Autism Neuroscience and the Primary Care Clinician

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Lecture overview

- Brain development and the neuroarchitecture of autism
- ASD behaviors and red flags
- Diagnostic criteria for autism spectrum disorders
- Clinical strategies for the front lines
Neurodevelopment and Autism

- Neurodevelopmental condition
  - Deficits in language development, social interaction and unusual patterns of behavior.
  - Impairment of complex processing
  - Not visible at birth
- Different brain structure
  - Neuroarchitecture differences

Geschwind, 2009

Synapses Gone Wild

- Synaptogenesis
- Pruning
- Second brain reorganization in early adolescence
- Executive function and association areas mature last
- White matter steady increases into adulthood
Grey Matter Development

- Gray matter increases then decreases with adolescence.
- Areas responsible for integration mature last.

Gogtay et al; PNAS; 2007

White matter pathways

Word of the Week: Connectomics

Diffusion Tensor Imaging (DTI)
Differential Growth in Autism

**Grey matter** differences in frontal and temporal regions; not in parietal or occipital regions

**White matter**
- increased in frontal and parietal areas
- Increase greatest in prefrontal
- Increased sub-cortical short tracks

**Superior Temporal Lobe differences**
- Link between social and language

**Cerebellar vermis** smaller

**Amygdala** increased in size in young but not adults

Geschwind, 2009

Abnormal Brain Growth

- ASD cohort birth HC average to low average
- 2-4 years larger than average
- Than slow or arrested growth
- Slightly smaller brain size as adult

Courchesne E et al., 2004
Brain abnormalities: What might it mean?

- Many areas implicated - reflects heterogeneity
- Dysfunction in micro- and macro-circuits
- Excess sub-cortical circuits
  - Lack of “central coherence” or integration of information across the brain regions
- Bi-directional:
  - Abnormal neurodevelopment ↔ abnormal processing
  - “Disconnection syndrome”
- Improvement in executive functions into adolescence but never reaches normative adult levels; less sophisticated and less flexible EF

Geschwind 2009
O’Hearn 2008

Tinker Toy Trouble

- Autism involves preservation of basic behavioral processes with abnormalities in complex functioning.
- Islands of knowledge but difficulty connecting them up
ACTIVITY: Autism=Tunnel Vision of the Brain

Activation of Fusiform Gyrus in Face Recognition Task

Control

Autism

Grelotti et al. (2002)
Role of the Amygdala

- Salience detection
- Connected to ventral temporal cortex (fusiform gyrus)
- Dysfunction impairs ability to link social stimuli with social meaning
- Dysregulation in ASD
  - Hypoactivation social stimuli
  - Hyperactivation “trivial” stimuli
- Interaction with executive functions

Neurodevelopment and executive function in Autism

Visual Pursuit in Autism—use of eye-tracking technology

Klin et al
Am J Psychiatry 2002
Absence of Preferential Looking to the Eyes of Approaching Adults Predicts Level of Social Disability in 2-Year-Old Toddlers With Autism Spectrum Disorder

Warren Jones; Katelin Carr; Ami Klin
ARCH GEN PSYCHIATRY/VOL 65 (NO. 8), AUG 2008; 946-954
Eye Contact, Joint Attention and Social Referencing

KEY SKILL: looking back and checking in to confirm/share

Be aware that cultural norms vary regarding what is considered socially appropriate eye contact

Qualitative Impairment in Communication:
Diagnostic and Statistical Manual IV-TR

- Delay in, or lack of, development of spoken language (without compensation with gesture)
- Impairment in ability to initiate or sustain a conversation
- Stereotyped and repetitive language or idiosyncratic language
- Lack of varied, spontaneous pretend play or social imitative play at developmental level

❖ CORE CONCEPT: FUNCTIONAL communication leading to SOCIAL Language (pragmatics) and to higher-order thinking and PLAY
Language examples

- Regina, age 3, mother says “stands and screams, I have no idea what she wants”
- James, age 5, parent questionnaire stated “He takes things very literally, for example, he doesn’t want to call a cantaloupe a cantaloupe because it doesn’t come from a can, he thinks it should be called a “fridge-elope”
- Tyler, 8, writing sample: “My family is great. My name’s is tyler I have a DS and I tink dogs are great, espesely chowauwau. My last name is XXXXX”.

Restricted or repetitive repertoire of behavior or interests: Diagnostic and Statistical Manual IV-TR

- Preoccupation with one or more stereotyped pattern of interest abnormal in either intensity or focus
- Apparently inflexible adherence to specific nonfunctional routines or rituals
- Stereotyped and repetitive motor mannerisms
- Persistent preoccupation with parts of objects

★CORE CONCEPT: Familiarity breeds comfort.
Dylan age 7 writing

Please write a few sentences about how things are going for you or anything else you want to write about!

First Name: Dylan Date: 7/10/03 Age: 7

I love to make maps. I always want to make maps 1-95. Which is over my favorite number!!! My favorite number is 45.
**Typical Atypicalities**

- Repetitiveness
  - 2 to 4 year olds need things to be “right” e.g. right cup
  - Repeating questions knows answer to
  - 4 to 6 year old obsessions e.g. dinosaurs
  - Rocking to fall asleep or in distress
- Flapping with excitement (overflow)
- Immediate echoing in early language development

  - In autism: obligatory, can’t inhibit and interferes with normal development and relations.

**DSM IV-TR diagnosis of AUTISTIC DISORDER:**

- Atypical behavior in social interaction, communicative language, and imaginative play prior to 3 years of age
- Six symptoms that impair functioning
  - At least two symptoms from Social Reciprocity
  - At least one in each of the other two areas
- Asperger’s Syndrome
  - No significant delays in cognition or basic language skills; has deficits in pragmatics
  - May present later
- PDD Not Otherwise Specified
  - If does not meet full criteria
- Symptoms cannot be better explained by another developmental, psychiatric, or neurologic disorder
~ 2013 DSM V- “Autism Spectrum Disorder”
WWW.ODSM5.ORG

• Pervasive Developmental Disorders category eliminated
• Elimination of PDD-NOS, Asperger's, Rett’s, CDD
• Continuum of severity
• Meets criteria 1, 2 and 3:
  1. Clinically significant deficits in social communication and interactions
     a. Marked deficits in nonverbal and verbal communication used for social interaction
     b. Lack of social reciprocity
     c. Failure to develop and maintain peer relationships appropriate to developmental level
  2. Restricted, repetitive patterns of behavior, interests and activities (at least TWO of the following)
     a. Stereotyped motor or verbal behaviors, or unusual sensory behaviors
     b. Excessive adherence to routines and ritualized patterns of behavior. Restricted, fixated interests
  3. Symptoms must be present in early childhood but may not become fully manifest until social demands exceed limited capacities

The Portable Autism Kit

• Letter blocks
• Wind-up toy
• Small cars (2)
• Bubbles
• Several figures
• Random items
• Paper
• Pencils/crayons
• Rubber band and large paperclip
Instruction:
Draw a picture of your family doing something

You're fat. You're so weird, you have no friends. I'm smart. You're dumb. I'm right. You're wrong. I'm always loved. You have no good future ahead of you. You're just a freak.
Practice changes to consider

- Attend to visual attention
- Measure head circumference sequentially
- Screen 18 and 24 months
- AAP Autism Toolkit
- Drawing/writing task
Summary

• Neurodevelopment is altered early in life in autism
• Decreased functional connectivity contributes to the core and possibly the associated symptoms of autism
• Improvements over time but residual executive function and linguistic deficits persist
• Behavioral diagnosis
• Pediatricians are critical to the identification and management of children with autism spectrum disorders.

The End
The Autism Speaks 100 Day Kit is created specifically for newly diagnosed families, to make the best possible use of the 100 days following the diagnosis of autism. Families whose children have been diagnosed within the past 6 months, and are age 5 or younger, may request a complimentary 100 Day Kit after completing their survey for recently-diagnosed families. Families with children diagnosed more than 6 months ago and/or over the age of 5, as well as other interested professionals, can download the PDF of the 100 Day Kit or view it online. www.AutismSpeaks.org is a reliable website. http://www.autismspeaks.org/community/family_services/100_day_kit.php

The Autism Consortium is a Boston based Autism research collaboration between the academic centers. Information packets in English, Spanish, Portuguese, Haitian-Creole, Chinese and Vietnamese.

www.autismconsortium.org
Multilingual Resource

- Ten Things Every Child with Autism Wishes You Knew articles; Spanish, Portuguese, Korean, French, Dutch, Afrikaans, Vietnamese, Portuguese, Hungarian, Danish, Croatian [www.ellennotbohm.com](http://www.ellennotbohm.com)
- Book Translations: Ten Things Every Child with Autism Wishes You Knew- Contact these publishers for information on these translations; Hyperlinks on [www.ellennotbohm.com](http://www.ellennotbohm.com)
  - Arabic: Kuwait Center for Autism
  - Complex Chinese: JC Culture and Publishing (in Taiwan)
  - Dutch: Uitgeverij Pica
  - Korean: Hanulim Publishing Co, Sag-ga 3f-374, Dangsan-Dong, Youngdungpo-Gu, Seoul, Korea

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- Herbert MR. et al. Dissociations of cerebral cortex, subcortical and cerebral white matter volumes in autistic boys. *Brain.* 2003; 126(Pt 5):1182-92,