

New Approaches to ADHD:

Addressing Patient Needs
From a Whole-life Perspective

Recognizing ADHD: Neurobiology, Symptoms, and Treatment

Previously Recorded Presentation With



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To obtain category 1 AMA PRA credit, the physician should:

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There is no charge for participating in this educational activity.

*A score of at least 70% on the post-test is required to earn CME credit.

Target Audience

This program was created for physicians who have an interest in ADHD.

Learning Objectives

After completion of this program, participants should be able to:

- Describe the wide variety of ADHD-related impairments
- Describe “executive functions” and their manifestations in patients with ADHD
- Outline appropriate treatment interventions for patients with ADHD based on its neurobiological etiology and on diagnostic criteria

Term of Offering

CME credit for this Internet program will be available through September 1, 2002. The original release date of this material was June 4, 2001. CME credit is offered upon successful completion of the post-test.

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Faculty Disclosure

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Recognizing ADHD: Neurobiology, Symptoms, and Treatment

- Prevalence and diagnostic criteria
- ADHD as impaired “executive functions”
- Functions often impaired in ADHD
- Psychobiology of ADHD
- Research on treatment options
- Treatment guidelines

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Inaccurate Stereotypes in ADHD

- Young boys, not girls
- Always hyperactive
- Never able to concentrate
- Not smart, low achiever
- Severe behavioral problems
- Symptoms remit in adolescence

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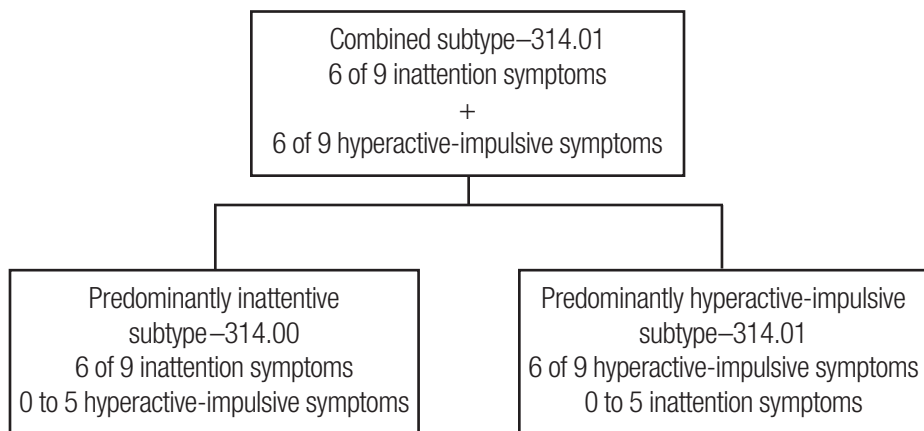
ADHD Prevalence

- Three to 7% of children; 3 to 4% of adults
- Male: female ratios range from 6:1 to 1:1
- All levels of intelligence (IQ)
- All levels of socioeconomic status
- Family genetic transmission: 91%
- Inheritance not specific to subtype

Barkley RA. *Sci Am.* 1998; 279:66-71.
Gaub M, Carlson CL. *J Am Acad Child Adolesc Psychiatry.* 1997;36:1036-1045.
Smalley SL, et al. *J Am Acad Child Adolesc Psychiatry.* 2000;39:1135-1143.

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Three Subtypes of ADHD



American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.*
4th ed. Washington, DC: American Psychiatric Press; 1994.

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Hyperactive-impulsive Characteristics

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- Core problem: impaired ability to inhibit
- Characterized by
 - Restless feelings and actions
 - Impulsive actions and speaking out
 - Excessive impatience
 - Only two speeds: full or asleep
 - Difficulty relaxing
 - Intrusiveness

Inattentive Characteristics

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- Impairments in multiple cognitive functions
- Difficulty with
 - Attending to work tasks
 - Organizing work
 - Sustaining mental effort to complete tasks
 - Filtering distractions
 - Short-term memory
 - Being “motivated to work”

Symptom Characteristics of ADHD

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- Dimensional, not “all or nothing”
 - Occasionally, everyone has some executive function impairment
 - In ADHD, impairment is chronic and severe
- Situational variability: “If I’m interested”
 - Most persons with ADHD have a few activities in which impairments are absent
- Looks like a willpower problem, but it isn’t

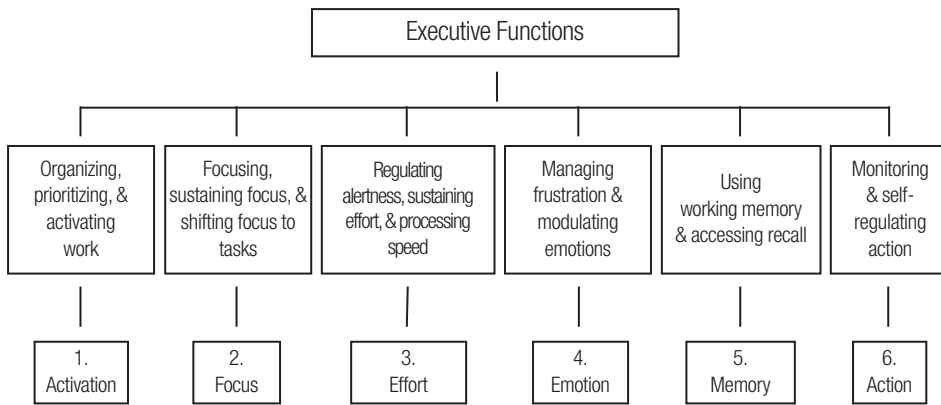
ADHD Symptoms Overlap With “Executive Functions”

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- Wide range of central control processes
- Connect, prioritize, and integrate cognitive functions moment-by-moment
- Integrate stored memories with current information
- Guide current thoughts and actions
- Analogous to the conductor of a symphony orchestra

Executive Functions Impaired in ADHD

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Brown TE. *Manual for Brown Attention Deficit Disorder Scales*. San Antonio, TX: The Psychological Corp.; 2001.

1. Organize, Prioritize, and Activate

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- Trouble getting started on work
- Difficulty organizing tasks
- Misunderstanding directions

Brown 2001.

Brown TE. Differential diagnosis of ADD and ADHD. In: Nadeau K, ed. *Comprehensive Guide to Attention Disorder in Adults: Research, Diagnosis, and Treatment*. New York, NY: Brunner/Mazel; 1995.

Brown TE. Emerging understandings of ADHD. In: Brown TE, ed. *Attention Deficit Disorder and Comorbidities in Children, Adolescents, and Adults*. Washington, DC: American Psychiatric Press; 2000.

2. Focus, Shift, and Sustain Attention

- Loss of focus when trying to listen or plan
- Forgetting what was read, needs to reread
- Easily distracted by internal or external stimuli

Brown, 1995, 2000, 2001.

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3. Sustain Alertness, Effort, and Processing Speed

- Quickly loses interest in tasks
- Difficulty completing tasks on time
- Much inconsistency in work output

Brown, 1995, 2000, 2001.

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4. Manage Frustration, Modulate Emotion*

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- Emotions too greatly influenced by thoughts and actions
- “Can’t put it to the back of my mind”
- Overreaction to frustration, hurts, or worries

*Not included in *DSM-IV* criteria.
Brown, 1995, 2000, 2001.

5. Use Working Memory Access Recall

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- Forgets to do planned tasks
- Difficulty recalling learned material
- Loses track of papers, belongings

Brown, 1995, 2000, 2001.

6. Monitor and Regulate Action

- Hard to sit still or be quiet
- Tasks done too fast and not carefully enough
- Frequent interruptions or impositions

Brown, 2001.

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Possible Causes of ADHD

“ADHD...a label for the heterogeneous group of dysfunctions related to each of several nodes along the attentional/intentional network...from...cerebellum up to and including prefrontal cortex...includes neural substrates of activation, orientation, motivation, and vigilance as these connect with and influence executive function....”

Denckla MB. *J Child Neurol*. 1991;6(suppl): S44-S50.

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Psychobiology of ADHD

- Disorder of deficient or delayed self-regulation
- Due largely to genetic differences in development or function of brain systems modulated by dopamine and norepinephrine
- Multiple networks in
 - Prefrontal cortex
 - Basal ganglia
 - Locus ceruleus
 - Cerebellum
 - Amygdala-septo-hippocampal system

Castellanos FX. Psychobiology of ADHD. In: Quay HC, Hogan AE, eds. *Handbook of Disruptive Behavior Disorders*. New York, NY: Kluwer Academic/ Plenum Publishers; 1999.

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Psychobiology of ADHD: Brain Structures Implicated

MODULATES EMOTION

1. Processes fear and excitement
2. Decreases the overwhelm
3. Responds to survival
4. Decreases noise

AROUSAL CENTER

1. Deadlines
2. Actions
3. Tactics

Attention network

REWARD CENTER

1. Response to bonding
2. Response to challenges
3. Seeks high stimulus

EXECUTIVE SECRETARY

1. Gross prioritizer
2. Directs attention
3. The initiator

Anterior cingulate gyrus

THE CEO

1. Creates Working Memory
 - Organizers and structures
 - Remembers self in the future
 - Consequence evaluation
 - Stops procrastination–long-term goals
2. Time Estimator
 - Process details
3. Monitors Behavior
 - Self-talk
 - Observer

Prefrontal cortex

Orbitofrontal cortex

THE GREAT INHIBITOR

1. Sustains attention–stops distractions
2. Stops overfocus and being stuck
3. Error catcher–stops the sleazing
4. Organizes how to behave

Adapted from Ratey JJ. *A User's Guide to the Brain: Perception, Attention, and the Four Theaters of the Brain*. New York, NY: Pantheon Books; 2001.

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ADHD vs. Frontal-lobe Trauma

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- In patients with ADHD
 - Dysfunctional neural networks are probably present from birth
 - There are subsequent effects on cognitive development
- In patients with frontal-lobe trauma
 - Cognitive abilities develop normally
 - Cognition is affected by the loss of or serious damage to brain tissue

Douglas VI. Cognitive control processes in attention deficit/hyperactivity disorder. In: Quay HC, Hogan AE, eds. *Handbook of Disruptive Behavior Disorders*. New York, NY: Kluwer Academic/ Plenum Publishers; 1999.

Interacting Catecholamines

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- The best current evidence indicates that [positive] effects of the stimulants on self-regulation processes, including attention and impulse control, are likely to be mediated by both dopamine and norepinephrine
- Norepinephrine and dopamine interact in complex ways at multiple levels

Castellanos FX. Psychobiology of ADHD. In: Quay HC, Hogan AE, eds. *Handbook of Disruptive Behavior Disorders*. New York, NY: Kluwer Academic/ Plenum Publishers; 1999.

Summary of Neurobiological Aspects

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- Primary etiology of ADHD is genetic
- Pregnancy, delivery, and infancy complications (PDICs) do not usually play a major role in cause or treatment response
- Most children with ADHD are neurologically healthy
- Some symptoms of ADHD are related to “lag”

Response to Medical Treatment

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- More than 170 studies involving more than 6,000 school-aged children
- Double-blind, placebo-controlled studies have unequivocally shown that medications can reduce core symptoms of hyperactivity, impulsivity, and inattention
- The majority of patients respond if medication is titrated carefully

Greenhill L, et al. *J Am Acad Child Adolesc Psychiatry*. 1999;38:503-512.

Medication Options for Patients With ADHD

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- Stimulants
 - Dextroamphetamine (Dexedrine)
 - Methylphenidate (Ritalin, Concerta)
 - Mixed amphetamine salts (Adderall)
- Nonstimulants
 - Bupropion (Wellbutrin)
 - Atomoxetine*
 - Nortriptyline (Pamelor)
 - Desipramine (Norpramin)
 - Clonidine (Catapres)
 - Guanfacine (Tenex)

*Not yet approved by the FDA.

Controversial Therapies

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- No scientific evidence for safety or effectiveness of
 - Dietary restrictions
 - Dietary supplements
 - Optometric vision training
 - EEG biofeedback

ADHD Medications: What Some Parents Fear

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- Change personality to “zombie”?
- Slow growth?
- Develop tics?
- Lose appetite?
- Poor sleep?
- Later drug or alcohol problems?
- Dependence on medication for lifetime?
- Being labeled, attribution problems?
- Reactions of family, teachers, peers?

Risks Increase Without Treatment

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- Risks of not treating ADHD are often far worse than risks of pharmacologic therapy
- Adverse effects from stimulants are usually mild, short-lived, and responsive to dosing or timing adjustments
- The risk-benefit ratio of stimulant treatment for patients with ADHD is generally highly favorable, but must be evaluated and monitored on an ongoing, case-by-case basis

Goldman LS, et al. *JAMA*. 1998;279:1100-1107.

MTA Study*

- 579 children (aged 7 to 9 years)
- ADHD combined type
- 14-month duration
- 6 sites
- 4-group parallel design

*NIMH Collaborative Multisite Multimodal Treatment Study of Children With Attention-Deficit/Hyperactivity Disorder.
The MTA Cooperative Group. *Arch Gen Psychiatry*. 1999;56:1088-1096.

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MTA Treatment Groups

- Medical management
 - Tailored dose design
 - t.i.d. dosing
 - Monthly monitoring
- Behavioral therapy
 - 8-week summer program specialized for ADHD
 - Patient training, in-class aide, teacher consultations, and daily reports
- Combined medication-psychosocial
- Community standard treatment
 - Evaluations and referrals
 - 67% on medication; b.i.d. regimens

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MTA Results

- Medical management or combination therapy had better outcomes than behavioral therapy or community care
- Combined therapy was equal to medical management for ADHD symptoms
- Combined therapy was slightly better for related problems

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MTA Study: Response to Therapy

- Percentage of children scoring average of <1 ("just a little") on SNAP-IV for inattention, hyperactive-impulsive, oppositional-defiant
 - Community care: 25%
 - Behavioral treatment: 34%
 - Medication management: 56%
 - Combined behavioral/medication: 68%

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Swanson JM, et al. *J Am Acad Child Adolesc Psychiatry*. 2001;40:168-179.

ADHD and Comorbidities

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- ADHD often coexists with other learning or psychiatric disorders
- Persons with ADHD have a 2- to 5-fold increased lifetime incidence of other psychiatric disorders^{1,2}
- MTA study: 70% of children with ADHD had at least 1 comorbid disorder in the previous year³

1. Brown TE. *Attention Deficit Disorders and Comorbidities in Children, Adolescents, and Adults*. Washington, DC: American Psychiatric Press; 2000.

2. Pliszka SR, et al. *ADHD With Comorbid Disorders: Clinical Assessment and Management*. New York, NY: Guilford Press; 1999.

3. The MTA Cooperative Group. *Arch Gen Psychiatry*. 1999;56:1088-1096.

Treatment Recommendations

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- Comprehensive assessment for ADHD and possible comorbid conditions
- Educate patient and family about ADHD and treatment:
(eg, “eyeglasses, not antibiotic”)
- Titrate dose; “fine tuning” to patient’s response, schedule, and adverse effects
(mg/kg not reliable)
- Monitor and adjust for optimal response; watch for possible rebound as dose wears off
- Fit to tasks (eg, sports, lessons, social activities)
- Combinations for comorbidities or partial response

Levels of Care: Tailoring to the Needs of Patient and Family

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- Interventions
 1. Comprehensive assessment for ADHD, comorbid disorders, and context
 2. Family education on ADHD and treatment
 3. Patient education, “fine tuning” of medications, monitoring
 4. Parental support and behavior management training
 5. Accommodations and interventions in school
 6. Psychotherapy for the individual and family
- Some patients and families require only interventions 1,2, and 3; others require all 6 or more
- Treatment should be tailored to needs of each patient and family

ADHD: Key Points

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- Affects many domains
 - School performance
 - Family life
 - Social activities
 - Peer relationships
 - Self-esteem
- Not a unitary disorder
- Developmental, heritable
- Dimensional, not categorical
- Impairment of executive functions
- Not always linked to hyperactivity
- Implicated in many psychiatric disorders
- Often responsive to medical treatments