Chapter 14

Neurodevelopmental Disorders

Outline

- Overview of Neurodevelopmental Disorders
- Attention Deficit/Hyperactivity Disorder
- Specific Learning Disorder
- Autism Spectrum Disorder
- Intellectual Disability (Intellectual Development Disorder)
- Prevention of Neurodevelopmental Disorders

Focus Questions

- *What are the defining features of ADHD?*
- *What is a specific learning disorder?*
- *What are the major features of autism spectrum disorders?*
- *How is intellectual disability defined?*

Neurodevelopmental Disorders

- Diagnosed first in infancy, childhood, or adolescence
- Include the following:
  - Attention deficit hyperactivity disorder (ADHD)
  - Specific learning disorder
  - Autism spectrum disorder
  - Intellectual Disability
  - Communication and Motor Disorders

Nature of Developmental Psychopathology: An Overview

- Normal vs. abnormal development
  - Consider age and environment of child
- Developmental psychopathology
  - Study of how disorders arise and change with time
  - Disruption of early skills can affect later development
  - Caution: do not excessively pathologize childhood behavior that is part of normal development

TABLE 14.1 Common Communication and Motor Disorders.

Childhood-Onset Fluency Disorder

Clinical Description	Statistics	Etiology	Treatment
A disturbance in speech fluency that includes a number of problems with speech, such as repeating syllables or words, prolonging certain sounds, making obvious pauses, or substituting words to replace ones that are difficult to articulate.	Occurs twice as often among boys as among girls. Begins most often in children by the age of 6, and 98% of cases occur before the age of 10 (Maguire, Yeh, & Ito, 2012). Approximately 80% of children who stutter before they enter school will no longer stutter after they have been in school a year or so (Kroll & Beitchman, 2005).	Rather than anxiety causing childhood-onset fluency disorder, this problem makes people socially anxious (Ezrati-Vinacour & Levin, 2004). Multiple brain pathways appear to be involved, and genetic influences may be a factor (Maguire et al., 2012).	Parents are counseled about how to talk to their children. *Regulated-breathing method* is a promising behavioral treatment in which the person is instructed to stop speaking when a stuttering episode occurs and then to take a deep breath (exhale, then inhale) before proceeding (Onslow, Jones, O'Brian, Packman, & Menzies, 2012). Altered auditory feedback (electronically changing speech feedback to people who stutter) can improve speech, as can using forms of self-monitoring, in which people modify their own speech for the words they stutter (Onslow et al., 2012).

- Stuttering Cluttering -rapid and/or irregular speech rate
- causative gene mutations linked to stuttering

Language Disorder

Clinical Description	Statistics	Etiology	Treatment
Limited speech in *all* situations. *Expressive language* (what is said) is significantly below *receptive language* (what is understood); the latter is usually average.	Occurs in 10% to 15% of children younger than 3 years of age (Johnson & Beitchman, 2005) and is almost five times as likely to affect boys as girls (Whitehurst et al., 1988).	An unfounded psychological explanation is that the children's parents may not speak to them enough. A biological theory is that middle ear infection is a contributory cause.	May be self-correcting and may not require special intervention (Whitehurst et al., 1988).

Social (Pragmatic) Communication Disorder

Clinical Description	Statistics	Etiology	Treatment
Difficulties with the social aspects of verbal and nonverbal communication, including verbosity, prosody, excessive switching of topics, and dominating conversations (Adams et al., 2012). Does not have the restricted and repetitive behaviors found in ASD.	Exact estimates not yet available, but the number of cases identified appears to be rising with increasing awareness (Baird et al., 2006; Bishop, 2000).	Limited information.	Individualized social skills training (e.g., modeling, role playing) with an emphasis on teaching important rules necessary for carrying on conversations with others (e.g., what is too much and too little information) (Adams et al., 2012).

Tourette's Disorder			
Clinical Description	**Statistics**	**Etiology**	**Treatment**
Involuntary motor movements *(tics)*, such as head twitching, or vocalizations, such as grunts, that often occur in rapid succession, come on suddenly, and happen in idiosyncratic or stereotyped ways. Vocal tics often include the involuntary repetition of obscenities.	Of all children, up to 20% show some tics during their growing years, and 1 to 10 children out of every 1,000 have Tourette's disorder (Jummani & Coffey, 2009). Usually develops before the age of 14. High comorbidity between tics and ADHD, as well as obsessive-compulsive disorder (Jummani & Coffey, 2009).	There are likely multiple vulnerability genes that influence the form and severity of tics (Jummani & Coffey, 2009).	*Psychological:* Self-monitoring, relaxation training, and habit reversal.

Adapted from (Durand, 2011)

Attention Deficit/Hyperactivity Disorder (ADHD)

- Nature of ADHD
  - Central features – inattention, overactivity, and impulsivity
  - Associated with numerous impairments
    - Behavioral
    - Cognitive
    - Social and academic problems

Types of Attention Deficit Hyperactivity Disorder Subtypes(ADHD)

- Inattentive
- Hyperactive/impulsive
- Combined

ADHD: Facts and Statistics

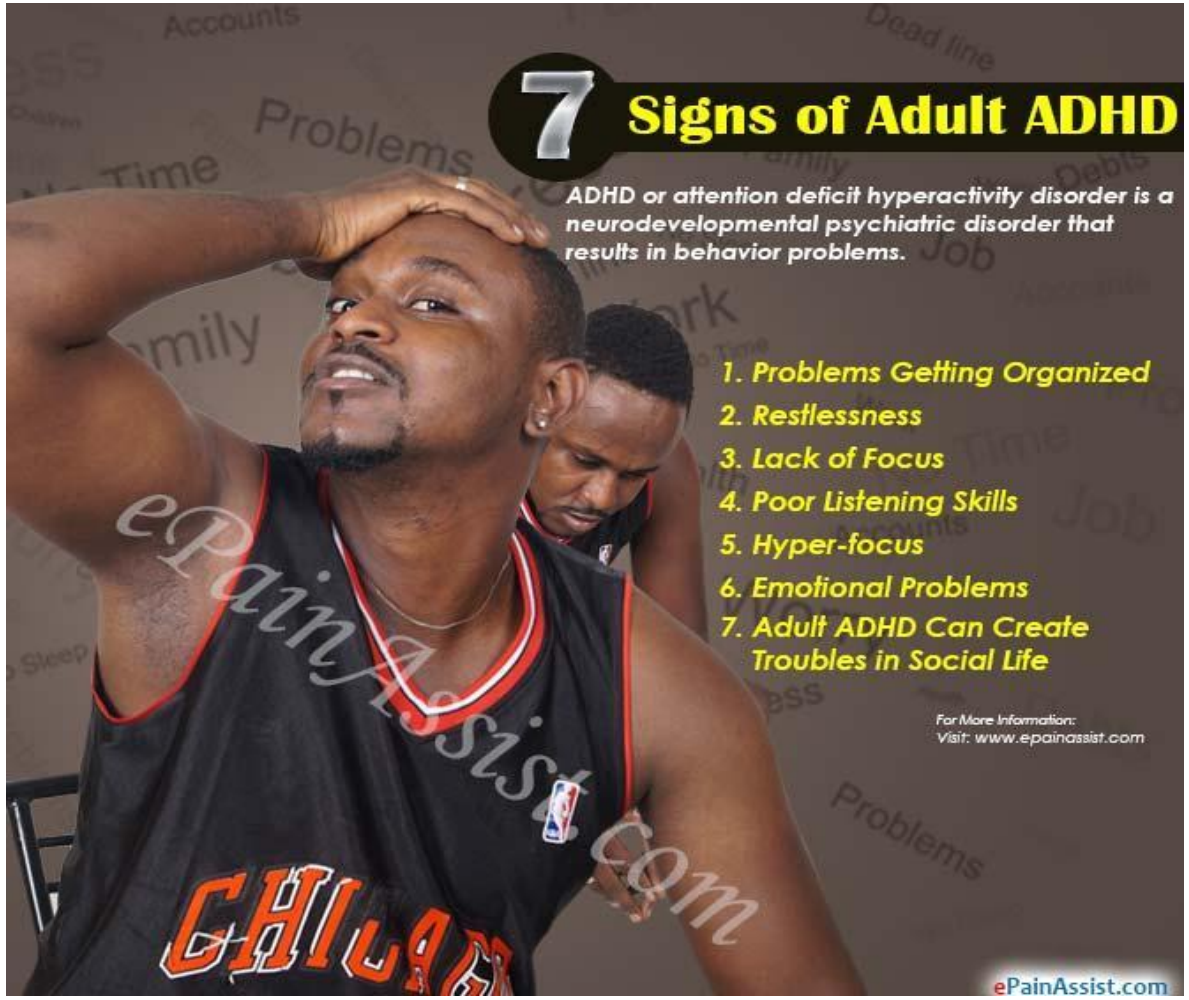
- Prevalence
  - Occurs in approximately 5% of school-aged children throughout the world
  - ADHD most commonly diagnosed in the United States, although prevalence appears fairly constant worldwide
    - One study: 11% of children aged 4 to 17 were labeled with ADHD in 2011-2012
  - In general population (including adults), 5 to 9% meet criteria

Test ADHD

The 'Unofficial' ADHD Test for Adults https://youtu.be/iozAFIr3BEw till 12min 24
Test https://totallyadd.com/do-i-have-add/

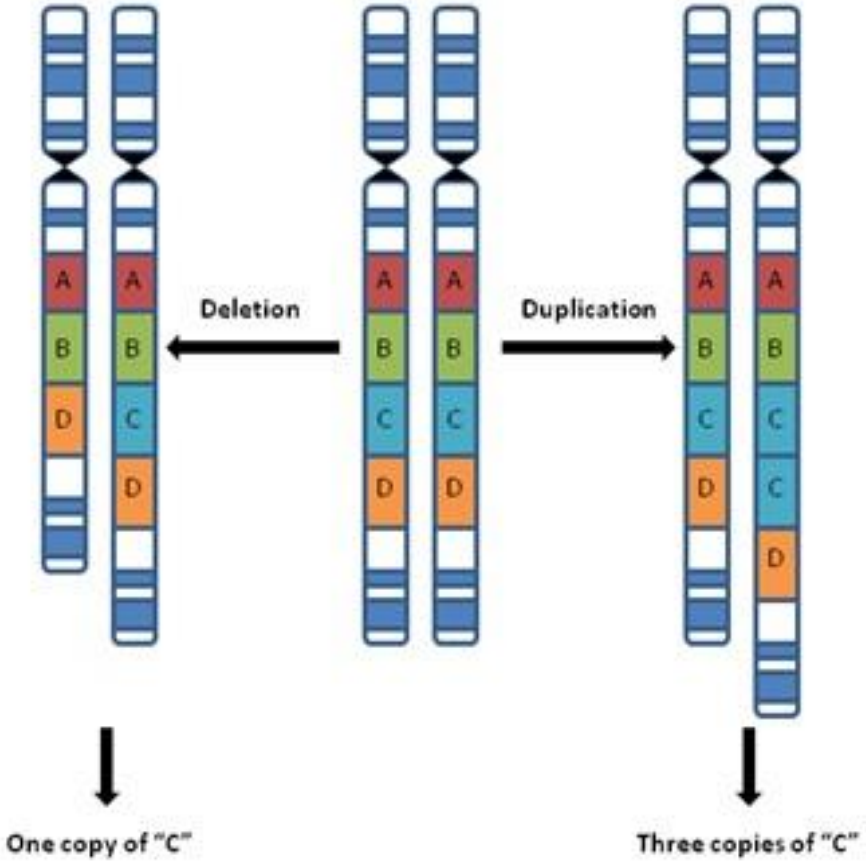
ADHD: Facts and Statistics, Continued

- Course of ADHD
  - Symptoms usually appear around age 3 to 4
  - Half of children with ADHD continue to have difficulties as adults
    - Divorce, lower education, substance use
  - Impulsivity decreases, but inattention remains
- Gender differences: Boys outnumber girls 3:1



Causes of ADHD: Biological Contributions

- Genetic contributions
  - ADHD seems to run in families
  - Partially explained by *copy number variants* – extra or missing copies of genes on chromosome
- The role of toxins
  - Food additives (e.g., dyes, pesticides) may play very small role in hyperactive/impulsive behavior among children
  - Maternal smoking increases risk
- Neurobiological correlates of ADHD
  - Inactivity of the frontal cortex and basal ganglia
  - Abnormal frontal lobe development, poor inhibitory control

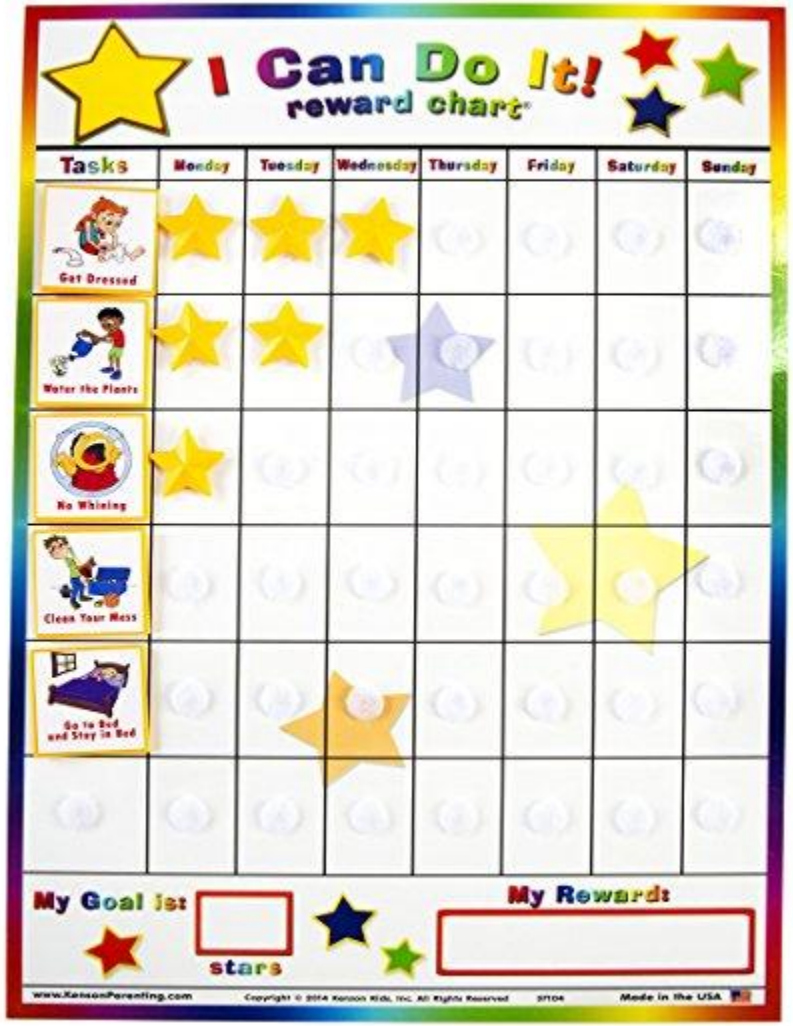


Causes of ADHD: Psychosocial Contributions

- Psychosocial factors
  - ADHD children are often viewed negatively by others > Frequent negative feedback from peers and adults
    - Peer rejection and resulting social isolation
    - Such factors foster low self-esteem

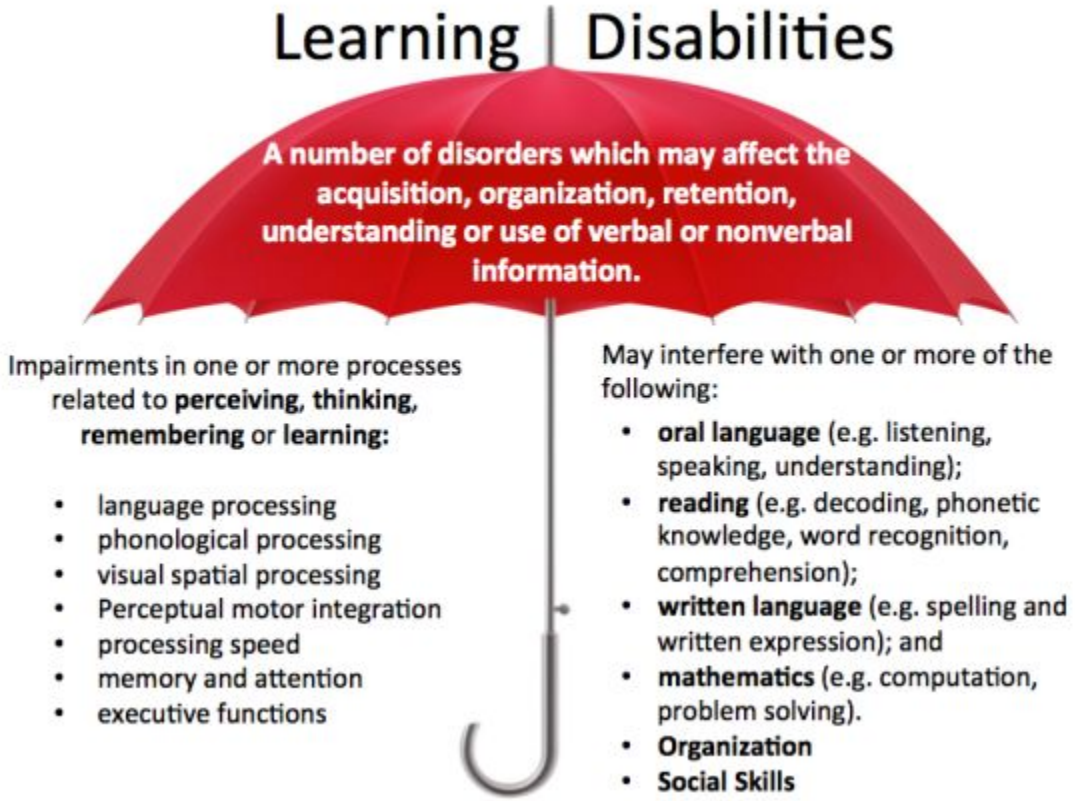
Treatment of ADHD

- Goal of biological treatments: reduce impulsivity and hyperactivity, improve attention
- Behavioral treatment for children
  - Reinforcement programs increase appropriate behaviors, decrease inappropriate behaviors
  - May also involve parent training



Надо какое ниб упражнение

Specific Learning Disorders: An Overview



- Scope of learning disorders
  - Academic problems in reading, mathematics, and/or writing
  - Performance substantially below expected levels based on age and/or demonstrated capacity
  - Problems persist for 6+ months despite targeted intervention

Specific Learning Disorder: Types

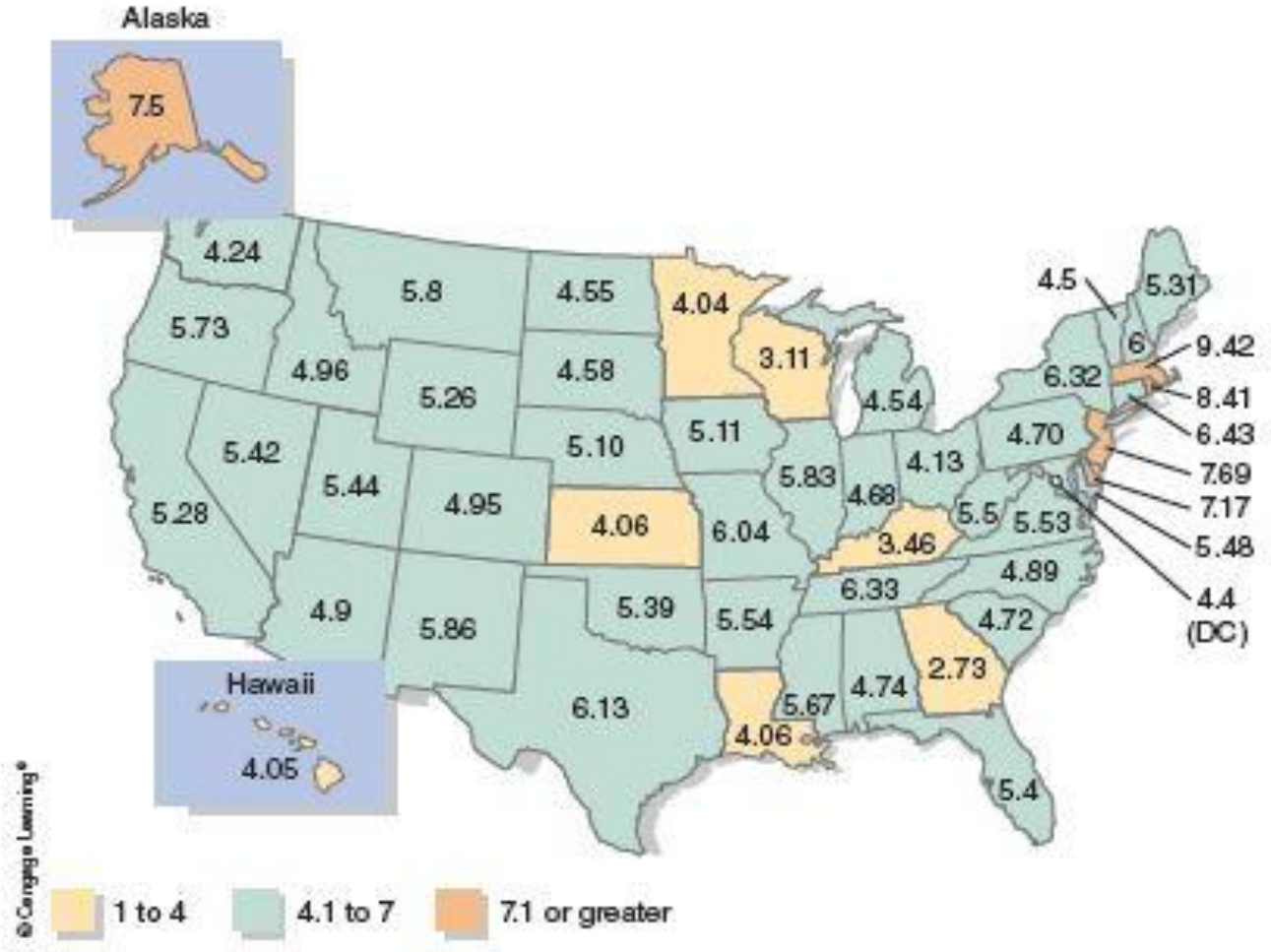
- With impairment in reading, may include:
  - Word reading accuracy
  - Reading rate or fluency
  - Reading comprehension

- With impairment in written expression, may include:
  - Spelling accuracy
  - Grammar punctuation and accuracy
  - Clarity/organization of written expression

- With impairment in mathematics, may include:
  - Number sense
  - Memorization of arithmetic facts
  - Accurate or fluent calculation
  - Accurate math reasoning

Specific Learning Disorder: Statistics

- Prevalence of learning disorders
  - 5 to 15% prevalence across youth of various age and cultures
  - Highest rate of diagnosis in wealthier regions, but children with low SES more likely to have difficulties
  - Reading difficulties most common, affect 7% of the general population

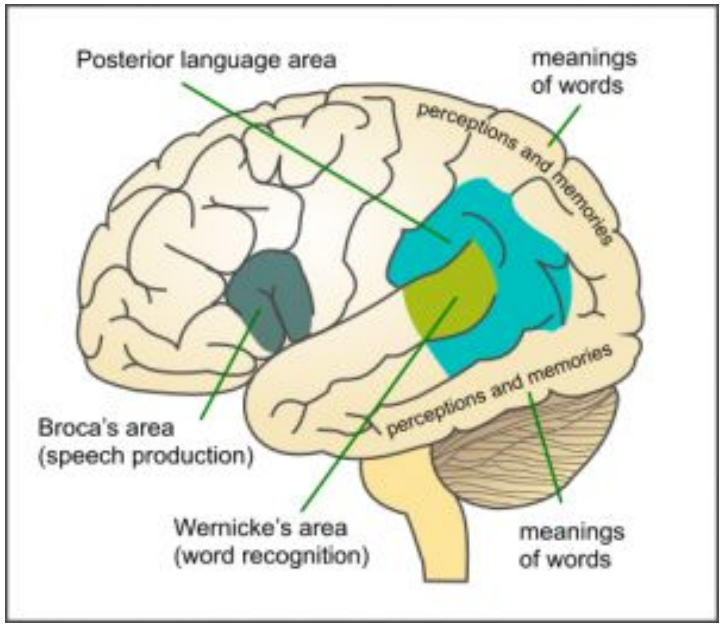


Specific Learning Disorders: Statistics, Continued

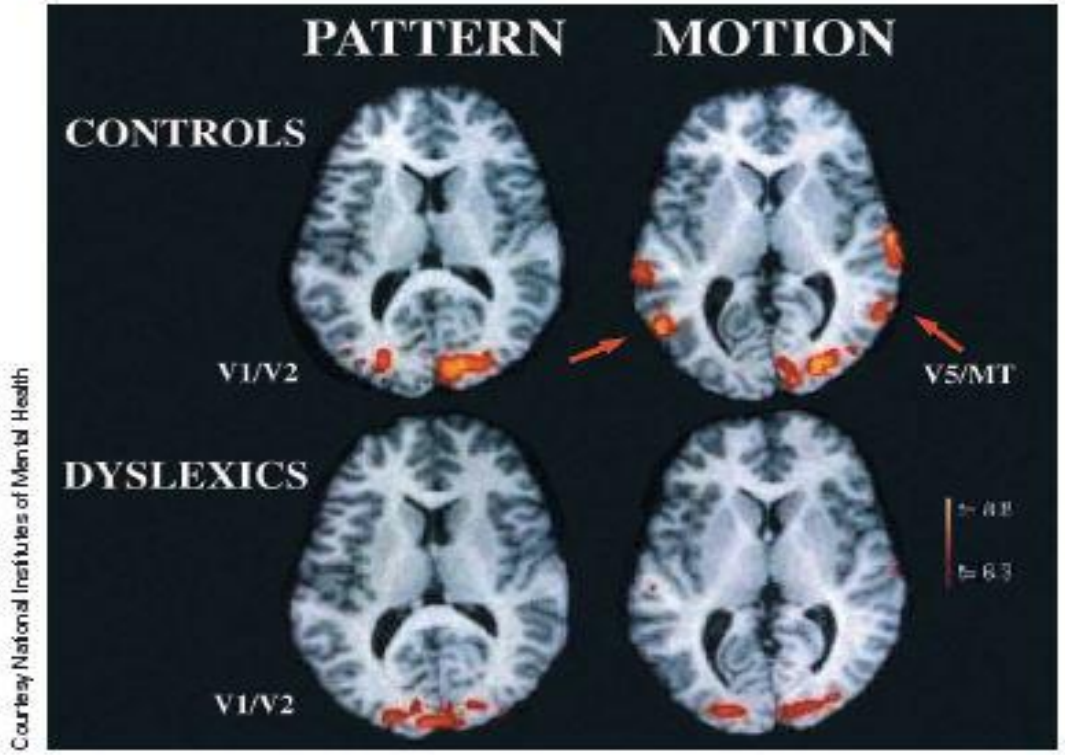
- Students with learning disorders are more likely to:
  - Drop out of school
  - Be unemployed
  - Have suicidal thoughts
  - Have negative school experiences
- May be related to communication disorders

Causes of Specific Learning Disorder

- Genetic and neurobiological contributions
  - Learning disorders run in families, but specific difficulties are not inherited
  - Evidence for subtle neurological difficulties is mounting (e.g., decreased functioning of areas responsible for word recognition)
  - Overall, contributions are unclear
- Performance also influenced by:
  - Motivational factors
  - Socioeconomic status
  - Cultural expectations
  - Parental interactions
  - Child management practices



Neurological Differences in Dyslexia



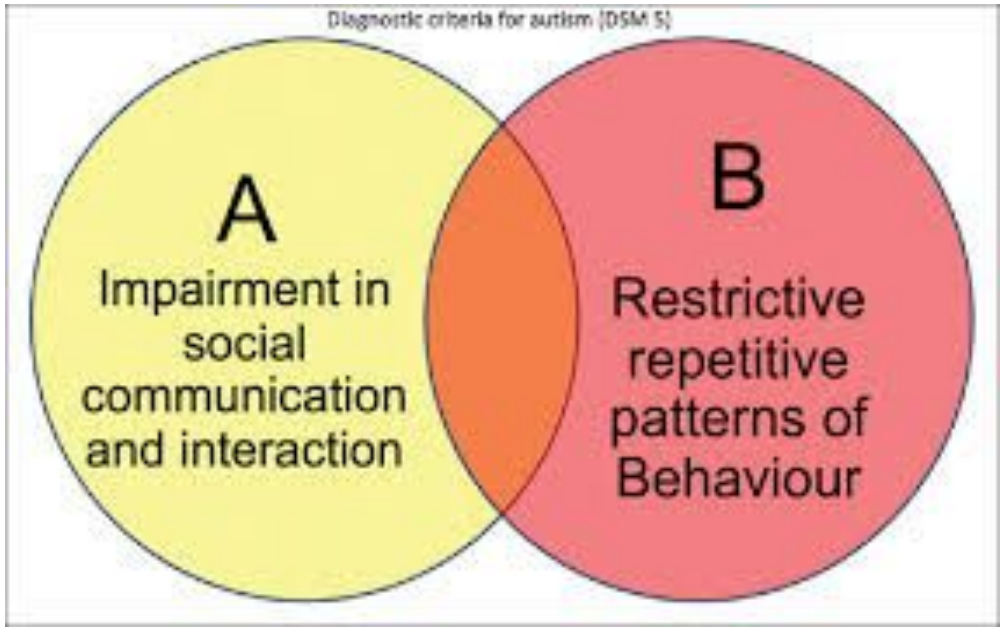
▲ These functional MRI scans of composite data from six dyslexic adults and eight controls show a horizontal slice through the brain, with the face at the top. Imaging shows atypical brain activity associated with dyslexia. The scans were performed while subjects tracked a pattern of moving dots on a computer screen. A brain area (V5/MT) normally active during such motion tasks did not switch on in dyslexic subjects (right). Their brain activity was more similar to that of controls during a pattern recognition task (left).

Treatment of Specific Learning Disorder

- Requires intense educational interventions
  - Remediation of basic processing problems, cognitive skills, and compensatory skills
  - Examples:
    - Vocabulary, discerning meaning, fact finding, decision making, critical thinking
- Data support behavioral educational interventions
- Biological interventions (e.g., Ritalin) usually used only for those individuals who also have ADHD

Autism Spectrum Disorder

- Problems occur in language, socialization, and cognition
- Pervasive – problems span many life areas
- 25% don’t acquire effective speech
  - Restricted, repetitive patterns of behavior, interests, or activities



Autism Spectrum Disorder

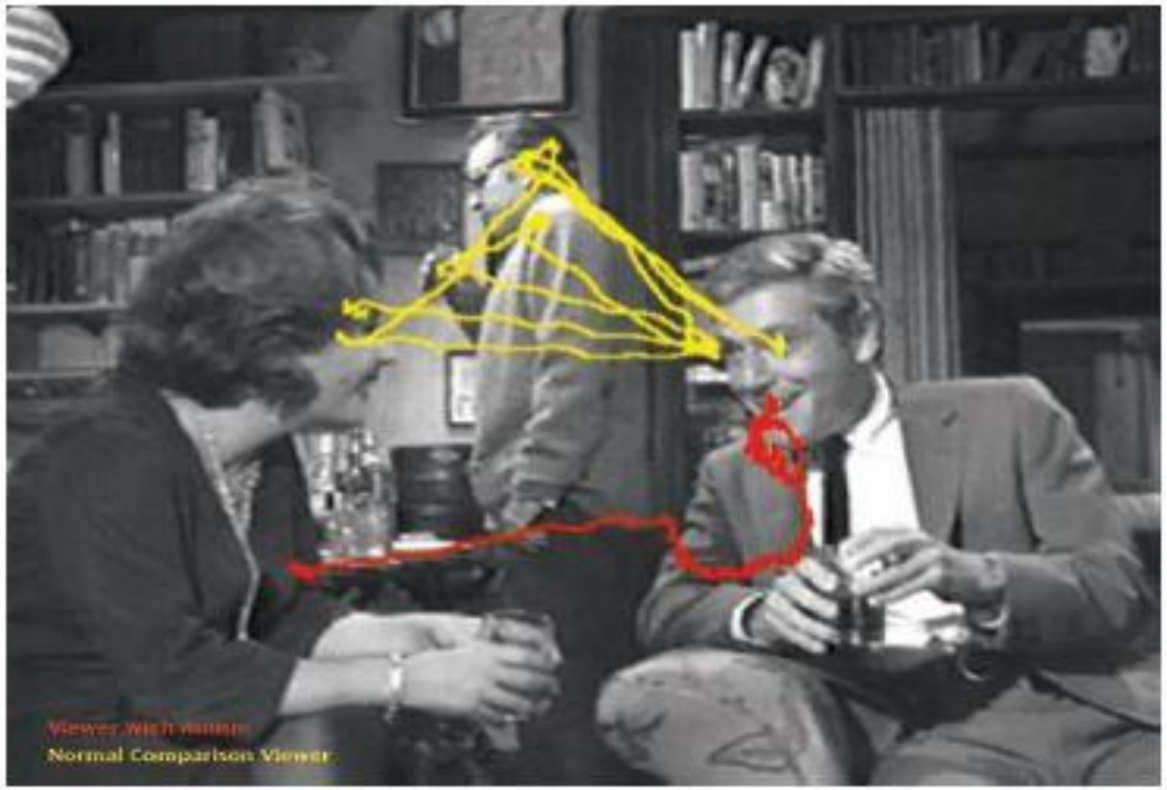
- Label is new to DSM-5
- Encompasses several disorders previously classified as “pervasive developmental disorders”
- Including:
  - Autistic disorder
  - Asperger’s disorder
  - Childhood disintegrative disorder
  - Rett syndrome

Rett Syndrom

Impairment in Social Communication and Interaction

- Defining characteristic: Failure to develop age-appropriate social relationships
  - Trouble initiating and maintaining relationships
  - Trouble with nonverbal communication
    - May lack appropriate expressions, tone
  - Trouble with social reciprocity
    - Deficits in *joint attention* – the ability to communicate interest in an external stimulus and another person at the same time

What Autism Looks Like



▲ Researchers are exploring how people with autism view social interactions among other people. (From Klin, A., Jones, W., Schultz, R., Volkmar, F., & Cohen, D. (2002). Defining and quantifying the social phenotype in autism. *American Journal of Psychiatry, 159,* 895–908.)

Restricted or Repetitive Behaviors and Interests

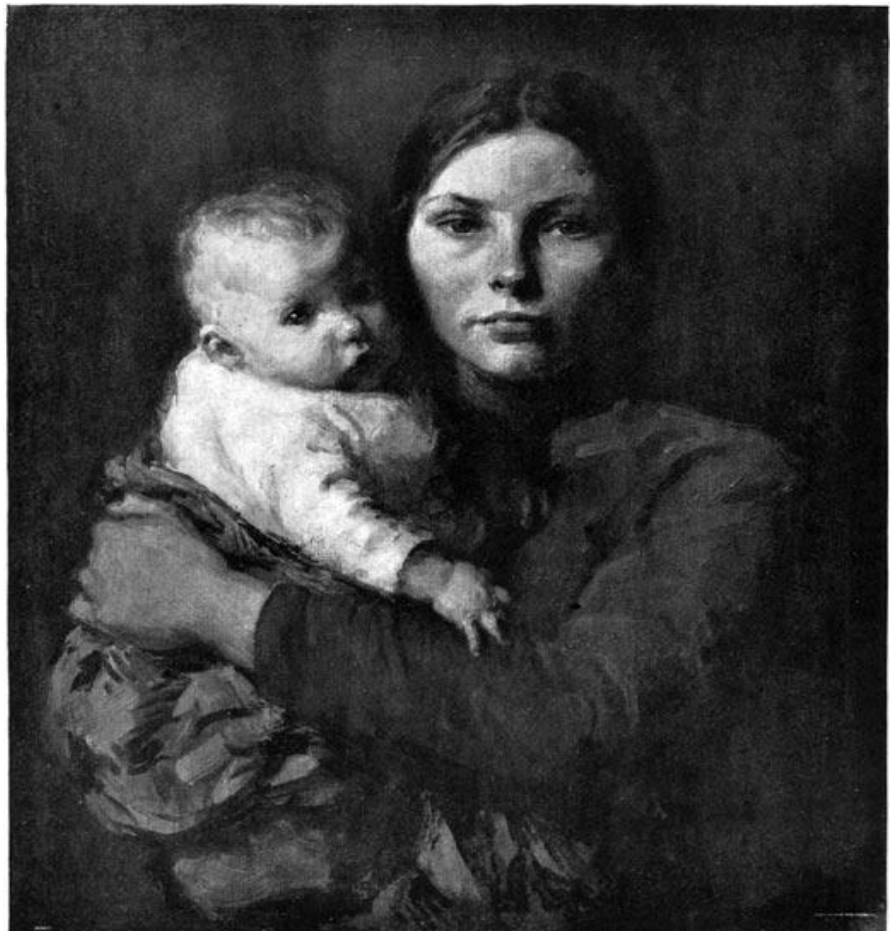
- Preference for the status quo – maintenance of sameness
- Severe forms: Stereotyped or ritualistic behavior
  - E.g., spinning, waving hands, rocking
- Less severe forms: Intense, circumscribed interest in very specific subjects
  - Having restricted areas of interest may compound difficulties relating to others

Autism Spectrum Disorder: Prevalence

- Previously thought to be very rare, but this is not the case
- 1 in 50 school-aged children meet criteria
- More commonly diagnosed in males
  - Gender ratio: 4 to 5:1
- IQ interaction
  - 38% show intellectual disabilities
- Occurs worldwide
- The better the language skills and IQ test performance, the better the prognosis

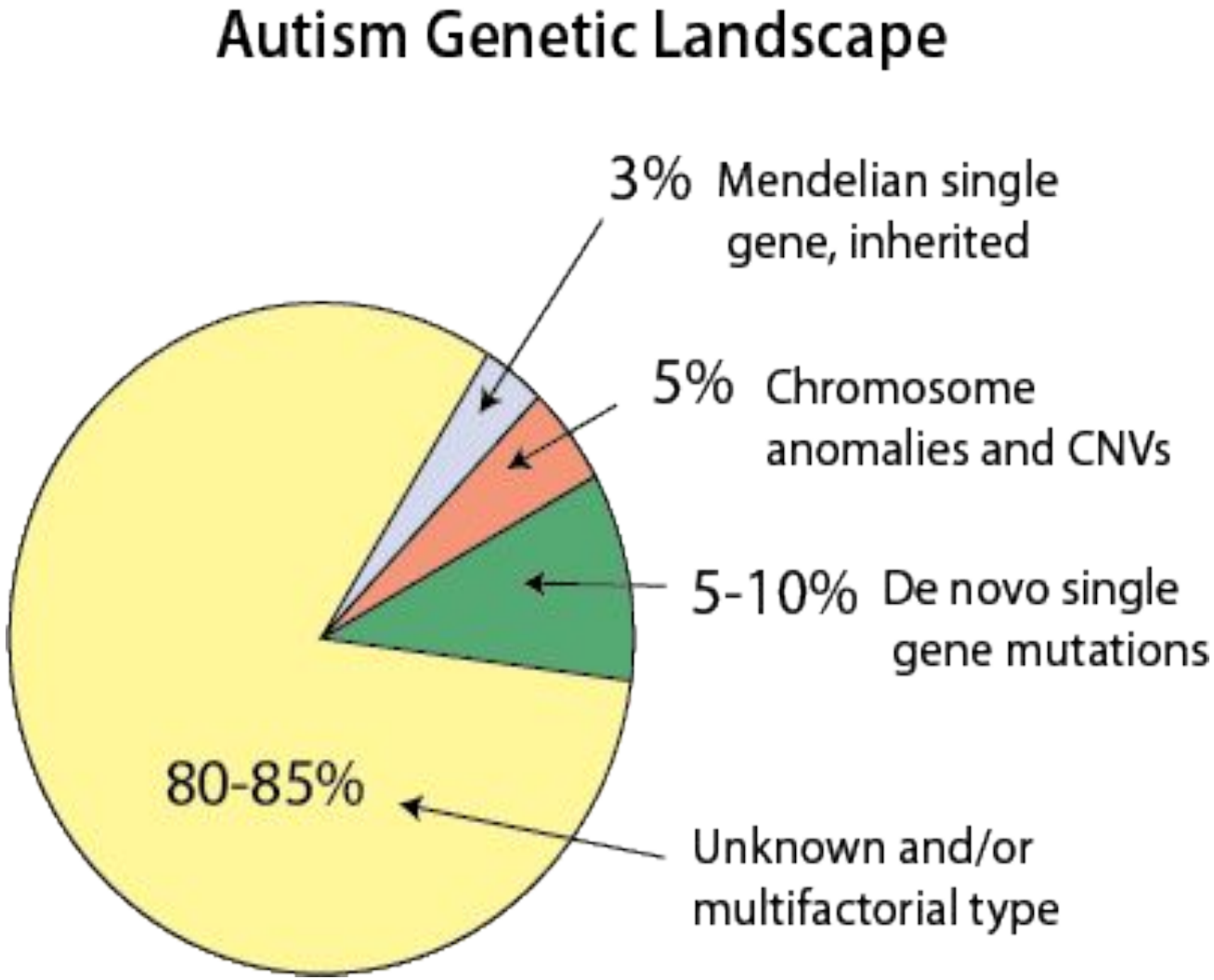
Psychological and Social Dimensions

- Historical views
  - Failed parenting
    - Perfectionistic, cold, and aloof
    - Parents thought to have high socioeconomic status and higher IQs
    - This view is not currently supportive



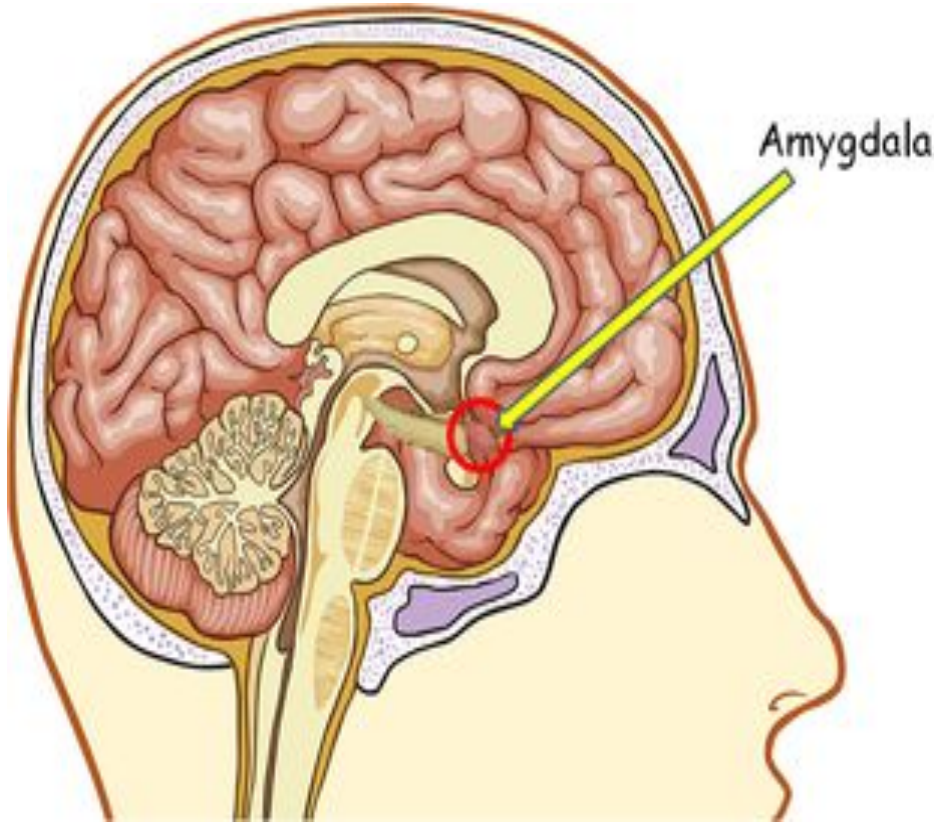
Biological Dimensions

- Significant genetic component
  - Familial component: If you have one child with autism, the chance of having a second child with autism is 20% (100x greater risk than general population)
- Numerous genes on several chromosomes involved
- Older parents associated with increased risk



Neurobiological Influences

- Neurobiological influences
- Amygdala
  - Larger size at birth = higher anxiety, fear
  - Elevated cortisol
  - Neuronal damage in the amygdala results from high stress, which may affect processing of social situations
- Oxytocin
  - Lower levels in individuals with ASD
  - giving oxytocin to people with ASD improved their ability to remember and process information with emotion content



Vaccination Risks

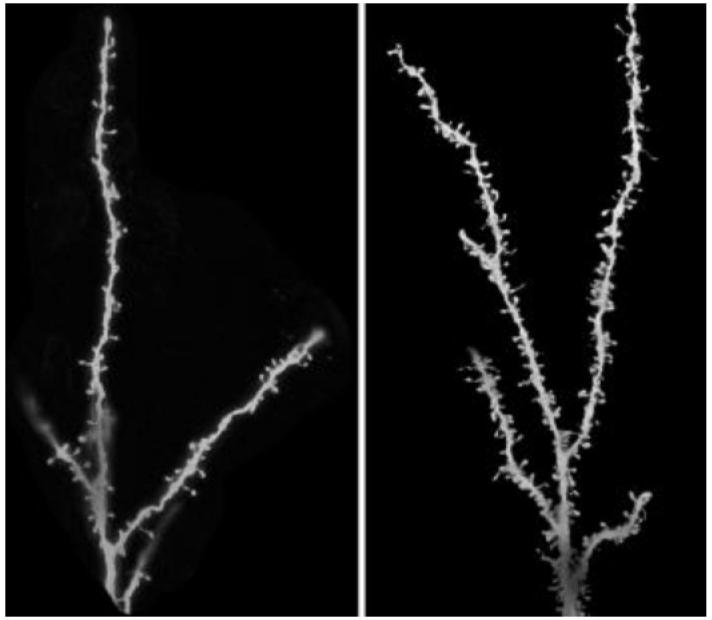
- Highly controversial theory is that mercury
  - Vaccinations do *NOT* increase the risk of autism
    - Mercury in some vaccinations was rumored to increase autism risk
    - Large scale studies do NOT support this
    - High rates of vaccinations do NOT increase risk for autism in the community at large
    - Health risk of not vaccinating is substantial

Scientists discover how a gene mutation causes autism

Mutations in a gene called UBE3A cause it to become hyperactive, leading to abnormal brain development and autism/ This hyperactivity causes autism
While the parents of the children had no UBE3A mutations, the children did. The UBE3A gene in the children was permanently switched on. Children and adolescents with autism have too many synapses in their brain, which can affect their brain function
Mutated UBE3A gene to mouse models the development of dendritic spines on the brain cells -too many dendritic spines has been associated with autism

Children with autism 'have too many synapses in their brain

In the brains of individuals without autism, the number of spines had reduced by almost 50% by late childhood. However, the number of spines in the brains of those with autism had only reduced by 16% by late childhood.



- **Children with autism 'have too many synapses in their brain'**

Treatment of Autism Spectrum Disorder

- Psychosocial treatments
  - Behavioral approaches
    - Skill building
    - Reduce problem behaviors
    - Communication and language training
    - Increase socialization
    - Naturalistic teaching strategies
  - Early intervention is critical – may “normalize” the functioning of the developing brain

Treatment of Autism Spectrum Disorder, Continued

- Biological treatments
  - Medical intervention has had little positive impact on core dysfunction
  - Some drugs decrease agitation
    - Tranquilizers
    - SSRIs
- Indicators of good prognosis
  - High IQ, good language ability

Treatment of Autism Spectrum Disorder, Part 3

- Integrated treatments
  - Preferred model: Multidimensional, comprehensive focus
    - Children offered special education at school focusing on communication
    - Judicious use of medication in some cases
    - Families given support too
  - When older, focus on integrating into the community while maximizing independence

Intellectual Disability (Intellectual Development Disorder)

- Overview
  - Below-average intellectual and adaptive functioning
  - First evident in childhood
  - Range of impairment varies greatly
  - Previously called mental retardation

Intellectual Disability

- IQ typically below 70 to 75
  - Previously distinguished different levels of severity; IQ may be as low as under 20
- Previously diagnosed on DSM-IV Axis II
  - Reserved for conditions that 1) are chronic and pervasive and 2) are likely to influence the presentation of other mental disorders

Levels of Intellectual Disability

- Mild
  - IQ = 50 or 55 to 70
- Moderate
  - IQ = 35-40 to 50-55
- Severe
  - IQs = 20-25 to 35-40
- Profound
  - IQ = below 20 to 25

Intellectual Disability, DSM-5

- DSM-5 identifies difficulties in three domains
  - Conceptual (e.g., skill deficits in areas such as language, reasoning, knowledge, and memory)
  - Social (e.g., problems with social judgment and the ability to make and retain friendships)
  - Practical (e.g., difficulties managing personal care or job responsibilities)
- Devalued by society

Other Classification Systems for Intellectual Disability

- American Association of Intellectual and Developmental Disabilities (AAIDD)
  - Based on assistance required
    - Intermittent
    - Limited
    - Extensive
    - Pervasive
  - Keeps the emphasis on what assistance is needed

Intellectual Disability: Statistics

- Prevalence = 1 to 3% of general population
  - 9 in 10 people with ID have mild impairment (IQ 50 to 70)
- Chronic course
- Highly variable individual prognosis
  - Independence is possible for many individuals with mild impairment when provided with appropriate resources (e.g., skills training)

Causes of Intellectual Disability

- Hundreds of known causes
  - Environmental (e.g., neglect)
  - Prenatal (e.g., exposures to toxins in the womb)
  - Perinatal (e.g., problems with delivery)
  - Postnatal (e.g., head injury)

Examples of Causes of Intellectual Disability

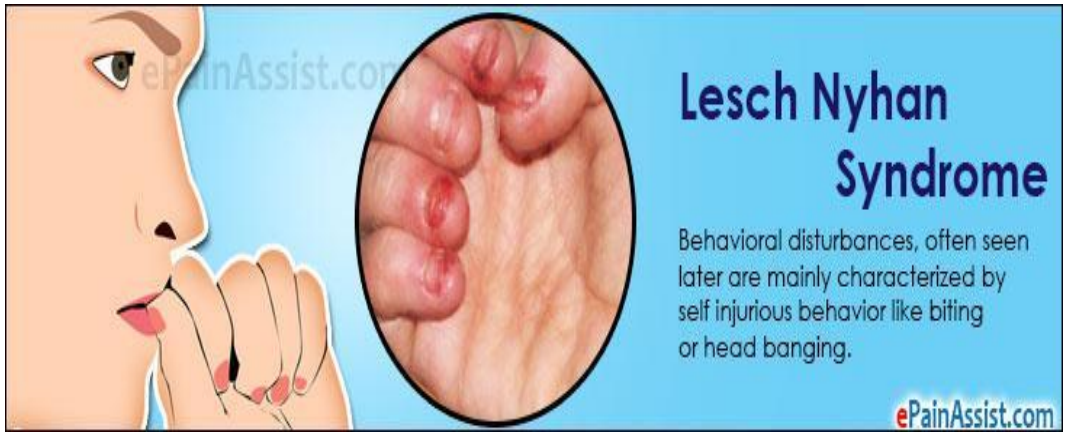
- Examples
  - Fetal alcohol syndrome
  - Exposure to other illness in the womb
  - Lack of oxygen (anoxia) during birth
  - Malnutrition
  - Head injuries
  - Childhood abuse

Causes of Intellectual Disability: Genetics

- Genetic influences
  - Chromosomal disorders (e.g., Down Syndrome)
  - Multiple genetic mutations
  - Single genes can be responsible
    - Dominant genes less often responsible for ID (because people with ID are less likely to have children)
    - Recessive genes more often responsible
- As many as 30% cases of ID have no identified etiology

Lesch-Nyham syndrome

- Genetic influences: De novo disorders (= mutation occurring in the sperm or egg or after fertilization)
  - Intellectual disability, symptoms of cerebral palsy, self-injurious behavior
  - Recessive allele on the X chromosome > only affects males (females have an additional X chromosome to balance)



Phenylketonuria (PKU)

The most common inborn error of amino acid metabolism.
Sources of phenylalanine are eggs, chicken, liver, beef, milk, and soybeans

- Treatment at any time during pregnancy may reduce the severity of developmental delay.

❑ Signs and symptoms

- About one-third of these children are never able to walk, and two-thirds cannot talk.
- Seizures, other neurologic abnormalities, decreased pigmentation of hair and skin, and eczema often accompany the mental retardation in untreated children.
-
- Hyperphenylalaninemia and the resultant mental retardation can be avoided by restricting phenylalanine intake early in life.
- Hence, several screening procedures are routinely performed to detect PKU in the immediate postnatal period.

Causes of Intellectual Disability: Down Syndrome

- Chromosomal influences
  - Down Syndrome
    - Most common chromosomal cause of intellectual disability
    - Extra 21st chromosome (Trisomy 21)
    - Distinctive physical symptoms

Causes of Intellectual Disability: Down Syndome, Continued

- Down Syndrome
  - Higher risk with advanced maternal age
  - Detectable with some prenatal tests
    - Amniocentesis
    - Chorionic villus sampling (CVS)
    - Mother’s blood tests
    - Tests do not indicate severity of impairment
    - 1 in 4 mothers elects to terminate the pregnancy

Causes of Intellectual Disability: Fragile X Syndrome

- Fragile X syndrome
  - Symptoms
    - Learning disabilities
    - Hyperactivity
    - Short attention span
    - Gaze avoidance
    - Perseverative speech
  - Gender differences
    - Primarily affects males
    - Women with Fragile X have mild symptoms

Causes of Intellectual Disability: Cultural-Familial Intellectual Disability

- Cultural-familial intellectual disability: Refers to intellectual disability influenced by social environmental factors, such as:
  - Abuse
  - Neglect
  - Social deprivation
- These factors likely interact with existing biological factors

Treatment of Intellectual Disability

- Severe ID: Treatment similar to that for autism spectrum disorder
- Mild ID: Treatment similar to that for learning disorders
- Goals are similar across severity; level of assistance differs
- Behavioral interventions teach:
  - Basic skills (e.g., dressing, hygiene)
  - Social skills
  - Practical skills (e.g., paying bills)

Treatment of Intellectual Disability: Goals

- Common goals
  - Participate in community life
  - Benefit from education
  - Hold a job or other productive pursuits (e.g., volunteering)
  - Build meaningful relationships

Prevention of Neurodevelopmental Disorders

- Efforts are still in early stages
- Early interventions for at-risk children
  - Head Start Program: Educational, medical (e.g., nutritional), and social support
- Future directions: Genetic screening
  - Detection and correction
  - Prenatal gene therapy

Summary of Neurodevelopmental Disorders

- This category encompasses a wide range of disorders with varying severity
- May be caused by genetic or environmental factors or have indeterminate cause
- Treatment focuses on mitigating functional impairment