The Overlap of ADHD and ASD: Clinical Presentation and Treatment

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My Role at Cincinnati Children's
Child Psychiatrist for Developmental Disabilities
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Conclusions

1. ADHD in children with Autism represents a clinical population with unique challenges.

2. ADHD can overlaps ASD symptoms amplifying deficits in executive function and social communication.

3. Successful diagnosis and treatment is a careful "dance" of monitoring and intervention.

Objectives

1. Characteristics of autism spectrum disorder (ASD)
2. Characteristics of ADHD in ASD
3. Evaluation of co-occurrence of ADHD in ASD
4. Untangling ADHD and ASD symptoms
5. Evidence-based treatment options
A description of “Tim”

An abstraction of mind which made him perfectly oblivious to everything about him. He appears to be always thinking and thinking, and to get his attention almost requires one to break down a mental barrier between his inner consciousness and the outside world.

Leo Kanner, MD
Autistic Disturbances of Affective Contact, 1943

IDEA Definition of ASD

Under the Individuals with Disabilities Educational Act, Autism is a developmental disability significantly affecting verbal and nonverbal communication and social interaction, usually evident before age 3 that adversely affects a child’s educational performance. Other characteristics often associated with ASD are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences.

Clinical Features of Autism

- Reciprocal Attention
- Joint Attention
- Sensory Overload
Clinical Features of Autism

Non-communicative Gestures

Preoccupation with Parts

TRAJECTORIES OF ASD

The Many Faces of Autism

Case A: “Tommy”
- Non-verbal
- Group home
- Day programming
- Intellectual disability
- Meets full DSM criteria

Case B: “Mary”
- Fluent
- Lives independently
- Software programmer
- High IQ
- Meets full DSM criteria
DSM-5 combines impairments in communication with social interactions

**Autism Spectrum Disorder**

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<thead>
<tr>
<th>DSM-IV TR</th>
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<td>Required 3 Deficits</td>
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<td>• Social interactions</td>
<td>• Social communication and interactions</td>
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<td>• Communication</td>
<td>• Restrictive &amp; Repetitive Behaviors, Interests, Activities</td>
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<td>• Restrictive, Repetitive and Stereotyped Behaviors</td>
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**Autism Spectrum Disorders**

Outdated but still useful!

- Autism
- PDD
- Rett's Disorder
- Asperger's
- Childhood Disintegrative Disorder

**Definition of Autism is Changing**

- DSM
- ICD
- IDEA
Social deficits

Intellectual Disability

Speech/communication deficits

Expressive/Receptive Language Disorders

Social Anxiety

Restrictive Interests And Repetitive behaviors

The Unique Fingerprint of Autism

Autism by the Numbers

- Male : Female Ratio 4:1
- Girls in general are more severely affected.
- > 40% without intellectual disability
- No association between race, immigrant status, or social class and autism
- 20-30% with a seizure disorder

Fombonne 2007; CDC 2013
Controversy: Is ASD increasing?

- The changes in the definition of Autism
  - more sophisticated diagnostic methods
  - Better at identifying whole “spectrum”
  - More aware of condition
  - Implications for service (“diagnostic substitution”)
- Likely “real” increase in incidence
- Probably a combination of both

How does Autism develop?

Genetic & Environmental Factors

Changes in Brain Development

Changes in Brain Function

Changes in Cognition

Changes in Behavior
High rate of concordance for autism and related symptoms in MZ and DZ twins.

2-10% of siblings have autism

Fraternal Twins have a 20 to 30% chance of dual diagnosis

One of the most heritable diseases

Larger role for environmental factors in current studies


Where in the brain is ASD?

Genetic & Environmental Factors

Changes in Brain Development

Changes in Brain Function

Changes in Cognition

Changes in Behavior

Summary of Brain Changes in ASD

- Larger head (16%) and brain (9%) sizes
  - Difference is prominent in early childhood (when symptoms start)
  - Head size normal at birth
  - Meta-analysis (Sacco 2015)
- Many regions of the brain are involved (Chen 2015)
- Specific genes have been identified that have to do with brain development and function (Geschwin 2011)
BASAL GANGLIA

CEREBRAL CORTEX

CORPUS CALLOSUM

HIGHER FUNCTIONS
MOVEMENT
PERCEPTION
REACTIONS

http://destroma.deviantart.com/

AMYGDALE AND HIPPOCAMPUS

EMOTIONS
MEMORY

http://destroma.deviantart.com/

BASAL GANGLIA

CEREBELLUM

AUTOMATIC
MOVEMENTS
BALANCE
COORDINATION

http://destroma.deviantart.com/
Brain Development Over Time

Convergence of genes on neural systems

Behavioral Implications of Developmental Changes in ASD
Common ASD Challenges

- Difficulties with communication
  - Pragmatic and figurative
- Difficulties with change and transition
  - Preference for familiar and routine
- Difficulties with behavior
  - Emotional regulation
- Difficulties with sensory issues
  - Sounds, lights, textures, and tastes

Don’t diagnosis ADHD in children with ASD (pre-DSM-5)
Objectives

1. Characteristics of autism spectrum disorder (ASD)
2. Characteristics of ADHD in ASD
3. Evaluation of co-occurrence of ADHD in ASD
4. Untangling ADHD and ASD symptoms
5. Evidence-based treatment options

Obvious now, but longstanding error!

- Decades of research argued for and supported the dual ASD/ADHD diagnosis (Lietner 2014)

- Co-occurrence of ADHD and ASD is associated with a lower quality of life and poorer adaptive functioning than in any one of these conditions (Vora and Sikora, 2011)
Let me see if Philip be a little gentleman; Let me see if he is able to sit still for once at table.”

But fidgety Phil, he won’t sit still; He wriggles and giggles and then, I declare, swings backwards and forwards, and tilts up his chair,

See the naughty, restless growing still more rude and wild, till his chair falls over quite. Philip screams with all his might, catches at the cloth, but then that makes matters worse again.
Similarities: ASD and ADHD

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<tr>
<td>ADHD overlap ASD</td>
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<tr>
<td>Neuropsychology Profiles</td>
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<td>Pragmatic Language</td>
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<td>Emotional Regulation</td>
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<td>Theory of Mind</td>
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Key Points of ADHD in ASD

- Hyperactivity, impulsivity, and inattention are key “ADHD symptoms”
- Evaluation can be difficult due to overlap with features of individuals with ASD
- Psychotropic ADHD medication may not be as effective in ASD
- Limited access to specialty referral.

(Mahajan 2012 Pediatrics)

ADHD symptoms in Autism

- Seeking help with ADHD symptoms (Gadow 2006, Crisley 2006) 37 to 85%
- ASD Preschoolers with hyperactivity (Carlsson 2013) 33%
- 5-17 y.o. met full criteria for ADHD (Leyfer 2006) 31%
Objectives

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Clinical Practice Pathways for Evaluation and Medication Choice for ADHD Symptoms in Autism (Mahajan)

- Medication choice subcommittee developed a practice parameters (2012)
- Critical review of 31 articles
- Establish ASD diagnosis including language and cognitive testing
- Core ASD symptoms
  - Optimize educational, speech and language, and behavioral supports
- Systematic medical evaluation for any undiagnosed conditions (i.e. seizures)

ADHD symptoms in Autism evaluation practice pathway

(Mahajan 2012 Pediatrics)
Objectives

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ADHD versus ASD Symptoms

Core ADHD Features
- Triad of
  - attentional difficulties
  - over activity
  - impulsive behaviors

May be ASD features
- Hyperactivity
- Stereotypy, anxiety, medications
- Inattention
- Social situation and/or simple non-preferred activities
How would a parent of a child with ADHD or ASD interpret these questions differently?

Vanderbilt Form

Challenge #1: Executive Function (EF) Overlap

Executive Function

- Executive Function is the ability to maintain problem solving skills to guide future behaviors (Welsh and Pennington 1988)
- Impairments in executive function lead to difficulties in developing independence.
- Executive function deficits in ASD are varied and pervasive and distinct (Hovek 2014; Pugliese 2014)
Overview of Executive Function

Initiation
- i.e. social interaction

Monitoring
- Attention to environment

Evaluating
- Different expectations

Executive Function: Initiation

- Difficulty with starting a behavior such as homework, a chore, or social interaction.
- Internal Reasons
  - Planning difficulties (i.e. motor system)
  - Processing speed
- External Reasons
  - Attention to Environmental Stimuli
  - Differing motivations (positive reinforcements)
  - Unclear expectations and uncertainty
Missing Information

- Loss of critical information in verbal and non-verbal communication
- Reduced initiation of social learning opportunities
- Decreased requests for assistance

(Mundy & Stella 2000)
Executive Function: Generalization

Cognitive flexibility is a particular deficit in ASD (Solomon 2007; Hill 2004)

- Have difficulty shifting to a new or different thought or action in a different environment
- A very unique school setting (i.e. classroom, staff, and activities) can further limit generalization (Horner 1989)

Example

That assignment was hard.
All assignments are hard.

I always do this at home.
I will do this at school too.
Executive Function: Generalization

- Extreme difficulty relating new stimuli to past experiences
- Slight environmental changes
- New personal
- New activities, even if slightly different
- May not recognize situation if slightly altered, i.e., one dimension is a novel stimulus
- Additional instruction needed for independence

Can you spot the difference?

Can you spot the difference?
Prompt Dependence

- Overreliance or dependence on adult support may inhibit independence
- Great for initially learning a skill quickly
- Common teaching strategies including prompts for initiating work and rewards for completion (Smith 2001)
- Students with primary 1 on 1 instruction at risk
- Allowing students to practice without interruption may lead to more generalized success (Binder 1993)

Summary of Challenge #1

Does child have significant ADHD symptoms per teachers/parents?

Yes, ASD interventions have helped

No, ASD interventions did not help

ADHD symptoms in Autism evaluation practice pathway

Challenge #1

Challenge #2

Challenge #3

(Mahajan 2012 Pediatrics)
Dual Diagnosis: Mental Health in Autism

- Atypical presentation
- Syndromic Presentations
- Decreased Reserve
- Atypical Response

Development of Mood & Anxiety Disorders in the Context of DD

- Tend to be more common in higher functioning persons
- Common triggers:
  - Issues with self-esteem
  - Coping with understanding of deficits associated with ASDs
  - Academic issues
  - Potential to be bullied
  - Decreased social and emotional insight, motivation/desire to have friends

Aggression, Self-Injury, and Irritability is Common in ASD

- Up to 30% of children with autism may have irritability
  - aggression (25%)
  - severe tantrums (30%)
  - deliberate self-injurious behavior (16%)
Aggression and Self-Injury

What does irritability in children with Autism look like (Table 1)?

- Injures self on purpose
- Cries over minor annoyances
- Aggressive towards others
- Screams inappropriately
- Mood change quickly
- Creeks and contains inappropriately
- Yells at inappropriate times
- Depressed mood
- Demands must be met immediately
- Stamps feet while banging objects
- Does physical violence to self
- Has outbursts when does not get their own way
- Irritable and whiny
- Deliberately hurts himself/herself
- Yells at inappropriate times
- Does physical violence to self
- Has outbursts when does not get their own way

Common Irritability and Mood Presentations

Persistant  Impulsive  Explosive  Anxious

Each category has different associated diagnoses and treatment options

Irritability  DBD  Mood disorders  Medical (GI)
ADHD  ID & LD  IED  ASD & PTSD  ID  OCD  Anxiety  Trait
Summary of Challenge #2

Anxiety or irritability disorders?

Yes, consider co-morbidity treatment.

No, consider ADHD treatment.

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ADHD symptoms in Autism evaluation practice pathway

Child with ASD referred for ADHD symptoms

Challenge #1

Does child have significant ADHD symptoms?

Challenge #2

Anxiety or mood disorders?

Challenge #3

Behavioral support, Medication trial

(Mahajan 2012 Pediatrics)
Medications Use is Rising in Youth with ASD

- 65% of youth with ASD are treated with at least one psychotropic medication
- 35% have evidence of 1 or more medications
- 2 drugs have FDA approval labeling for use in autism

Rosenberg et al., 2010; Schubart, Camacho, & Leslie, 2014; Spencer et al., 2013

Case 1: 14 y.o. male ASD “Irritable”
Initial History

- Limited vocalizations
- Can be aggressive and difficult to redirect.
- Easily frustrated
- Self-contained classroom

There are only so many ways to describe behavior for clinicians and families!

Case 1: 14 y.o. male ASD “Irritable”
Targeted Classification

- Limited vocalizations
  - Unable to sit for speech therapy
- Can be aggressive and difficult to redirect
  - Goofy, almost inadvertent aggression
  - Otherwise happy
- Easily frustrated
  - Difficulty attending to even 5 minute tasks
- Self-contained classroom
  - Was unable to attend to lessons
Common Irritability and Mood Presentations

- Persistent
- Impulsive
- Explosive
- Anxious

Irritability
DBD
Mood disorders
Medical (GI)

ADHD
ID & LD
Motor

IED
ASD & PTSD
ID

OCD
Anxiety
Trait

Case 1: 14 y.o. male ASD “Irritable”
Outcome
- After discussion with parents with started methylphenidate 20 mg twice a day
- First weekend
- Current progress

Evidence for Stimulant Use
- Methylphenidate
  - Ritalin, Metadate, Concerta, Focalin, Daytrana patch
- Amphetamines
  - Adderall, Dexedrine, Vyvanse
- Increases concentrations of dopamine and norepinephrine in the pre-frontal
Stimulants: Evidence of Effect

- **RUPP Trial of Methylphenidate (2005)**
  - **Design:**
    - Double-blind, placebo-controlled crossover trial
    - 1 week each of placebo, low, medium, and high dose MPH in random order
  - **Primary outcome of interest:**
    - Reduction of Hyperactivity subscale score on ABC (Aberrant Behavior Checklist)
  - **Sample:**
    - 72 children with ASD ages 5 to 14 years
    - Autistic Disorder (71%), PDD-NOS (21%), Asperger (7%)
    - Mean IQ of 63 (range 16-135)

**Results**
- ABC Hyperactivity improved
- 49% were "responders" to MPH vs. 13% to placebo
- Adverse effects in 18% of subjects: **Irritability**, decreased appetite, difficulty falling asleep, emotional outbursts

Stimulant Response in ASD

- **MR**
  - 54% response (Aman 1996)
- **ASD**
  - 49% response (RUPP 2005)
- **ADHD**
  - Kids 70%/90% (Wigal 2012)
  - Adults MPH 76% (Spencer 2004)
Other ADHD Medications

- Alpha-2 agonists (guanfacine (Tenex) or clonidine)
- Atomoxetine
- Atypical antipsychotics (risperidone, etc.)

Summary of Challenge #2

ADHD Medication Trial → Identified effective treatment
- Stimulants
- Atomoxetine
- Alpha-2

Case 2: 17 y.o. female ASD “impulsive”

Initial History
- High functioning with intact language
- Mostly difficult with sustained attention classes
- Previous stimulant trials had resulted in severe irritability and mood swings
Case 2: 17 y.o. female ASD “inattentive”

Targeted Classification

- High functioning with intact language
  - Reviewed cognitive testing showing decreased processing speed
- Above average IQ
- Mostly difficult with sustained attention classes
  - Reading, homework, organization
- Previous stimulant trials had resulted in severe irritability and mood swings
  - Patient described feeling very uncomfortable, but focus was improved

Common Irritability and Mood Presentations

Persistant  Impulsive  Explosive  Anxious

Irritability  DBD  Mood disorders  Medical (GI)
ADHD ID & LD Motor
IED ASD & PTSD ID
OCD Anxiety Trait

Case 2: 17 y.o. female ASD “inattentive”

Outcome

- Restarted low-dose stimulant with atypical antipsychotic
- Needed titration of both medications for improvement
- Irritability was mitigated by atypical antipsychotics in the RUPP MPH trial
Independence in ASD

- What features of ASD contribute to difficulties in independence?
  - Social and communication deficits
  - Restricted, repetitive, stereotypic behaviors
  - Joint attention and imitation
  - Limited social interest

- If ADHD comorbidity is an impediment to learning, the risk of not treating is potentially years of sub-optimal learning.

Improvement Model

- Assessment
- Revise and Modify
- Response

Conclusions

- What features of ASD contribute to difficulties in independence?
  - Social and communication deficits
  - Restricted, repetitive, stereotypic behaviors
  - Joint attention and imitation
  - Limited social interest

- If ADHD comorbidity is an impediment to learning, the risk of not treating is potentially years of sub-optimal learning.
Conclusions

1. ADHD is a common and impairing comorbidity in ASD
2. There are systematic ways of assessing for ADHD in ASD
3. Untangling ADHD and ASD symptoms can be complicated and requires knowledge/experience of both disorders
4. Effective evidence based treatment options are available.

Summary and Goal of Treatment

Increase in Learning → Individual Burden
Increase Well-being → Caregiver Burden
Increase Independence → Societal Burden

If ADHD comorbidity is an impediment to learning, the risk of not treating is potentially years of sub-optimal learning.

Thank you

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