

A Tale of Two Brothers: Late Identification & Treatment of AD/HD

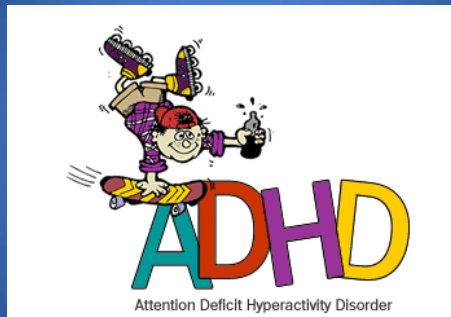
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Overview

- What is Attention Deficit/Hyperactivity Disorder (ADHD)
- Causes (Etiology)
- Coexisting Problems
- Proper Identification
- Treatment

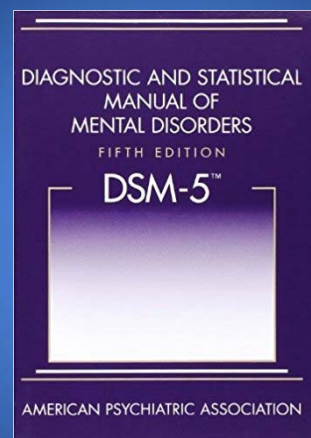
What is your Conceptualization?



What's Your Conceptualization?



What's Your Conceptualization?



DSM – 5 Diagnostic Criteria

6 or more Symptoms for at least 6 months

➤ Dimension 1: Inattention

- ❖ Fails to give close attention, makes careless mistakes
- ❖ Has difficulty sustaining attention
- ❖ Does not appear to listen
- ❖ Struggles to follow through on instructions
- ❖ Has difficulty with organization
- ❖ Avoids or dislikes tasks requiring sustained mental activity
- ❖ Loses things
- ❖ Easily Distracted
- ❖ Forgetful in daily activities



DSM – 5 Diagnostic Criteria

6 or more Symptoms for at least 6 months

➤ Dimension 2: Hyperactivity - Impulsivity

- ❖ Fidgets, squirms in chair
- ❖ Has difficulty remaining seated
- ❖ Runs about or climbs excessively (extreme restlessness in adults)
- ❖ Difficulty engaging in activities quietly
- ❖ Acts as if driven by a motor (adults will describe this as a more internal feeling)
- ❖ Talks excessively
- ❖ Blurts out answers before questions completed
- ❖ Difficulty waiting or taking turns
- ❖ Interrupts or intrudes upon others



What's Your Conceptualization?



DSM – 5 Diagnostic Criteria

- Sx are inconsistent with developmental level
- Negatively impact social and academic/occupational activities
- > 17 yrs, only 5 symptoms are required
- Sx present prior to age 12 (previously age 7)
- Do not occur exclusively during the course of psychotic disorder and are not better accounted for by another mental disorder

DSM – 5 Diagnostic Criteria

- Sx are inconsistent with developmental level
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- > 17 yrs, only 5 symptoms are required
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- Do not occur exclusively during the course of psychotic disorder and are not better accounted for by another mental disorder

Associated Problems

- **Dimension 3: Emotional Impulsivity (EI) & Deficient Emotional Self-Regulation (DESR)***
 - ❖ Overemphasis on the most observable and objectively measurable features has led to the deemphasis/exclusion of this central area of the disorder
 - ❖ More emotionally reactive (positive & negative)
 - Emotional Rollercoaster
 - Low Frustration Tolerance
 - Hot Temper
 - Difficulty Coping with stress
- **Dimension 4: Executive Dysfunction**
 - ❖ “Conductor” of the brain

Executive Coaching (“Parenting”)



Interactional Model

- Self Monitor
- Sustain
- Plan
- Organize
- Working Memory
- Initiate
- Emotional Control
- Shift
- Inhibit

Metacognitive:
Problem Solving



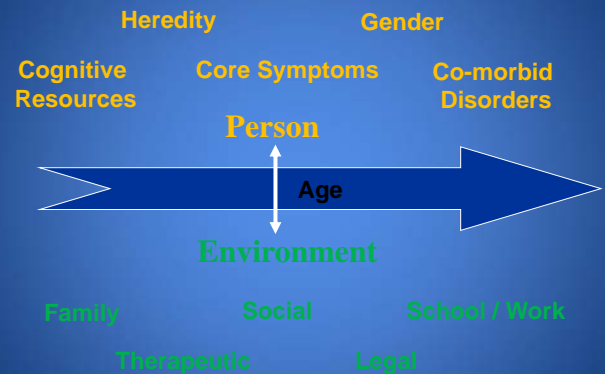
Behavioral/Emotional
Regulation

Etiology “Nots”

- Social Environment
- Poor Parenting
- Diet

- While the expression of ADHD is **influenced** by **myriad** of intra- and extra-individual **variables** (e.g., level of intelligence, environmental demands, available supports/resources), these are **not causative** factors.

Developmental Model of AD/HD



Etiology Neurological Findings

- **EEG**
 - ❖ Lower electrical activity more pronounced over frontal regions
- **Blood flow**
 - ❖ Less to frontal regions and connections (caudate nucleus: striatum [nerve bundle])
- **PET Scans**
 - ❖ Less brain activity in frontal regions
- **MRI**
 - ❖ Children smaller areas of white matter in right frontal region
 - ❖ Corpus callosum smaller

Etiology Genetic Findings

- Meta-analysis of 79 Twin and Adoption studies (Nikolas and Burt, 2010)
 - ❖ Majority of variance in ADHD traits result of genetic factors (71-73%)
- Siblings of children with AD/HD 5-7x more likely to have AD/HD (32% risk factor)
- If a parent has AD/HD, risk to the offspring is greater than 50% (57%, Biederman, et al., 1995; 55%, Smalley, et al., 2000).
- Depression may be a related genetic expression
 - ❖ Family members of children with ADHD at increased risk for MD

Genetic Findings in AD/HD

- ADHD is among the most genetically influenced of all psychiatric conditions
- More inherited than **height** or **intelligence**

Etiology Other Factors

- **Trauma**
 - ❖ Fetal exposure to alcohol, tobacco, drugs
 - ❖ Early exposure to high levels of toxic substances such as lead
 - ❖ Brain Injury
- **Rare Genetic Abnormalities**
 - ❖ Turner Syndrome (24% vs. 1.3% of controls)
 - ❖ Fragile X Syndrome
- **Causative Factors Many Times not Easily Discernable**

Adults are not Children

AD/HD presents with very different characteristics in adulthood

- Less externalizing symptoms
- Higher comorbidity (possibly causal, at least complicating/exacerbating) with other psychiatric disorders, including MDD, BP, Anxiety, substance abuse
- Seen as “milder” in severity
- Higher rates of MVAs, TBIs, other health issues

Adult ADHD

Overall, symptoms of AD/HD **persist without much alteration** – save for a **decrease in level of overt hyperactivity**. The methods of coping are different, given the increased autonomy of adulthood, but because of this, some of the coping responses may be more costly, such as in multiple divorces and/or job changes.

Adult ADHD

Self-Regulation

- Impulsivity seen in problem solving and behavior and can have serious life consequences
- Change jobs more frequently, 3 times more likely to be terminated or laid off from a job, 35% are self-employed by their 30s
- Affective lability continues, spontaneous elevated periods are diminished but lows persist (described as boredom/ discontentment)

Adult ADHD

Self-Regulation

- *Twice as likely to be arrested*
- *Receive more speeding tickets and license suspensions vs. controls (Barkley et al., 2002)*
- *7x / 8x more likely to be involved in MVA when unmedicated*

Adult ADHD

Self-Regulation

- Sensation seeking continues, but less dramatic (e.g., leisure activities & spending)
- Anxiety Disorders and Depression continue to be present at levels higher than the general population
- Irritability continues, explosive temper but may calm down quickly

Adult ADHD

Cognitive

- Attentional deficits particularly difficult for college students
 - ❖ *Achieve less educational and occupational success*
- Other adults may not complain of attention, but partly due to selecting jobs with lower attentional demands
- Disorganization at home and work, cluttered and unkempt environments

Adult ADHD

Cognitive

- Failure to plan, chronically late for work and appointments
- Trouble with paperwork and financial records
 - ❖ Increased rate of financial problems, poor credit histories
- May do multiple tasks at once, but tasks not completed on time and many left partially finished.



Adult ADHD

Cognitive

- Time Blindness
 - ❖ Impaired Time Estimation
 - ❖ Positive Illusory Bias
- Not Past-Present-Future
- Now / Not Now

Adult ADHD

Interpersonal/Social Relationships

- Increased number of sexual partners, less likely to use contraception, 4x higher rate of STDs, increased rate of unwanted pregnancies
 - ❖ Milwaukee Young Adult Outcome Study found number of births for AD/HD group vs. control group was 42:1 by age 20
- Relationships tend to be more volatile
- Marry and divorce hastily (2x more likely)

Adult ADHD

Interpersonal/Social Relationships

- Difficulties in controlling and modulating feelings have negative impact on marriage and parenting
- Feelings of being overwhelmed by the day-to-day management issues of the family.
- Supportive spouse burnout
- More research needed

Social Functioning

Given the tremendous amount of “data” needing to be processed and responded to in “real time,” social skill difficulties would be predicted, if not expected, and can be understood in terms of weaknesses in attention, process speed, inhibition, and executive functions.



Significant Impact

Research on AD/HD in adults consistently demonstrates considerable impact on QOL

- ❖ *Achieve less educational and occupational success*
- ❖ *Twice as likely to be arrested*
- ❖ *Receive more speeding tickets and license suspensions vs. controls (Barkley et al., 2002)*
- ❖ *Greater degree of interpersonal dysfunction*
 - *Exhibit riskier sexual behaviors, more at risk of STDs and unwanted pregnancies*
 - *2x risk of divorce*

Summary

- Still frequently misunderstood
- Underappreciated
- Underdiagnosed in Adults
 - ❖ AD/HD symptoms mistakenly associated with other psychiatric conditions
- Clear treatment implications



Wake Up!

CLEAR TREATMENT IMPLICATIONS

Coexisting Conditions

The Rule rather than the Exception

- 80% ADHD patients present at least one lifetime psychiatric comorbidity (Fischer et al., 2007)

National Comorbidity Survey Replication (NCS-R)

w AD/HD (w/o AD/HD)*

- Major Depressive D/O: 18.6% (7.8)*
- Dysthymia: 12.8% (1.9)
- Bipolar D/O: 19.4% (3.1)
- Any Mood D/O: 38.3% (11.1)
- Any Anxiety D/O: 47.1% (19.5)
- Any Substance D/O: 15.2% (5.6)
- Intermittent explosive D/O: 19.6% (6.1)

AD/HD and Substance Abuse

Ohlmeier et al. (2007)

- Investigated 91 alcohol-dependent participants
 - ❖ 23.1% met DSM-IV dx criteria for AD/HD in childhood
 - ❖ 1/3rd of these met criteria in adulthood
 - ❖ 76.2% of AD/HD patients had “avg. to high” use of nicotine vs. 45.7% for non-AD/HD

AD/HD and Substance Abuse

- Treatment of AD/HD in childhood or adolescence may reduce severity of substance use disorders in adulthood
- Wilens et al. (2008) found that treating children with AD/HD with stimulants had a protective effect on later development of substance use disorders and cigarette smoking
 - ❖ 114 subjects w AD/HD followed prospectively 5-years
 - ❖ Found no increased risk of use with stimulant tx
 - ❖ Stimulant tx found to reduce risk for cigarette smoking and substance use disorders
 - ❖ Consistent with findings of a prior meta-analysis (Wilens et al., 2003)

AD/HD and Gender

- The negative effect of AD/HD on risk of substance abuse has been found to be stronger for men.
- For women with AD/HD, more at risk to develop
 - ❖ depressive episodes
 - ❖ eating disorders

Sobanski et al. (2007).

Late Onset
versus
Late Identification

**ASSESSMENT IS
“A BODY-CONTACT
SPORT”**

- WALSH, 1992

Identification of AD/HD in Adults



NEUROPSYCHOLOGICAL EVALUATION

- General Intelligence
- Attention/Concentration/Orientation
- Executive Functions
 - ❖ Initiating, sustaining, inhibiting
 - ❖ Mental flexibility, set-shifting
 - ❖ Concept formation, problem solving
- Receptive & Expressive Language
- Visual-Spatial & Visual-Motor

NEUROPSYCHOLOGICAL EVALUATION

- Motor Functioning
- Sensory/Perceptual Functioning
- Learning & Memory
- Psychological/Emotional Functioning
- Social Functioning
- Academic Achievement

Like Son like Father

- 11-year-old boy, “bright but not working up to potential”
- Failing spelling despite being “too bright”
- Intelligence upper end high average
- Significant weakness on “third factor”, sustained attention, dysgraphia, visual motor integration (Bender Gestalt), spelling

Like Son like Father

- Father successful dentist, mother a nurse
- “Don’t you mention Ritalin”
- Significant positive response
- Attention greatly improved
- Handwriting neat and Bender Gestalt drawings organized and accurate
- Went from Ds to A’s in spelling

G.I.G.O.

“Garbage In, Garbage Out”

Like Son like Father

- Anxious depression abated over several months
- Marital relationship improved

A Tale of Two Brothers

Demographics

- Parents both physicians
- Maternal family history of anxiety, depression, alcohol abuse
- High intelligence for both sides
- Postgraduate education for many relatives with noted struggles to achieve

Demographics

- Younger brother presented first
 - Unremarkable medical history
 - Attending Catholic High School on partial academic scholarship
 - Earned primarily A's through his freshman year, significant decline thereafter
 - Sports Anxiety – dropped out of baseball, then wrestling

Demographics

- Older brother
 - Unremarkable medical history
 - Graduated Catholic High School, IB, 4.3 GPA
 - Dropped out college second semester
 - Anxiety w panic – ultimately dropped out of wrestling

Presenting Complaints

- Similar for both brothers
 - Attentional difficulties described as increasingly impacting performance as they progressed in their education
 - Not just in classroom (e.g., sports)

Presenting Complaints

- Significant difficulties with reading comprehension
 - ❖ Extensive compensatory strategies developed (e.g., maximize test taking skills)
 - ❖ Problem of loss of Efficiency
- Benefit of IB
 - ❖ Smaller class size
 - ❖ Emphasis on acquiring knowledge from class lectures

Treatment

- Comprehensive Neuropsychological Evaluation
- Older Brother
 - CBT – Emphasis on relaxation training
 - Pharmacotherapy (Lexapro 20mg, methylphenidate, 54mg XR, PM booster)
- Younger Brother
 - Transferred to Small Catholic H.S.
 - Pharmacotherapy (methylphenidate, 45mg XR, PM booster)

Younger Brother

WECHSLER ADULT INTELLIGENCE SCALE -IV
Full Scale IQ (FSIQ) = 100, 50th percentile
General Ability Index (GAI) = 102, 55th percentile

	STD	%		STD	%
Verbal Comprehension, (VCI)	107	68	Perceptual Reasoning (PRI)	98	45
Similarities	12	75	Block Design	7	16
Vocabulary	14	91	Matrix Reasoning	11	63
Information	8	25	Visual Puzzles	11	63
Comprehension **	14	91	Figure Weights**	15	95
			Picture Completion**	10	50
Working Memory (WMI)	108	70	Processing Speed (PSI)	86	18
Digit Span	9	37	Coding	6	9
Arithmetic	14	91	Symbol Search	9	37
Letter-Number Sequencing**	11	63	Cancellation**	4	2

Older Brother

WECHSLER ADULT INTELLIGENCE SCALE -IV
Full Scale IQ (FSIQ) = 108, 70th percentile
General Ability Index (GAI) = 118, 88th percentile

	STD	%		STD	%
Verbal Comprehension, (VCI)	122	93	Perceptual Reasoning (PRI)	107	68
Similarities	13	84	Block Design	11	63
Vocabulary	16	98	Matrix Reasoning	13	84
Information	13	84	Visual Puzzles	11	63
Comprehension **	14	91	Figure Weights**	16	98
			Picture Completion**	7	16
Working Memory (WMI)	97	42	Processing Speed (PSI)	89	23
Digit Span	7	16	Coding	8	25
Arithmetic	12	75	Symbol Search	8	25
Letter-Number Sequencing**	8	25	Cancellation**	8	25

Younger Brother

AROUSAL, ALTERNESS & ATTENTION

DOMAIN	MEASURE	STD	%	
Arousal/Alertness	Qualitative Observation	WNL		
Focused Attention	WAIS-IV: Symbol Search	95	37	
	WAIS-IV: Cancellation	70	2	
	Stroop: Color-Word Score	104	61	
	Stroop: Color-Word Interference Score	96	39	
Sustained Attention	TOVA-V: Omission Errors	<40	<1	SS=112, 79 th %
Verbal Span of Attention	WAIS-IV: Digits Forward = 10	95	37	
	CVLT-II: List A Trial 1 = 5	85	16	
Processing Speed	WAIS-IV: PSI	86	18	
	Stroop: Word Score	117	87	
	Stroop: Color Score	108	70	
	TOVA-V: Response Rate	54	<1	SS=127, 96 th %
Processing Speed Stability	TOVA-V: Response Rate Variability	49	<1	SS=122, 93 rd %

Older Brother

AROUSAL, ALTERNESS & ATTENTION

DOMAIN	MEASURE	STD	%	
Arousal/Alertness	Qualitative Observation			
Focused Attention	WAIS-IV: Symbol Search	90	25	
	WAIS-IV: Cancellation	90	25	
Sustained Attention	TOVA-V: Omission Errors	89	23	SS=108, 70 th %
Verbal Span of Attention	WAIS-IV: Digits Forward = 7	85	16	
	CVLT-II: List A Trial 1 = 5	85	16	
Processing Speed	WAIS-IV: PSI	89	23	
	TOVA-V: Response Rate	119	90	SS=140, 99 th %
Processing Speed Stability	TOVA-V: Response Rate Variability	93	32	SS=123, 94 th %

Younger Brother

MEMORY & LEARNING ABILITIES				
SKILL	MEASURE	STD	%	QUALITATIVE
VERBAL LEARNING				
	CVLT-II: List A Trials 1-5	100	50	
	CVLT-II: List A Trial 1	85	16	5 words
	CVLT-II: List A Trial 5	100	50	13 words
Efficiency	CVLT-II: Learning Slope	108	70	5, 8, 12, 13, 13
	Percent Recall Consistency	108	70	
Proactive Interference	CVLT-II: List B vs. List A Trial 1 Recall	130	98	9 vs. 5
Retroactive Interference	CVLT-II: List A Short Delay Recall vs. List A Trial 5	100	50	11 vs. 13
VERBAL MEMORY				
Immediate Recall	CVLT-II: List A Short-Delay Free Recall	100	50	11 words
	CVLT-II: List A Short-Delay Cued Recall	100	50	12 words
	WJ-III: Story Recall Immediate	82	12	G.E. = 3.5
Delayed Recall	CVLT-II: List A Long-Delay Free Recall	108	70	13 words
	CVLT-II: List A Long-Delay Cued Recall	93	45	12 words
	WJ-III: Story Recall Delayed	88	21	G.E. = 3.3
Recognition	CVLT-II: Discriminability	108	70	1 False Positive
VISUOSPATIAL MEMORY				
Immediate	ROCF: Immediate Reproduction	96	39	
Delayed Recall	ROCF: Delayed Reproduction	97	42	
Recognition	ROCF: Recognition	91	27	

Older Brother

MEMORY & LEARNING ABILITIES				
SKILL	MEASURE	STD	%	QUALITATIVE
VERBAL LEARNING				
	CVLT-II: List A Trials 1-5	108	70	
	CVLT-II: List A Trial 1	85	16	5 words
	CVLT-II: List A Trial 5	93	32	12 words
Efficiency	CVLT-II: Learning Slope	100	50	5, 10, 14, 14, 12
	Percent Recall Consistency	107	68	
Proactive Interference	CVLT-II: List B vs. List A Trial 1 Recall	115	84	7 vs. 5
Retroactive Interference	CVLT-II: List A Short Delay Recall vs. List A Trial 5	107	68	12 vs. 12
VERBAL MEMORY				
Immediate Recall	CVLT-II: List A Short-Delay Free Recall	100	50	12 words
	CVLT-II: List A Short-Delay Cued Recall	100	50	12 words
	WJ-III: Story Recall Immediate	113	81	G.E. >13.3
Delayed Recall	CVLT-II: List A Long-Delay Free Recall	100	50	12 words
	CVLT-II: List A Long-Delay Cued Recall	100	50	13 words
	WJ-III: Story Recall Delayed	111	77	G.E. > 17.8
Recognition	CVLT-II: Discriminability	108	50	0 False Positive
VISUOSPATIAL MEMORY				
Immediate	ROCF: Immediate Reproduction	101	54	
Delayed Recall	ROCF: Delayed Reproduction	86	18	
Recognition	ROCF: Recognition	83	13	

Younger Brother

RECEPTIVE LANGUAGE SKILLS				
SKILL	MEASURE	STD	%	On Meds.
Phonetic Word Attack	WIAT-III: Pseudoword Decoding	108	70	
Phonological Awareness	NEPSY-II: Phonological Processing	105	63	
Reading Efficiency	WJ-III: Reading Fluency	98	45	
	Nelson-Denny: Reading Rate	99	47	SS=94, 46 th
Reading Comprehension	Nelson-Denny: Comprehension	111	77	SS=120, 91 st
Oral Comprehension	WJ-III: Understanding Directions	105	63	
Abstract Comprehension	WAIS-IV: Similarities	110	75	
EXPRESSIVE LANGUAGE SKILLS				
Lexical Retrieval	NEPSY-II: Speeded Naming	110	75	
Vocabulary	WAIS-IV: Vocabulary	120	91	
	Nelson-Denny: Vocabulary	117	87	
Writing Mechanics	WIAT-III: Spelling	120	91	
Speed of Written Expression	WJ-III: Writing Fluency	126	96	

Older Brother

RECEPTIVE LANGUAGE SKILLS				
SKILL	MEASURE	STD	%	On Meds.
Phonetic Word Attack	WIAT-III: Pseudoword Decoding	109	73	
Reading Efficiency	WJ-III: Reading Fluency	98	45	
	Nelson-Denny: Reading Rate	81	10	SS = 94, 34 th %
Reading Comprehension	Nelson-Denny: Comprehension	106	65	SS = 128, 97 th %
Oral Comprehension	WJ-III: Understanding Directions	97	42	
Abstract Comprehension	WAIS-IV: Similarities	115	84	
EXPRESSIVE LANGUAGE SKILLS				
Vocabulary	WAIS-IV: Vocabulary	130	98	
	Nelson-Denny: Vocabulary	108	71	
Writing Mechanics	WIAT-III: Spelling	103	58	
Speed of Written Expression	WJ-III: Writing Fluency	106	66	
COWAT	CFL Total = (13,11,9) 33	110	75	
	Animal & Supermarket Total = (26,23) 49	112	78	

Outcomes

- Report improved attention, processing most notable with reading
- Could not recall NDRT content from prior administration, but had strong sense could comprehend vs. not
- Did not need to read questions and “work backwards”
- No longer looked at sentence, at each word, and have to re-read several times over

Outcomes

- Older Brother
 - “Before I did not know what I was reading at all. I could not believe how much I didn’t understand. I actually thought that it (NDRT) was a trick test.”
 - “I didn’t know that I really didn’t understand (what he was reading).”

Outcomes

➤ Both Report

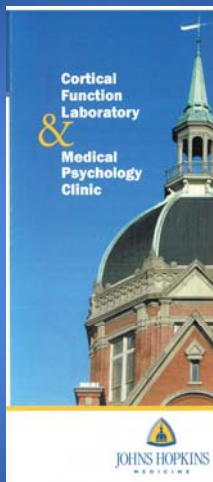
- Feeling significantly better
- Increased confidence, self-assurance
- Increased self-esteem
- Decreased anxiety
- Increased QOL

Outcomes

➤ Not just the 3 Rs: Wrestling

- Younger
 - pre-Tx record: 13-10, got frustrated and quit
 - post-Tx record: 21-1, Captain of team
- Older
 - Senior Year H.S. pre-Tx record: 3-13
 - Freshman College – did not attend matches due to anxiety w panic
 - Sophomore – eligible during 2nd Semester
 - 4-0 last tournament, beat former H.S. State Champion

Side Effect
Or
Main Effect ?





JOHNS HOPKINS
MEDICINE

SCHOOL OF MEDICINE

