Self-Regulation: Integration, Extended Phenotype, and Clinical Implications*. New York: Guilford Press; 2011.
2. Barkley RA, Murphy KR, Fischer M. *ADHD in adults: What the science says*. New York: Guilford Press; 2008.
3. Pennington BF, Bennetto L, McAleer O, Roberts RF. Executive functions and working memory: Theoretical and measurement issues. In: Lyon, GR, Krasnegor N, eds. *Attention, Memory, and Executive Function.* (pp. 327-348). Baltimore, MD: Paul H. Brookes; 1996: 327-348.
4. Lezak MD. *Neuropsychological Assessment;* 3rd ed.; New York: Oxford University Press; 1995.
5. Arnsten AF. Toward a new understanding of attention-deficit hyperactivity disorder pathophysiology: an important role for prefrontal cortex dysfunction. *CNS Drugs*. 2009;23(Suppl 1):33-41.

Learning objectives

After completing this newsletter, the reader should be better able to:

1. Discuss the problems associated with the tests used in the clinical assessment of EF.
2. Discern whether stimulants are effective in the treatment of executive function deficits.
3. Explain how childhood adversity, psychiatric comorbidities can predict ADHD persistence into adulthood.
4. Describe a case study in which a patient with ADHD, dyslexia, and executive function disorder was successfully assessed and treated.

The researchers propose that "this disparity between EF tests and EF ratings is likely due to their assessing different levels of a hierarchically organized EF system that can be conceptualized as a meta-construct. Each level gives rise to longer-term goals that require new abilities and skills so as to create increasingly more complex nested sets of goal directed activities organized and sustained across increasingly longer temporal durations and involving larger social networks to attain."

Citations

1. Barkley RA, Fischer M. Predicting impairment in major life activities and occupational functioning in hyperactive children as adults: self-reported executive function (EF) deficits versus EF tests. *Dev Neuropsychol*. 2011;36(2): 137-161.
2. Brown TE. Executive functions and attention deficit hyperactivity disorder: implications of two conflicting views. *Int J Disabil Dev Educ*. 2006;53(1):35–46.
3. Boonstra AM, Oosterlaan J, Sergeant JA, Buitelaar JK. Executive functioning in adult ADHD: a meta-analytic review. *Psychol Med*. 2005;35(8):1097–1108.
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Please consider the following question before proceeding with the article. Please find the answer for this question on page 10 of the article.

1. Which of the following statements about executive function (EF) tests is true?

   A. Most EF tests were originally developed to assess EF and its constructs.

   B. The variance shared between any single EF test and EF ratings in such studies is typically below 10%.

   C. Research involving children having various neurological disorders including frontal lobe injuries and traumatic brain injury finds a high relationship between ratings of everyday EF and EF tests.

   D. Research reveals a positive relationship between EF tests and measures of daily functional ability in the elderly.

Neuropsychological test designs for measuring EF in ADHD children should first consider age

If testing is to be used for measuring executive function (EF) in children, then the design of any battery of neuropsychological tests for measuring EF in ADHD children should first consider age before interpreting developmental variations and neuropsychological test results, says a recent Korean study.[1]

In this study, a sample of 112 ADHD children into 4 groups of 28 based on ADHD status (ADHD vs. non-ADHD), age (lower grades [LG: age 7-9 years] vs. higher grades [HG: 10-12 years]) and Wisconsin Card Sorting Test (WCST) performance, defined by the number of completed categories (CC). Participants in each group were matched according to age, gender, ADHD subtype, and intelligence. The Wechsler intelligence Scale for Children 3rd edition tested intelligence and the Computerized Neurocognitive Function Test-IV, which included the WCST, tested EF.

Comparisons of EFs scores in LG ADHD children showed statistically significant differences (27.3% variance) in performing digit spans backward, some verbal learning scores, including all memory scores, and Stroop test scores. However, comparisons of EF scores in HG ADHD children did not show any statistically significant differences. Correlation analyses of the CC and EF variables and stepwise multiple regression analysis in LG ADHD children showed a combination of the backward form of the Digit span test and Visual span test in lower-performance ADHD participants significantly predicted the number of CC (variance – 27.3%; $P<0.001$).

With regard to developmental differences, although there are more than 100 studies examining neuropsychological functioning in childhood ADHD, relatively few studies exist to examine such functioning in ADHD preschoolers, adolescents, and/or adults.[2] Although many researchers have extensively studied elementary school-age ADHD children's neuropsychological functioning, such studies have not considered these children's neurodevelopment characteristics.

Citations

1. Hong HJ, Lee JB, Kim JS, et al. Impairment of concept formation ability in children with ADHD: comparisons between lower grades and higher grades. *Psychiatry Investig*. 2010;7(3):177-188.
2. Seidman LJ. Neuropsychological functioning in people with ADHD across the lifespan. *Clin Psychol Rev*. 2006;26(4):466-485.

Stimulants not found to be effective in the treatment of executive function deficits

In a randomized clinical trial, executive function (EF) deficits did not impact the clinical response to an osmotic-release formulation of methylphenidate (OROS-MPH), showing such deficits do not moderate the response to methylphenidate and measures of EF deficits are not associated with response to OROS-MPH.[1]

In this a 6-week, parallel design, placebo-controlled study in adults with DSM-IV ADHD, the psychometric index of EF used standardized neuropsychological testing. The researchers assessed behaviors reflective of EFDs using the Behavior Rating Inventory of Executive Function – Adult Version (BRIEF-A). Participants with available measures of EF (OROS-MPH – N=40; placebo N=47) were included for analysis. No difference was observed in the percentage of subjects completing the 6-week acute efficacy phase 1 of the trial (OROS-MPH – 100% [N=40] vs. placebo – 98% [N=46]; P=0.4). For the OROS-MPH group, the mean daily dose at phase 1 endpoint was 85±32 mg (1.0±0.3 mg/kg), and for the placebo group 101±22 mg (1.2±0.1 mg/kg; P<0.001). Based on the neuropsychological testing at the baseline assessment, 40% of the ADHD subjects (N=35/87) were considered to have EF deficits; however, 93% (N=81) of subjects had ≥2 BRIEF-A clinical scale T-scores (N=65).

The researchers recently completed a large scale (N=223) single site, 6-week, double blind, randomized, placebo-controlled, parallel study design of OROS-MPH in adults with DSM-IV ADHD. Clinical response at the study endpoint was significantly greater in the OROS-MPH group versus placebo (62% vs. 37%; P<0.001). These results indicate that OROS-MPH is effective in the treatment of adults with ADHD. Yet, while these results show that stimulants are effective in reducing symptoms of ADHD in adults, uncertainties remain as to their efficacy on other key aspects of the clinical picture. One suspected source of morbidity and disability associated with ADHD across the life cycle has been EF deficits. The results of this latest study demonstrate a sizeable minority of ADHD patients continue to struggle with residual behavioral concomitants of EF impairments despite good clinical response to OROS-MPH.

Citation

1. Biederman J, Mick E, Fried R, et al. Are stimulants effective in the treatment of executive function deficits? Results from a randomized double blind study of OROS-methylphenidate in adults with ADHD. *Eur Neuropsychopharmacol*. 2011 Mar 8. [Epub ahead of print]

Please consider the following question before proceeding with the article. Please find the answer for this question on page 10 of the article.

2. In the study by Biederman and colleagues, in which they sought to determine whether stimulants are effective in the treatment of EF deficits, which of the following statement is false?
   - A. EF deficits were successfully treated with atomoxetine
   - B. EF deficits were successfully treated with osmotic-release methylphenidate
   - C. ADHD symptoms were successfully treated with osmotic-release methylphenidate.
   - D. B and C

Childhood adversity, psych comorbidities foretells ADHD persistence into adulthood

Persistence of ADHD over the long term is predictable from psychosocial adversity and psychiatric comorbidity established over a decade earlier, a new study indicated.[1] The study was designed to evaluate predictors of ADHD prolongation in a large sample of boys with (N=110) and without ADHD (N=105) followed prospectively for 11 years into young adulthood. The mean age at the start of the study was 11 years (range 6-17); the mean age at follow-up was 22 years (range 15-31).

Subjects were comprehensively and blindly assessed with structured diagnostic interviews and assessments of cognitive, social, school, and family functioning. Of the ADHD subjects, 39 (35%) had syndromatic persistence, 24 (22%) had symptomatic persistence, 16 (15%) had functional persistence, 7 (6%) were not symptomatic, syndromatic, or

functionally impaired but were medicated for ADHD, and 24 (22%) were fully remitted. Thus, 78% (86/110) of ADHD subjects showed some evidence of persistence.

Persistent ADHD was associated with a significantly higher rate of oppositional defiant disorder (ODD; $P \leq 0.01$), conduct disorder (CD; $P \leq 0.001$), and 2 or more anxiety disorders ($P \leq 0.001$) at baseline compared to the remittent ADHD group. Both ADHD (persistent and remittent) groups had significantly higher rates of ODD and major depressive disorder at baseline compared to controls. However, only the persistent ADHD group had significantly higher rates of bipolar disorder compared to the controls ($P \leq 0.001$). Examination of baseline The Child Behavior Checklist (CBCL) findings revealed that the persistent ADHD group had significantly higher T-scores at baseline on the Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior subscales of the CBCL compared to the remittent ADHD group. Both ADHD groups had significantly higher Anxious/Depressed, Social Problems, Attention, Delinquent, and Aggressive T-scores at baseline compared to the Controls. However, only the persistent ADHD group had significantly higher Withdrawn, Somatization, and Thought Problems T-scores at baseline compared to controls.

The treatment history findings revealed no significant associations between persistence or remission and intensity of treatment. Say the investigators, this indicates that treatment at baseline did not account for the patterns of persistence and remission observed. The issue of whether a particular child with ADHD will have a persistent illness is of tremendous clinical import. Although some differences were noted in the profile of ADHD symptoms between persistent and non-persistent cases, these differences were not remarkable. Conversely, impairment, adversity, and comorbidity predicted persistence or late remission. Children who have none of these risk factors may have a comparatively good prognosis. Further research is warranted to address whether the predictive validity of these domains extends into later adulthood.

Citation

1. Biederman J, Petty CR, Clarke A, et al. Predictors of persistent ADHD: an 11-year follow-up study. *J Psychiatr Res.* 2011;45(2):150-155.

Please consider the following question before proceeding with the article. Please find the answer for this question on page 10 of the article.

3. In the study that evaluated predictors of ADHD persistence in a sample of boys with and without ADHD followed prospectively for 11 years into young adulthood, which of the following statements is false?
   A. Compared to remittent ADHD, persistent ADHD was associated with a higher rate of oppositional conduct disorder
   B. Compared to persistent ADHD, remittent ADHD was associated with a lower rate of conduct disorder
   C. Both persistent and remittent ADHD groups had significantly higher rates of major depressive disorder at baseline compared to controls.
   D. Both persistent and remittent ADHD groups had significantly higher rates of bipolar disorder at baseline compared to controls.

The connection between ADHD and poor emotional control is familial, claims study

A study of probands with and without ADHD and their siblings suggests deficient emotional self-regulation (DESR) is familial in ADHD families and that this familial transmission cannot be accounted for by other disorders.[1] DESR refers to 1) deficits in self-regulating the physiological arousal caused by emotions, 2) difficulties inhibiting inappropriate behavior in response to either positive or negative emotions, 3) problems refocusing attention from strong emotions, and 4) disorganization of coordinated behavior in response to emotional activation.[2]

Probands were men and women between the ages of 18 and 55 years who had children or siblings eligible for participation in the study.[1] Probands were included as having ADHD if they met full DSM-IV criteria for the disorder (N=127) or for late-onset ADHD (N=79). The late-onset participants had onset in adolescence. The remaining participants were defined as not having ADHD (N=123).

The results showed that, relative to comparison subjects, ADHD was more prevalent in the siblings of probands with ADHD, irrespective of the presence or absence of DESR. ADHD was present in 48% of the siblings of ADHD probands versus 7% of the siblings of comparison probands ($P<0.001$). ADHD was present in 60% of the siblings of

ADHD plus DESR probands versus 7% of the siblings of comparison probands ($P<0.001$). The respective prevalence of ADHD in siblings did not differ significantly between ADHD probands with and without DESR (60% vs. 48%). Siblings of ADHD plus DESR probands had significantly elevated rates of DESR relative to comparison probands (27% vs. 0%, respectively; $P<0.001$), but the siblings of ADHD probands did not (5% vs. 0%. DESR was also significantly more prevalent in the siblings of probands with ADHD plus DESR compared with the siblings of probands with ADHD (27% vs. 5%; $P<0.01$).

DESR scale items for siblings of both ADHD plus DESR probands and ADHD probands included that a study participant:

- Quickly becomes angry or distressed
- Gets frustrated easily
- Overreacts emotionally
- Gets easily excited by ongoing activities
- Frequently loses temper
- Tends to be argumentative
- Becomes oversensitive to or easily annoyed by others
- Develops anger or resentfulness

Relative to siblings of comparison subjects, siblings of both ADHD plus DESR probands and ADHD probands had significantly higher rates of major depression, oppositional defiant disorder, and alcohol dependence. Siblings of ADHD plus DESR probands additionally had significantly higher rates of lifetime bipolar disorder, social phobia, and generalized anxiety disorder relative to the siblings of comparison probands. No significant differences were observed in the rates of any of these psychiatric disorders when comparing the siblings of ADHD plus DESR probands with siblings of ADHD probands.

Citation

1. Surman CB, Biederman J, Spencer T, et al. Deficient emotional self-regulation and adult attention deficit hyperactivity disorder: a family risk analysis. *Am J Psychiatry.* 2011 Apr 15. [Epub ahead of print]
2. Barkley RA. Deficient emotional self-regulation: a core component of attention-deficit/hyperactivity disorder. *J ADHD Relat Disord.* 2010; 1(2):5–37.

Adding naltrexone to MPH could short-circuit stimulant abuse

A study has identified the μ opioid receptor (MOPR) as a potential target for attenuating rewarding effects of methylphenidate (MPH) and suggests that a formulation which combines naltrexone with MPH could be a useful pharmaceutical approach to lessen the abuse potential of MPH and other stimulants.[1]

Using a murine model, the researchers showed that supratherapeutic doses of MPH produce rewarding effects (surrogate measure for addiction in humans) in a conditioned place preference paradigm and upregulate MOPR activity in the striatum and nucleus accumbens, brain regions associated with reward circuitry. Co-administration of naltrexone, a non-selective opioid receptor antagonist, prevents MPH-induced MOPR activation and the rewarding effects. The MPH-induced MOPR activation and rewarding effect require activation of the dopamine D1 but not the D2-receptor.

MPH is one of the most commonly used and highly effective treatments for ADHD in children and adults. As the therapeutic use of MPH has increased, so has its abuse and diversion. Yet, the mechanisms associated with development of MPH-associated abuse and dependence are not well understood making it difficult to develop methods to mitigate its street value. As a result, many ADHD patients especially children and adolescents, who could benefit from MPH treatment do not receive it and risk lifelong disabilities associated with untreated ADHD.

Therefore, understanding the mechanisms associated with development of MPH addiction and designing methods to prevent it assume high public health significance.

The conclusions obtained from this MPH study could apply to the entire class of stimulant drugs, including amphetamine, and analeptics such as modafinil because all of these compounds share a common dopaminergic mode of action and likely affect the MOPR in the same manner as MPH.[2] Compared with the slow-release formulations which are currently the only strategy currently on the market, an advantage of the naltrexone-stimulant combination envisaged in this study is that the naltrexone/stimulant combination would not become ineffective upon pulverization, because destroying the formulation in this manner cannot separate the naltrexone from the stimulant compound. Therefore, such a formulation would be resistant to abuse by the most common form, which is intranasal administration of the pulverized preparation.

Citations

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2. Xia YF, He L, Whistler JL, Hjelmstad GO. Acute amphetamine exposure selectively desensitizes kappa-opioid receptors in the nucleus accumbens. *Neuropsychopharmacology.* 2008;33(4):892-900.

Case study: A patient with ADHD, dyslexia and EF deficits treated with atomoxetine and remediation

Robert is a 45-year old male who was diagnosed with dyslexia as a child. At this time, he presents to your office for ADHD evaluation as ADHD was recently diagnosed in his 6-year old son. Robert received remediation for dyslexia; however a more probing history reveals a record of attention and executive dysfunction deficits such as non-reading based difficulties with mathematics, day dreaming, not listening when others are speaking, forgetfulness, organizational difficulty, and trouble starting and finishing tasks – characteristics which continue to the present time. These deficits are independent of any reading-based tasks and impair his functioning at home and on his job as a taxi dispatcher. For example, he forgets to assign drivers to trips and leaves callers on hold. His wife corroborates the symptoms and is incredibly frustrated by his inability to not finish tasks and not listening. Her feeling is that she has two children to take care of – her son and Robert. He rarely reads and feels embarrassed by this difficulty and not being to help his son with his homework. Other than restlessness and trouble waiting, few hyperactive impulsive symptoms are present.

Robert has no other psychiatric history, no substance abuse disorder and no history consistent with mood disorder. The provisional assessment is of dyslexia and ADHD, inattentive type.

Please consider the following question before proceeding with the article. Please find the answer for this question on page 10 of the article.

4. At this point, how would you proceed?
   - A. Prescribe a psychostimulant for his ADHD and reassess
   - B. Prescribe a non-stimulant ADHD medication and reassess
   - C. Refer him for neuropsychological testing to confirm the diagnosis
   - D. A and C

Not only does the patient desires to verify the persistence of his dyslexia, but it is also important to know if there is a learning disability which may not respond to pharmacotherapy prescribed for his ADHD symptoms. Therefore, you refer him for neuropsychological testing, which confirms these diagnoses.

You initiate a trial of atomoxetine 25 mg/day and titrate to 80 mg/day over a month. After 6 weeks of therapy, Robert reports substantial improvement in his ability to complete tasks, to be attentive, not to be easily distracted decreased distraction and to be less forgetful. This is confirmed by his wife. His ability to continue his attempts at reading is also improved, but he is still having difficulty. You refer him to reading remediation. Compared to prior attempts at reading remediation, the patient is reporting increased ability to participate in remediation now that ADHD is treated.

Atomoxetine has been shown to reduce ADHD symptoms and improve reading scores in ADHD groups with dyslexia groups.[1] Research indicates that atomoxetine improves visuospatial working memory and, to a lesser degree, inhibition in children with ADHD and dyslexia.[2] This suggests differential developmental pathways for co-morbid ADHD plus dyslexia as compared to ADHD and dyslexia alone.[1,2]

Take home points

- Neuropsychological testing is useful in confirming the existence of comorbid ADHD and learning disabilities
- ADHD and dyslexia are highly co-morbid; in samples of subjects with ADHD, the rate of dyslexia is between 18% and 45%[3]
- There is potential improvement in visuospatial memory in ADHD and dyslexia with atomoxetine therapy[1,2]
- ADHD symptoms can improve in patients with ADHD and dyslexia[1,2]
- One needs to distinguish between symptoms of the two disorders by examining deficits in non-reading domains, such as mathematics.

Citations

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Please consider the following question before proceeding with the article. Please find the answer for this question on page 10 of the article.

5. According to the case study just presented, which of the following statement are true?
   A. Neuropsychological testing is rarely useful in confirming the existence of comorbid ADHD and learning disabilities
   B. ADHD and dyslexia are highly co-morbid
   C. There is no improvement in visuospatial memory in ADHD and dyslexia with atomoxetine therapy
   D. There are no known developmental pathways differentials for co-morbid ADHD plus dyslexia as compared to ADHD and dyslexia alone.

Journal reviews

Greater physical activity associated with better executive functioning performance in ADHD children

Children with attention-deficit hyperactivity disorder (ADHD) consistently perform worse on executive function (EF) tasks relative to those without ADHD. A new study shows that higher physical activity was found to be a significant predictor of planning as assessed with the Tower of London Total Move Score (TMS) and Total Execution Time (TET) ($P<0.05$ for both comparisons).[1]

Eighteen children diagnosed with ADHD were recruited through advertisements placed at local ADHD clinics, medical providers, specialty ADHD schools, and various relevant support agencies. To be included in the study, participants had to be diagnosed with ADHD by a medical professional and currently taking medication to treat ADHD symptoms. Although it is likely that physical activity might be more beneficial to ADHD children who are not currently medicated, the vast majority of ADHD children are medicated and, therefore, the researchers sought to explore relationships between variables in a sample already receiving this form of treatment. As a result of the higher prevalence rate of ADHD in boys relative to girls and because behavioral and cognitive symptoms vary significantly as a function of gender, only boys were included in this study.

The boys (median age 10.6 years) were instructed to complete a series of EF tasks. Physical activity was measured with an accelerometer that provided daily minutes of moderate-to-vigorous intensity physical activity. Higher PA was associated with lower TMS and faster execution times, which are indicative of better performance.

Physical activity is thought to benefit EF by modifying brain structure and function, particularly in the frontal regions of the brain. This is relevant to ADHD populations considering that ADHD models hypothesize that a core deficit in frontal lobe function underlies its various cognitive and behavioral manifestations.[2] Animal studies document various cerebral changes as a result of physical activity that may lead to enhanced EF including increased cerebral blood flow, angiogenesis and neurogenesis, and increased release of brain-derived neurotrophic factor. Research with humans suggests that the same physiological mechanisms may explain the relationship between physical activity and enhanced EF.[3]

The Tower of London tasks, used to assess EF, require the subject to copy a modeled pattern of 3 colored beads (red, blue, green) in as few moves as possible.[4] The TMS is the sum of all moves taken to solve the problems that exceeded the minimum required move score. The TET score indicates how long the participant took to solve the problems. Percentile scores are adjusted for age and higher percentile scores represent better performance and more efficient planning abilities. The Total Correct Score (TCS), which did not reach statistical significance in this study, indicates how many of the 10 problems were solved in the minimum number of moves.

Inattention rather than OCD predicts core features of hoarding disorder, says study

Symptoms of obsessive-compulsive disorder (OCD) did not significantly predict any of the core features of hoarding disorder (HD), according to a recent study that compared persons diagnosed with HD but not OCD, OCD but not HD, and healthy controls.[5] Conversely, the inattentive – but not hyperactive/impulsive – symptoms of ADHD significantly predicted severity of clutter, difficulty discarding, and acquiring. These results challenge current conceptualizations of hoarding as a subtype of OCD, and imply an association with neurocognitive impairment.

Eighty seven participants – age 18 to 65 – were recruited specifically for hoarding or clutter problems, not for OCD, which may have resulted in a more representative sample given the rather low rate of true OCD among hoarders. Participants were administered the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV) and Hoarding Rating Scale-Interview (HRS-I). Once these measures were completed, participants completed a battery of self-report questionnaires including a demographics form; the Saving Inventory-Revised (SI-R), a 23-item questionnaire of compulsive hoarding severity; the Obsessive Compulsive Inventory-Revised (OCI-R), Depression Anxiety Stress Scale (DASS), and the ADHD Symptom Scale (ADHDSS).

The results showed a combination of demographic variables (age, gender) and general distress variables (depression,

anxiety, and stress) were significant predictors of the core features of hoarding. Non-hoarding OCD did not add predictive power to any of the models; i.e., OCD symptoms did not predict hoarding symptoms over and above general psychological distress. However, when adult ADHD symptoms of inattention and hyperactivity/impulsivity were added to the models, predictive capacity increased significantly in each case. Examination of beta weights in the final models indicated that age and inattention symptoms were significant independent predictors of all 3 of the core features of hoarding (clutter, difficulty discarding, acquiring).

Traditionally, hoarding has been conceptualized as a variant of OCD. However, over 80% of primary hoarding patients deny symptoms of OCD.[6] Hoarding symptoms may correlate less well with OCD symptoms than with other symptoms such as depression.[7] The chronic nature of compulsive hoarding, its associated public health burden, and the potential impact of life stressors on symptom development warrants further research.

ADHD and OCD patients have shared but also disorder-specific brain dysfunctions, suggest researchers

A British study proposes that that ADHD and OCD patients have shared but also disorder-specific brain dysfunctions during interference inhibition and attention allocation.[8] The study of boys with ADHD, with OCD, or with no psychiatric diagnoses (healthy controls) showed that both disorders shared dysfunction in mesial frontal cortex. Disorder-specific dysfunctions, however, were observed in dorsolateral prefrontal cortex in OCD patients and in caudate, cingulate, and parietal brain regions in ADHD patients. The disorder-specific dissociation of striato-cingulate activation that was increased in OCD compared to ADHD patients, was furthermore inversely related to the symptomatology of the two disorders, and may potentially reflect differential dopamine modulation of striatal brain regions.

Event-related functional magnetic resonance imaging (fMRI) was used to compare brain activation of the study participants during a Simon task that measures interference inhibition and controls, while co-measuring attention allocation. The decreased activation in caudate and cingulate in ADHD was negatively correlated with ADHD symptoms and positively with OCD behavioral traits.

The 6-min fMRI adaptation of the Simon task involves a stimulus-response incompatibility effect and measures interference inhibition and selective attention and controls for the attentional oddball effect. Research has shown that brain activation is more sensitive than behavioral performance.[9] Thus, reduced brain activation despite comparable task performance is a common finding in ADHD patients.

ADHD among long-term prison inmates is a prevalent, persistent and disabling disorder, study reveals

A Swedish study has suggested that ADHD is present among 40% of adult male longer-term prison inmates and that coexisting disorders, such as substance use disorder (SUD), autism spectrum disorder (ASD), personality disorders, mood disorders and anxiety disorders, severely affect prison inmates with ADHD.[10] In addition, educational level and executive functions were poorer among ADHD inmates compared with ADHD outpatients and controls.

In this study, 315 male inmates (median age 31 years) were screened for childhood ADHD by the Wender Utah Rating Scale (WURS-25) and for present ADHD by the Adult ADHD Self-Report Screener (ASRS-Screener). Thirty four inmates were assessed for ADHD and comorbid psychiatric disorders. These findings were compared with 20 adult males with ADHD, assessed at a psychiatric outpatient clinic and 18 healthy controls.

Only 7% of prison inmates confirmed with ADHD had received a diagnosis of ADHD during childhood. All subjects reported lifetime SUD in which amphetamines were the most common misused substances. Mood and anxiety disorders were present in approximately 50% of subjects; ASD was present in about 25%. Personality disorders were common; almost all inmates presented conduct disorder (CD) and antisocial personality disorder. Prison inmates reported more ADHD symptoms during both childhood and adulthood, compared with ADHD psychiatric outpatients. Furthermore, analysis of executive functions after controlling for intelligence quotient (IQ) showed both ADHD groups performed poorer than controls on working memory tests. These findings of ADHD symptom severity, psychiatric comorbidities and executive functioning disorders among prison inmates, suggest that their asocial behavior may have been the result of undiagnosed and untreated psychiatric problems in early life. The study results underscore the need for considering these severities when introducing ADHD treatment programs for prison inmates.

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ANSWERS TO THE ARTICLE QUESTIONS:

1. B
2. C
3. D
4. C
5. B

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